Flora of the Carolinas, Virginia, Georgia, and surrounding areas

Working Draft of 11 January 2007

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

TABLE OF CONTENTS

Table of Contents

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. The Flora includes treatment of all species in Virginia, North Carolina, South Carolina, and Georgia (the primary flora area), with less detailed treatment of all species occurring in a secondary flora area consisting of the adjoining states of Alabama, Mississippi, Tennessee, Kentucky, West Virginia, the District of Columbia, Maryland, and Delaware, and portions of the additional states of New Jersey (southern New Jersey), Louisiana (the Florida Parishes, those east of the Mississippi River), and Florida (the Panhandle and northeastern Florida) (see Figure 1.A.). Approximately 5400 species and infraspecific taxa are recognized for the primary flora area (the Carolinas, Virginia, and Georgia), with an additional 900 taxa from the secondary and tertiary flora areas. Approximately 6300 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 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.

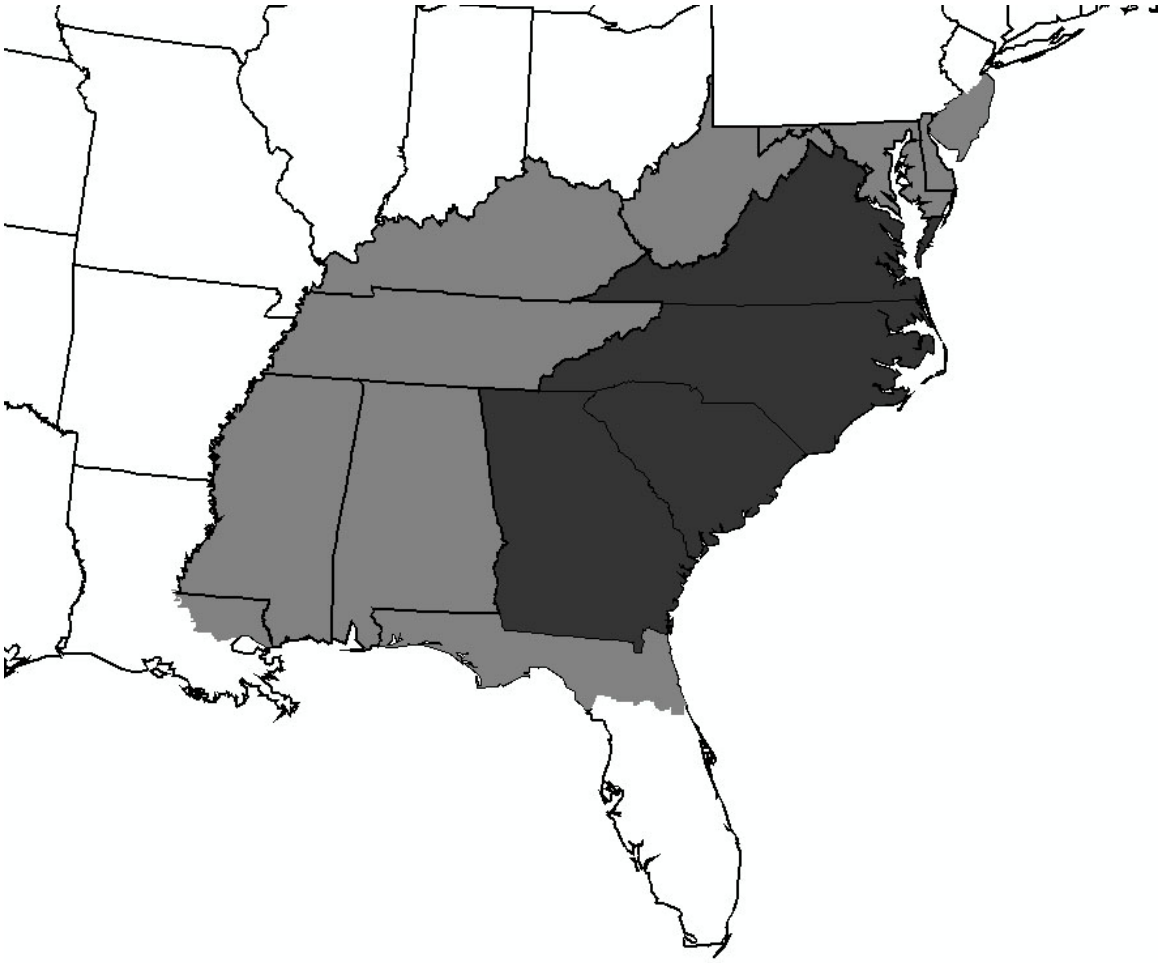

Figure 1.A. Map of the area covered by the Flora (Chapter 1).

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 primary area (Georgia, South Carolina, North Carolina, and Virginia), 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.
2. Native taxa documented from the secondary flora area, consisting of Alabama, Mississippi, Tennessee, Kentucky, West Virginia, Maryland, District of Columbia, Maryland, Delaware, eastern Louisiana, northern Florida, and southern New Jersey.
3. Alien taxa demonstrably established in the secondary flora area.

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 Chapter 3 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, Tennessee, Kentucky, West Virginia, Maryland, Delaware, and the District of Columbia). The inclusion in the keys of taxa from the broader, secondary area will facilitate the discovery of range extensions, as well as extending the usefulness of the Flora to a broader geographic area. 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.

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; and Flora of North America (1993b, 1997, 2000, 2002a, 2002b, 2003a, 2004b, 2005, 2006a, 2006b, 2006c) as FNA. 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.

Rarity. Species monitored as rare, threatened, or endangered by the state agencies of North Carolina, South Carolina, and Virginia, or by the U.S. Fish and Wildlife Service, are so indicated. While the details of rarity status will change, this will still provide the user a preliminary indication that the taxon is one of conservation concern. This information is derived from Franklin (2004), Townsend (2005), Georgia Natural Heritage Program (2005), and USFWS (2005).

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.

Acknowledgments

Reviews, comments, contributions, and support for the new flora have been gratefully received over many years from the following: Jim Allison, Jame Amoroso, Lewis Anderson, Loran Anderson, Matthew Barnett-Lawrence, Rodney Bartgis, Jeffery Beam, Allen Belden, Millie Blaha, John Boggan, Marj Boyer, Ted Bradley, Edwin Bridges, Richard Broadwell, Dan Brunton, A.J. Bullard, Bill Burk, Julian Campbell, Susan Carr, Jay Carter, Linda Chafin, Sherri Church, Roy Coomans, Pat Cox, Bob Dellinger, Pete Diamond, Jamey Donaldson, Wilbur Duncan (now deceased), Lee Echols, Dwayne Estes, Susan Farmer, Mary Felton (now deceased), Gary Fleming, Cecil Frost, Chris Frye, Chick Gaddy, Kancheepuram Gandhi, Bill Gensel, Lisa Giencke, Bob Godfrey (now deceased), Tom Govus, Joel Gramling, Ben Hafer, Arthur Haines, Jim Hardin, Karin Heiman, Hal Horwitz, Ron Jones, John Kartesz, Gary Kauffman, Benson Kirkman, Bob Kral, Alexander Krings, Ron Lance, Julia Larke, Chris Lea, Richard LeBlond, Michael Lee, Harry LeGrand, Steve Leonard, Chris Ludwig, Paul Manos, Laura Mason, Jim Massey, Jim Matthews, Bob McCartney, Kathleen McCoy, Carol Ann McCormick, Patrick McMillan, Julie Moore, Mike Moore (now deceased), Larry Morse, Bill Moye, Nora Murdock, Zack Murrell, Lytton Musselman, Robert Naczi, John Nelson, Guy Nesom, Claire Newell, Carl Nordman, Cary Norquist, Shawn Oakley, Doug Ogle, James Padgett, Tom Patrick, Karen Patterson, Linda Pearsall, Sam Pearsall, Bob Peet, Dan Pittillo, Bert Pittman, Richard Porcher, Milo Pyne, Al Radford (now deceased), Tom Rawinski, Doug Rayner, Mary Russo, Mike Schafale, Steve Seiberling, Alan Smith, Inge Smith, Peter Smith, Anita Solomon, Bruce Sorrie, Don Stone, Dave Taylor, John Thieret (now deceased), Leonard Uttal, Nancy Van Alstine, Brian van Eerden, Herb Wagner (now deceased), Dan Ward, Donna Ware, Richard Ware, Stewart Ware, Allison Weakley, Tom Wentworth, Peter White, Tom Wieboldt, Gene Wofford, Donna Wright, Robert Wright, Steve Young, the Flora of Virginia Project, participants in the Carolina Vegetation Survey annual "pulses,", NatureServe (Durham Office), the Southern Resource Office of The Nature Conservancy, the North Carolina Natural Heritage Program (Division of Parks and Recreation), the Virginia Division of Natural Heritage, the Conservation Trust for North Carolina, and the NCU, NCSC, DUKE, UGA, USCH, CLEMS, VDB at BRIT, FSU, US, BRIT, WILLI, BOON, WCUH, and UNCC herbaria. I ask the forgiveness of anyone omitted inadvertently.

FERNS AND "FERN ALLIES"

Family circumscriptions follow Smith et al. (2006).

ARTIFICIAL KEY TO THE GENERA OF FERNS AND FERN ALLIES

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 *Trichomanes* 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..... ***Trichomanes*** (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 growing as floating or rooted aquatics

1 Plant a floating aquatic.
  2 Leaves < 1 mm long, reddish or green, without hairs on the upper surface ..... ***Azolla*** (AZOLLACEAE)
  2 Leaves 5-50 mm long, bright green, with obvious hairs on the upper surface ..... ***Salvinia*** (SALVINIACEAE)
1 Plant a rooted aquatic.
  3 Plant clover-like, with 4 leaf segments borne terminally ..... ***Marsilea*** (MARSILEACEAE)
  3 Leaves linear.
    4 Plants cormose, with numerous undivided leaves ..... ***Isoetes*** (ISOETACEAE)
    4 Plants rhizomatous, the leaves reduced to a winged petiole..... ***Pilularia americana*** (MARSILEACEAE)

Key C – 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 trailing, perennial; [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..... ***Trichomanes 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). {key *Hymenophyllum* and *Trichomanes* under this lead}

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 Indusium ("involucre") bivalvate (deeply divided into 2 flaps); receptacle not exserted from between the 2 flaps of the indusium..... ***Hymenophyllum*** (HYMENOPHYLLACEAE)

4 Indusium ("involucre") tubular or funnelform, sometimes slightly 2-lobed; receptacle long and whiplike, exserted from the mouth of the tubular indusium..... ***Trichomanes*** (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 Indusium ("involucre") bivalvate (deeply divided into 2 flaps); receptacle not exserted from between the 2 flaps of the indusium..... ***Hymenophyllum*** (HYMENOPHYLLACEAE)

11 Indusium ("involucre") tubular or funnelform, sometimes slightly 2-lobed; receptacle long and whiplike, exserted from the mouth of the tubular indusium..... ***Trichomanes*** (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)

7 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*** (WOODSIACEAE)
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*** (WOODSIACEAE)
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, brown, 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, green, 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..... ***Polystichum*** (DRYOPTERIDACEAE)

8 Leaves light to medium green, herbaceous, deciduous to semi-evergreen.

9 Sori continuous along the midrib of the pinna.....***Blechnum*** (BLECHNACEAE)

9 Sori distinct.

10 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)

10 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, 0.3-1 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..... ***Phlebodium*** (POLYPODIACEAE)

5 Leaves 1-pinnate or more divided.

6 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.

7 Veins anastamosing, rejoining to form a netlike pattern; pinnae 4-25 pairs per leaf; [non-native, rarely naturalized]..... ***Cyrtomium*** (DRYOPTERIDACEAE)

7 Veins branching dichotomously, free, not rejoining to form a netlike pattern; pinnae 25-50 pairs on larger leaves; [native, common]..... ***Polystichum*** (DRYOPTERIDACEAE)

6 Leaves 1-pinnate-pinnatifid, the pinnae pinnatifid, generally lacking a prominent basal lobe, light green to dark green, herbaceous to subcoriaceous; indusium either reniform or cuplike.

8 Vascular bundles in the petiole 3-7..... ***Dryopteris*** (DRYOPTERIDACEAE)

8 Vascular bundles in the petiole 2, uniting above.

9 Indusium reniform, arching over the sorus .....***Thelypteris*** (THELYPTERIDACEAE)

9 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.

9 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)

9 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.

10 Leaf blades pentagonal or broadly triangular in outline, ca. 1× as long as wide.

11 Leaf blade pentagonal in outline, the terminal pinna the largest; sori submarginal, roundish, the indusium reniform.....***Arachniodes*** (DRYOPTERIDACEAE)

11 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*** (DENNSTAEDTIACEAE)

10 Leaf blades elongate, mostly lanceolate, generally 4× or more as long as wide.

12 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)

12 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*).
13 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)
13 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.
14 Vascular bundles (3-) 5 (-7) in the petiole ..... ***Dryopteris*** (DRYOPTERIDACEAE)
14 Vascular bundles 2 in the petiole (or uniting near the leaf blade into 1).
15 Leaves 25-65 cm wide, with whitish, straight, acicular hairs; [species adventive and weedy, presently known in our area only from the Coastal Plain of SC] ..... ***Macrothelypteris*** (THELYPTERIDACEAE)
15 Leaves 5-25 (-30) cm wide, with scales and minute glands (sometimes also with septate hairs); [native species, widespread].
16 Leaves 1-pinnate-pinnatifid; indusium cuplike, attached beneath the sorus and consisting of 3-6 lanceolate to ovate segments ..... ***Woodsia obtusa*** (WOODSIACEAE)
16 Leaves 2-pinnate-pinnatifid; indusium flaplike or pocketlike, attached at one side of the sorus and arching over it.
17 Leaves 10-30 cm wide, the tip acute to acuminate; indusium flaplike ..... ***Athyrium*** (WOODSIACEAE)
17 Leaves 4-9 cm wide, the tip long-attenuate; indusium pocketlike or hoodlike .... ***Cystopteris bulbifera*** (WOODSIACEAE)

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) ..... ***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 Leaf blades broadly (about equilaterally) triangular, pentagonal, or flabellate in outline, 0.7-1.3× as long as wide.
3 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)
3 Leaf blades pentagonal or broadly triangular in outline, the petiole not branched dichotomously.
4 Leaf blade pentagonal in outline, the terminal pinna the largest; sori submarginal, roundish, the indusium reniform ..... ***Arachniodes simplicior*** (DRYOPTERIDACEAE)
4 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*).
5 Sporangia borne in marginal, linear sori, indusium absent, protected by the revolute leaf margin and a minute false indusium; texture of mature blades somewhat fleshy; plants solitary from a short underground rhizome with thick, mycorrhizal roots; [primarily of moist forests] ..... ***Botrypus*** (OPHIOGLOSSACEAE)
5 Sporangia borne in a stalked, specialized, fertile portion of the blade; texture of mature leaf blades hard and stiff; plants colonial from deep-seated rhizomes; [primarily of moist to dry woodlands and savannas] ..... ***Pteridium*** (DENNSTAEDTIACEAE)
2 Leaves elongate in outline, mostly ovate, lanceolate, oblanceolate, or narrowly triangular, 1.5-10× or more as long as wide.
6 Leaves 2-pinnate or more divided, the pinnae divided to their midribs.
7 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)
7 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.

8 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)

8 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.

9 Vascular bundles (3-) 5 (-7) in the petiole ..... ***Dryopteris*** (DRYOPTERIDACEAE)

9 Vascular bundles 2 in the petiole (or uniting near the leaf blade into 1).

10 Leaves 25-65 cm wide, with whitish, straight, acicular hairs; [species adventive and weedy, presently known in our area only from the Coastal Plain of SC] ..... ***Macrothelypteris*** (THELYPTERIDACEAE)

10 Leaves 5-25 (-30) cm wide, with scales and minute glands (sometimes also with septate hairs); [native species, widespread].

11 Leaves 1-pinnate-pinnatifid; indusium cuplike, attached beneath the sorus and consisting of 3-6 lanceolate to ovate segments ..... ***Woodsia obtusa*** (WOODSIACEAE)

11 Leaves 2-pinnate-pinnatifid; indusium flaplike or pocketlike, attached at one side of the sorus and arching over it.

12 Leaves 10-30 cm wide, the tip acute to acuminate; indusium flaplike ..... ***Athyrium*** (WOODSIACEAE)

12 Leaves 4-9 cm wide, the tip long-attenuate; indusium pocketlike or hoodlike ..... ***Cystopteris bulbifera*** (WOODSIACEAE)

6 Leaves 1-pinnate-pinnatifid or less divided, the pinnae entire, toothed, lobed or pinnatifid.

13 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.

14 Fertile leaf woody, brown, 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)

14 Fertile leaf stiff but herbaceous, green, 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)

13 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.

15 Rhizomes long-creeping, leaves scattered, forming clonal patches.

16 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)

16 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)

15 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 *Matteucia*)

17 Plants moderately to very robust, the leaves typically 6-30 dm tall; leaves either strongly dimorphic, the fertile leaves very unlike the sterile, brown at maturity (*Matteucia* and *Osmunda cinnamomea*) 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*); rachises scaleless, petioles scaleless (except at the base in *Matteucia*).

18 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 ..... ***Matteucia struthiopteris*** (ONOCLEACEAE)

18 Leaves slightly if at all tapering to the base, about equally broad through much of their length, the basalmost pinnae much > 1/2 as long as the largest pinnae ..... ***Osmunda*** (OSMUNDACEAE)

17 Plants mostly less robust, the leaves 3-10 dm tall (except *Dryopteris ludoviciana*, *D. celsa*, and *D. goldiana* 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.

18 Sori elongate, the indusium elongate, attached along one side as a flap.

19 Petiole and rachis lustrous brownish-black; fertile leaves 2-8 (-12) cm wide.....

.....***Asplenium platyneuron*** (ASPLENIACEAE)

19 Petiole and rachis green; fertile leaves 10-20 (-30) cm wide.

20 Leaves 1-pinnate-pinnatifid (the pinnae pinnatifid).....***Deparia*** (WOODSIACEAE)

20 Leaves 1-pinnate (the pinnae entire).....***Diplazium*** (WOODSIACEAE)

18 Sori roundish, the indusium kidney-shaped or roundish, attached by a central stalk.

21 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 ..... ***Polystichum*** (DRYOPTERIDACEAE)

21 Leaves 1-pinnate-pinnatifid, the pinnae pinnatifid, generally lacking a prominent basal lobe, light green to dark green, herbaceous to subcoriaceous; indusium reniform.

22 Vascular bundles in the petiole 4-7..... ***Dryopteris*** (DRYOPTERIDACEAE)

22 Vascular bundles in the petiole 2, uniting above .....
.....***Thelypteris*** (THELYPTERIDACEAE)

ASPLENIACEAE Frank 1877 (Spleenwort Family)

A family of a single genus 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.

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.

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 (very rarely normal, known only from Hale County, AL) ..... ***A. ×ebenoides***

6 Petiole partially or entirely green (darkened or not at its base).

8 Leaves pinnatifid or pinnate through most or all of their lengths.

9 Leaves pinnatifid, sometimes fully pinnate at the base; spores normal ..... ***A. pinnatifidum***

9 Leaves pinnate, sometimes pinnate-pinnatifid at the base; spores abortive.....***A. ×trudellii***

8 Leaves bipinnate to tripinnate.

10 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***

10 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.

11 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.
12 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***
12 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***
11 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.
13 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***
13 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].
14 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***
14 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.
15 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***
15 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
16 Pinna margins crenate to serrate; pinna base lacking an auricle, or the auricle rudimentary; veins evident; spores 64 per sporangium ..... ***A. heterochroum***
16 Pinna margins shallowly crenate; pinna base with auricle; veins obscure; spores 32 per sporangium ..... ***A. heteroresiliens***

Asplenium bradleyi D.C. Eaton, Bradley's Spleenwort. Pd (GA, NC, SC, VA), Mt (GA, NC, VA), Cp (GA, SC): dry outcrops of felsic sedimentary or metasedimentary rocks, such as sandstone, quartzite, or metaquartzite, at low to moderate elevations; rare (NC Rare, SC Rare, VA Watch List). 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; = *A.* ×*bradleyi*]

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

Asplenium heterochroum Kunze, Bicolored Spleenwort. Cp (GA, SC): fairly moist outcrops of calcareous sedimentary rocks, such as coquina limestone ("marl"); rare (GA Special Concern). Se. and sc. GA (Jones & Coile 1988) south to n. FL; West Indies; Belize. [= FNA, K; < *A. heterochroum* Kunze – S]

Asplenium heteroresiliens W.H. Wagner, Marl Spleenwort, Carolina Spleenwort, Wagner's Spleenwort, Morzenti's Spleenwort. Cp (GA, NC, SC): 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); rare (US Species of Concern, GA Threatened, NC Endangered, SC Rare). 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; < *A. heterochroum* Kunze – S, in part]

Asplenium monanthes Linnaeus, Single-sorus Spleenwort. Mt (NC, SC): 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; rare (NC Endangered, SC Rare). 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 Sandwich Islands, 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); sinkholes limestone talus in the collapsed mouth of a sinkhole in Jackson County, AL; and the Huachuca Mountains, Cochise County, AZ. [= RAB, FNA, K, W]

Asplenium montanum Willdenow, Mountain Spleenwort. Mt, Pd (GA, NC, SC, VA): 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 2000m), but in the Piedmont to as low as 150 m; common. 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]

Asplenium pinnatifidum Nuttall, Lobed Spleenwort. Pd, Mt (GA, NC, SC, VA): 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; uncommon (NC Watch List, SC Rare). 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; = *A. pinnatifidum* var. *pinnatifidum* – G; = *A. ×pinnatifidum* – K]

Asplenium platyneuron (Linnaeus) Britton, Sterns, & Poggenburg, Ebony Spleenwort. Mt, Pd, Cp (GA, NC, SC, VA): moist to dry soils of forests, woodlands, old fields; also on outcrops, especially of calcareous rocks, at low to moderate elevations; common. April-October. Québec, Ontario, 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; > *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. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp (GA): moist to dry outcrops of calcareous sedimentary or metamorphic rocks, such as limestone, dolostone, or marble, sometimes on narrow seams of calcareous materials in otherwise acidic rocks, mostly at low to moderate elevations, but remarkably on Grandfather Mountain at over 1800m; common in VA, rare in VA Piedmont, NC, and SC (NC Watch List, SC Rare). April-October. Sc. PA, KY, s. IL, MO, se. KS, OK, TX, CO, and s, NV south to FL, TX, AZ, and Mexico; also in the 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]

Asplenium rhizophyllum Linnaeus, Walking Fern. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp (NC, VA): 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; common (but local) in VA Mountains, uncommon in VA Piedmont, rare in VA Coastal Plain, uncommon in NC Mountains, rare in NC Piedmont and Coastal Plain (SC Rare). May-October. S. Québec, Ontario 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]

Asplenium ruta-muraria Linnaeus *var.* ***cryptolepis*** (Fernald) Wherry, American Wall-rue. Mt (GA, NC, VA), Pd (VA): moist to dry outcrops of calcareous sedimentary or metamorphic rocks, such as limestone, dolostone, or marble, at low to moderate elevations; uncommon in VA (rare in Piedmont, rare in NC) (GA Special Concern). 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. Ontario 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. [< *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 trichomanes Linnaeus *ssp.* ***quadrivalens*** D.E. Meyer emend. Lovis, Maidenhair Spleenwort. Mt (VA): moist outcrops of calcareous sedimentary rocks, such as limestone or dolostone; rare (VA Watch List). 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. Ontario south to w. VA, OH, and s. IL, and in British Columbia, 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. Mt, Pd (GA, NC, SC, VA): 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; common (SC Rare). 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 Newfoundland to AK, south to NC, c. GA (Jones & Coile 1988), c. AL, AR, OK, w. TX, 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]

Asplenium ×trudellii Wherry (pro species) [*montanum* × *pinnatifidum*], Trudell's Spleenwort. Pd (GA, VA), Mt (GA, NC, VA): moist outcrops of felsic sedimentary or metamorphic rocks, such as sandstone, phyllite, schist, at low elevations; rare. 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; = *Asplenium pinnatifidum* Nuttall var. *trudellii* (Wherry) Clute – G; = *Asplenium trudellii* Wherry – S; = ×*Asplenosorus trudellii* (Wherry) Mickel]

Asplenium scolopendrium Linnaeus var. *americanum* (Fernald) Kartesz & Gandhi, American Hart's-tongue Fern, is a very rare taxon, occurring in humid sinkholes in e. TN and n. AL, and other habitats, farther north in c. NY, n. MI, and Ontario; it is also reported as naturalized in MD by Reed (1953). [= FNA, K; = *Phyllitis scolopendrium* (Linnaeus) Newman var. *americana* Fernald – C, F, G]

* *Asplenium scolopendrium* Linnaeus var. *scolopendrium* is 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, occurs in WV (Hardy and Monroe counties), close to the VA line. It occurs on acidic rocks and may well be found in our area, as it is so inconspicuous. Its chromosome formula is SSSS. [= C, FNA, K]

The following additional hybrids (with both parents occurring in our area) are known; not all have been reported from our area, but all could plausibly occur here. They can usually be fairly readily recognized by observers experienced with both of their parents; their morphology is intermediate between the two parents, and they are usually (though not always) found in close proximity to both parents.

Asplenium ×alternifolium Wulfen (pro sp.) [*A. septentrionale* × *trichomanes*]. Chromosome formula = SSTT. Known from Hardy County, WV (Wagner et al. 1991). [= FNA, K]

Asplenium ×boydstoniae (Walter) Short [*A. ebenoides* × *platyneuron*]. Chromosome formula = PPPR. Known from Hale County, AL. This hybrid can only occur in association with fertile (autotetraploid) *A. ebenoides*, which is so far known only from Hale County, AL. [= FNA, K]

Asplenium ×clermontiae Syme [*A. ruta-muraria* × *trichomanes*]. Chromosome formula = TTUU. Known from OH. [= K; = *A.* ×*clermontae* – FNA, orthographic variant]

Asplenium ×gravesii Maxon [*A. bradleyi* × *pinnatifidum*]. Chromosome formula = MMPR. Known from GA, VA, TN, KY, and other states. [= FNA, K]

Asplenium ×herb-wagneri W.C. Taylor & Mohlenbrock [*A. pinnatifidum* × *trichomanes*]. Chromosome formula = MRT. [= FNA, K]

Asplenium ×inexpectatum (E.L. Braun ex Friesner) Morton [*A. rhizophyllum* × *ruta-muraria*]. Chromosome formula = RUU. [= FNA, K]

Asplenium ×kentuckiense T.N. McCoy [*A. pinnatifidum* × *platyneuron*]. Chromosome formula = MPR. Known from several localities in the VA Mountains and Piedmont. [= FNA, K]

Asplenium ×morganii W.H. Wagner [*A. platyneuron* × *ruta-muraria*]. Chromosome formula = PUU. Known from MD. [= K]

Asplenium ×shawneense (R.C. Moran) H.E. Ballard [*A. rhizophyllum* × *trichomanes*]. Chromosome formula = RT. [= FNA, K]

Asplenium ×virginicum Maxon [*A. platyneuron* × *trichomanes*]. Chromosome formula = PT. [= FNA, K]

Asplenium ×wherryi D.M. Smith [*A. bradleyi* × *montanum*]. Chromosome formula = MMP. Known from Murray Co. GA. [= FNA, K]

AZOLLACEAE Wettstein 1903 (Mosquito Fern Family)

Azollaceae consists of the single genus *Azolla*, with about 6 species. References: Lumpkin in FNA (1993b).

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. Cp (GA, NC, SC, VA), Mt, Pd (NC, SC, VA): stagnant waters of interdune ponds, limesink ponds, old millponds, beaver ponds, floodplain sloughs; uncommon (though often locally abundant, rare in Mountains and Piedmont of Virginia only). 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. Cp (GA): freshwater lake; rare, introduced from w. North America. 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]

BLECHNACEAE (C. Presl) Copeland 1947 (Deer Fern Family)

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: 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. occidentale*** *var.* ***minor***
1 Leaf blades usually > 5 dm long; leaves pinnate throughout; margins serrulate.....***B. serrulatum***

Blechnum occidentale Linnaeus *var.* ***minor*** Hooker, Hammock Fern. Cp (GA): moist forests; rare. S. GA south to FL; West Indies, Central America, and South America. [= FNA; < *B. occidentale* – K, S]

* ***Blechnum serrulatum***, L.C. Richard, Swamp Fern, Marsh Fern. Cp (SC): vacant lots, bottomlands; rare, introduced from tropical America, including FL. Introduced and established in e. SC (Beaufort and Jasper counties) via landscaping plants brought in from FL (P. McMillan, pers. comm. 2005). [= FNA, K, S]

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).

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. Cp, Pd, Mt (GA, NC, SC, VA): moist to wet, acid, organic soils, such as bogs, blackwater bottomlands, pocosins; common (rare in VA Mountains). May-September. Nova Scotia west to MI and MO, south to FL and e. TX, primarily on the Coastal Plain. When fruiting structures are not present, sometimes confused with *Onoclea*, but *W. areolata* has the pinnae tending to be alternate (vs. tending to be opposite), the pinnae tending to be acute or acuminate (vs. obtuse), and the pinna margin finely serrulate (vs. entire). See Cranfill (1983) for a discussion of the geography and ecology of *W. areolata*. [= RAB, C, F, FNA, G, K, W; = *Lorinseria areolata* (Linnaeus) K. Presl – S]

Woodwardia virginica (Linnaeus) J.E. Smith, Virginia Chain Fern. Cp, Mt, Pd (GA, NC, SC, VA): moist to wet, acid, organic soils, such as bogs, blackwater bottomlands, pocosins, sometimes in standing water, as in periodically flooded coastal plain depression ponds; common (rare in VA Mountains and VA Piedmont). June-September. Nova Scotia west to MI and IL, south to FL and TX, and in Bermuda, primarily on the Coastal Plain. Sometimes confused when sterile with *Osmunda cinnamomea* (which see for discussion). [= RAB, C, F, FNA, G, K, W; = *Anchistea virginica* (Linnaeus) K. Presl – S]

DENNSTAEDTIACEAE Pichi Sermolli 1970 (Bracken Family)

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 elongate in outline, at least 4× as long as broad, membranaceous; sori globular, separate ..... ***Dennstaedtia***
1 Leaf blades broadly triangular in outline, about as broad as long, subcoriaceous; sori linear, confluent ..... ***Pteridium***

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: This common species 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 punctilobula (Michaux) T. Moore, Hay-scented Fern, Pasture Fern, Boulder Fern. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): rocky or dry woodlands and forests, rock outcrops, pastures, clearings, roadbanks; common (uncommon in Piedmont, rare in Coastal Plain). June-September. Nova Scotia and Québec west to MI, south to NC, n. GA, n. AL, and AR, progressively more montane southward. [= RAB, C, F, FNA, G, K, S, W]

* *Dennstaedtia cicutaria* (Sw.) T. Moore. AL. Introduced. {investigate status} [= K]

Pteridium Gleditsch ex Scopoli 1760 (Bracken)

A genus of 2-11 species, cosmopolitan in distribution. *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: Jacobs & Peck in FNA (1993b).

1 Lower surface of rachis and costae shaggy pubescent; segment margins usually pubescent; terminal segments of well-developed pinnules generally 2-4 × as long as broad, about 3-7 mm wide ..... ***P. aquilinum*** *var.* ***latiusculum***
1 Lower surface of rachis and costae glabrous or sparsely pilose; segment margins usually glabrous or sparsely pilose; terminal segments of well-developed pinnules generally 6-15 × as long as broad, about 2-5 mm wide ..... ***P. aquilinum*** *var.* ***pseudocaudatum***

Pteridium aquilinum (Linnaeus) Kuhn *var.* ***latiusculum*** (Desvaux) Underwood ex Heller, Eastern Bracken. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): mainly in dry woodlands, forests, and heath balds, up to 1600 meters in elevation; common (rare in Coastal Plain). July-September. The species is nearly worldwide in distribution; var. *latiusculum* is itself very widely distributed, occurring in most of North America (largely replaced by var. *pseudocaudatum* in the Southeast), in Mexico, and in Eurasia. The relationship of these two varieties is discussed in detail by Speer & Hilu (1999) and Speer, Werth, & Hilu (1999). [= RAB, C, F, FNA, G, K, W; = *P. latiusculum* (Desvaux) Hieronymus var. *latiusculum* – S]

Pteridium aquilinum (Linnaeus) Kuhn *var.* ***pseudocaudatum*** (Clute) Heller, Tailed Bracken, Southern Bracken. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): mainly in dry sandy woodlands, often locally abundant in sandhills and flatwoods; common (uncommon in Piedmont). July-September. Var. *pseudocaudatum* is primarily a variety of the Southeastern Coastal Plain (where it is ubiquitous and abundant), but is reported north to MA, OH, IN, s. MI, and MO. [= RAB, C, F, FNA, G, K, W; = *P. latiusculum* (Desvaux) Hieronymus var. *pseudocaudatum* (Clute) Maxon – S]

KEY TO FERNS AND "FERN ALLIES"

DRYOPTERIDACEAE Ching 1965 (Wood-fern Family)

A family of about 40-45 genera and 1700 species, cosmopolitan in distribution, but concentrated in temperate and montane areas. Here circujmscribed (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, 2× 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***
  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; [subfamily *Dryopteridoideae*, tribe *Dryopterideae*].
    3 Veins anastamosing, rejoining to form a netlike pattern; pinnae 4-25 pairs per leaf; [non-native, rarely naturalized] ..... ***Cyrtomium***
    3 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. Pd (SC): moist banks in forested creek ravine; rare, introduced from 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. Cp (GA, NC, SC), Mt (GA?, VA): ditches, disturbed swamps, old mortar of brick walls; rare, native of e. Asia. [= FNA, K, S; = *Polystichum falcatum* Linnaeus f.]
* ***Cyrtomium fortunei*** J. Smith *var.* ***fortunei***, Fortune's Net-veined Holly Fern. Cp (GA, SC), Pd? (GA?): old mortar of brick walls; rare, native of se. China. Two other varieties are recognized; neither appears to be naturalized in North America. [= 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. For further information on hybrids, see the discussion of hybrids following the species accounts.

1 Leaves bipinnate-pinnatifid to tripinnate-pinnatifid (or to quadripinnate in the lower pinnae).
  2 Leaves evergreen, 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, 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 degrees (like an open Venetian blind); fertile leaves 8-12 cm wide..... ***D. cristata***
5 Leaves not dimorphic, or only slightly so, deciduous (*D. celsa* and *D. goldiana*) or evergreen (*D. ludoviciana*); fertile leaves lanceolate to ovate in outline, generally 1.5-4× as long as wide; pinnae mostly 3-4× 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, 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 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***
8 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. Mt (NC, VA): spruce-fir forests, northern hardwood forests; common (VA Watch List). July-September. Newfoundland and n. Québec 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; = *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. Mt (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): acidic, organic-rich bogs, swamps, less frequently in moist rocky ravines, rich forests, and sloping rock outcrops; common, uncommon to rare south and east of VA Mountains (GA Special Concern, SC Rare). June-September. Irregularly circumboreal, in North America ranging from n. Québec west to Yukon, south to NC, SC, 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; = *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. Mt (GA, NC, SC, VA), Cp, Pd (NC, SC, VA): swamps, seepage bogs; uncommon (GA Special Concern). June-September. Ranging (scattered) from ne. NJ and ne. NY west to s. IL, e. MO, and AR, south to SC, nw. GA, n. AL, TN, and n. LA; disjunct in w. NY and w. MI. 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; = *D. goldiana* (Hooker ex Goldie) ssp. *celsa* W. Palmer – G]

Dryopteris clintoniana (D.C. Eaton) Dowell, Clinton's Wood-fern, Broad Swamp Fern. Pd? (VA?): moist to wet forests; rare. This species is fertile allohexaploid derived from hybridization of *D. cristata* and *D. goldiana*; its chromosome complement is symbolized GGLLSS. This species has a disputed southern distribution; it is sometimes attributed to our area (as by Shetler & Orli 2000). It is definitely known as far south as se. PA, sc. PA, and OH. It is provisionally accepted for our area; additional study is needed. [= FNA, C, G, K; = *D. cristata* (Linnaeus) A. Gray var. *clintoniana* (D.C. Eaton) Underwood – F]

Dryopteris cristata (Linnaeus) A. Gray, Crested Wood-fern. Mt (NC, VA), Pd (*GA, NC, VA), Cp (NC, VA): bogs, swamp forests; uncommon (GA Special Concern). July-September. Circumboreal, in North America from Newfoundland to s. Saskatchewan and se. British Columbia, south to NC, TN, OH, IN, n. IL, IA, NE, and ID; disjunct in AL. 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; = *D. cristata* var. *cristata* – F]

Dryopteris goldiana (Hooker ex Goldie) A. Gray, Goldie's Wood-fern. Mt (GA, NC, SC, VA), Pd (VA): boulderfield forests, rich cove forests, seepage swamps, especially over calcareous sedimentary or mafic metamorphic or igneous rocks;

uncommon (NC Watch List, SC Rare). June-September. New Brunswick west to s. Ontario 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; = ***D. goldiana*** ssp. *goldiana* – G]

Dryopteris intermedia (Muhlenberg ex Willdenow) A. Gray, Fancy Fern, Evergreen Wood-fern. Mt (GA, NC, SC, VA), Pd, Cp (NC, VA): cove forests, other moist, rocky forests, over a variety of substrates; common (uncommon in Piedmont, rare in Coastal Plain) (SC Rare). June-September. 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; = ***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. Cp (GA, NC, SC): blackwater swamp forests; rare (NC Watch List). June-September. A Southeastern Coastal Plain species: e. NC south to s. FL, west to s. AL and s. MS (Sorrie & Leonard 1999); disjunct in the West Gulf Coastal Plain of LA and AR. 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. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): rock outcrops, boulderfield forests, other rocky forests; common (less common in Piedmont, rare in Coastal Plain). June-September. Newfoundland west to s. Ontario 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]

The following hybrids are known between species which occur in our area. If the hybrid has been reported from our area, it is so indicated. In addition, the chromosome formulae are indicated, using the conventions listed at the end. These hybrids all have unbalanced chromosome complements which do not allow pairing. Thus, all produce aborted spores (if they produce spores at all), which can be recognized (at 30-40× magnification) by their irregular size, shape, and color. For further information on these hybrids and a key to them, see Montgomery (1982).

D. campyloptera* × *intermedia. Known from NC. Chromosome formula = EII.
***D. campyloptera* × *marginalis*.** Known from VA. Chromosome formula = EIM.
D. carthusiana* × *cristata [***D.* ×*uliginosa*** (A. Braun ex Dowell) Druce]. Known from VA. Chromosome formula = ILSS.
D. carthusiana* × *intermedia [***D.* ×*triploidea*** Wherry]. Known from NC and VA. Chromosome formula = IIS. This is one of the commonest *Dryopteris* hybrids.
D. carthusiana* × *marginalis [***D.* ×*pittsfordensis*** Slosson]. Chromosome formula = IMS.
D. celsa* × *cristata. Known from NC. Chromosome formula = GLLS.
D. celsa* × *goldiana. Chromosome formula = GGL.
D. celsa* × *intermedia [***D.* ×*separabilis*** (Wm. Palmer) Small]. Known from NC and VA. Chromosome formula = GIL.
D. celsa* × *ludoviciana [***D.* ×*australis*** (Wherry) Small]. Known from GA, NC, SC, and VA. Chromosome formula = GLL.
D. celsa* × *marginalis [***D.* ×*leedsii*** Wherry]. Chromosome formula = GLM.
D. clintoniana* × *marginalis [***D.* ×*burgessii*** Boivin]. Chromosome formula = GLMS.
D. cristata* × *intermedia [***D.* ×*boottii*** (Tuckerman) Underwood]. Known from VA. Chromosome formula = ILS. This is one of the commonest *Dryopteris* hybrids.
D. cristata* × *marginalis [***D.* ×*slossoniae*** Wherry ex Lellinger]. Known from VA. Chromosome formula = LMS.
D. goldiana* × *intermedia. Known from NC. Chromosome formula = GI
D. goldiana* × *marginalis. [***D.* ×*neowherryi*** W.H. Wagner]. Known from NC and VA. Chromosome formula = GM.
D. intermedia* × *marginalis. Known from VA. Chromosome formula = IM.

E = *D. expansa*
G = *D. goldiana*
I = *D. intermedia*
L = *D. ludoviciana*
S = *D. "semicristata"* (hypothetical taxon, perhaps extinct)

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).

Polystichum acrostichoides (Michaux) Schott, Christmas Fern. Mt, Pd, Cp (GA, NC, SC, VA): moist to dry forests and woodlands; common. June-September. Nova Scotia west to MN, south to s. FL and e. TX; also in Mexico. One of the most

familiar ferns in e. North America. Var. *lonchitoides* Brooks, allegedly endemic to WV, is of uncertain taxonomic value. [= RAB, C, F, FNA, G, S, W; > ***P. acrostichoides*** var. ***acrostichoides*** – K; > ***P. acrostichoides*** var. ***lonchitoides*** Brook – K]

EQUISETACEAE L.C. Richard ex de Candolle 1805 (Horsetail Family)

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. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): moist streambanks, bottomlands, moist disturbed sites; common. March-April. A circumboreal species, occurring throughout North America. [= RAB, C, FNA, G, K, S, W; > ***E. arvense*** var. ***arvense*** – F]

Equisetum fluviatile Linnaeus, Water Horsetail, Pipes. Mt (VA): open calcareous wetlands; rare (VA Rare). June-August. Circumboreal, south in North America to n. VA, PA, IL, IA, and WA. [= C, F, FNA, G, K, W]

Equisetum hyemale Linnaeus *ssp.* ***affine*** (Engelmann) Calder & R.L. Taylor, Tall Scouring Rush. Mt, Pd, Cp (GA, NC, SC, VA): riverbanks, alluvial floodplains; common (uncommon in NC and SC). May-September. Ssp. *affine* occurs nearly throughout North America and in Mexico and Guatemala; ssp. *hyemale* is Eurasian. [= FNA; = ***E. hyemale*** var. *affine* (Engelmann) A.A. Eaton – RAB, C, K, W; > ***E. hyemale var. affine*** – F; > ***E. hyemale*** var. *robustum* (A. Braun) A.A. Eaton – F; > ***E. hyemale*** var. *pseudohyemale* (Farwell) Morton – G; > ***E. hyemale*** var. *elatum* (Engelmann) Morton – G; ***E. praealtum*** Rafinesque – S; **= *Hippochaete hyemalis*** (Linnaeus) Bruhin ssp. ***affinis*** (Engelmann) W.A. Weber]

* ***Equisetum ramosissimum*** Desfontaines *ssp.* ***ramosissimum***, Branched Scouring Rush. Cp (NC): disturbed areas; rare, introduced from the Old World, where it is widespread in Europe, Asia, and Africa. This species was apparently introduced long ago on ship's ballast to Wilmington (New Hanover Co. NC), and other southeastern ports, such as Pensacola, 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. Mt (VA): seepage swamps; rare (VA Rare). Circumboreal, south in North America to MD, n. VA, 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]

Equisetum ×*ferrissii* Clute (pro sp.) [= ***E. hyemale*** × *laevigatum*]. There are old reports, repeated in RAB, S, and FNA, of the occurrence of ***E.*** ×*ferrissii* in our area; documentation of these reports is not known; it is reported for Prince George's County, MD (Shetler & Orli 2000). *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]

Equisetum laevigatum A. Braun. Widespread in n. North America, south to CT, NY, PA, KY, AR, and TX. There are old reports, repeated in RAB, and S, of this species in our area; 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]

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]

HYMENOPHYLLACEAE Link 1833 (Filmy Fern Family)

A family of 6-10 (or many more) genera and 600-650 species. See Moran (1998) for an interesting discussion and overview of independent fern gametophytes in e. North America. References: Farrar in FNA (1993b); Iwatsuki in Kramer & Green (1990); Morton (1968).

1 Sporophytes present.
  2 Indusium ("involucre") bivalvate (deeply divided into 2 flaps); receptacle not exserted from between the 2 flaps of the indusium ..... ***Hymenophyllum***
  2 Indusium ("involucre") tubular or funnelform, sometimes slightly 2-lobed; receptacle long and whiplike, exserted from the mouth of the tubular indusium ..... ***Trichomanes***
1 Gametophytes only present.
  3 Gametophytes thalloid, flattened..... ***Hymenophyllum***
  3 Gametophytes filamentous, no portion flattened and planar ..... ***Trichomanes***

Hymenophyllum J.E. Smith 1793 (Filmy Fern)

As here very broadly circumscribed, a genus of about 330 species, almost strictly tropical in distribution. *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: Raine, Farrar, & Sheffield (1991); Iwatsuki in Kramer & Green (1990); Morton (1968).

1 Sporophytes present.
  2 Leaf blade with stellate hairs..... ***H. tayloriae***
  2 Leaf blade glabrous..... ***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..... ***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 ..... ***H. tunbrigense***

Hymenophyllum tayloriae Farrar & Raine, Gorge Filmy Fern. Mt (GA, NC, SC): spray cliffs near waterfalls, permanently moist ceilings of grottoes in escarpment gorges with high rainfall; rare (GA Special Concern, NC Watch List). 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 (Davison 1997) and sites in e. TN and n. 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; = "a branching ribbon-like gametophyte with marginal rhizoids and small, ovate, plate-like gemmae several cells wide, of the genus *Hymenophyllum*" – RAB; **= *Sphaerocionium sp. 1***]

Hymenophyllum tunbrigense (Linnaeus) J.E. Smith, Tunbridge Filmy Fern. Mt (SC): moist rock faces in an escarpment gorge with high rainfall; rare (SC Rare). June-September. The occurrence of this filmy fern in the escarpment gorge of Eastatoe Creek (and its tributaries) 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]

Trichomanes Linnaeus 1753 (Filmy Fern)

Depending on circumscription, a genus of 80-300 species, primarily tropical. Dubuisson et al. (2003) and other molecular phylogenetic studies of *Trichomanes* suggest that some of the segregates may warrant recognition at the generic level. References: Iwatsuki in Kramer & Green (1990); Morton (1968); Dubuisson et al. (2003).

1 Plant a sporophyte (thus with simple, lobed, or pinnate-pinnatifid leaves).
  2 Leaves pinnate-pinnatifid, > 5 cm long; [subgenus *Trichomanes*, section *Lacosteopsis*] ..... ***T. boschianum***
  2 Leaves simple to slightly lobed, < 2 cm long; [subgenus *Didymoglossum*, section *Didymoglossum*] ..... ***T. petersii***
1 Plant a gametophyte (thus filamentous, forming felt-like mats).
  3 Gametophytes free-living, distant from sporophytes of *T. boschianum* or *T. petersii*..... ..... ***T. intricatum*** (see discussion under *T. intricatum*)
  3 Gametophytes growing in association with or in proximity to sporophytes of *T. boschianum* or *T. petersii*..... ..... ***T. boschianum*** or ***T. petersii*** (see discussion under *T. intricatum*)

Trichomanes boschianum Sturm, Appalachian Filmy Fern. Mt (GA, NC, SC, VA): on rock outcrops, usually vertical or overhanging, usually in deeply shaded grottoes receiving seepage or spray from waterfalls; rare (GA Rare, NC Threatened, SC Rare). June-September. W. NC and w. SC west to ne. GA, AL, MS (Menapace, Davison, & Webb 1998), and AR, and north to s. OH, KY, and s. IL; also disjunct in Chihuahua, Mexico. See Belden et al. (2004) for more details on the first documented Virginia occurrence. [= RAB, C, F, FNA, G, K, S, W]

Trichomanes intricatum Farrar, Grotto-felt, Appalachian Trichomanes, Weft Fern. Mt, Pd (GA, NC, SC, VA): on ceilings or back walls of grottoes, especially in humid gorges or near or behind waterfalls; rare (NC Watch List, VA Watch List). This species is rather widespread in e. North America, from VT, MA, CT, IN, and IL south to NC, SC, GA, AL, TN, and KY. *T. intricatum* cannot be morphologically distinguished from gametophytes of *T. boschianum* or *T. 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* 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 key above (based on proximity to 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 *T. boschianum* and *T. 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 *T. intricatum* 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 *T. boschianum*, *T. petersii*, or *Hymenophyllum tunbrigense* should be investigated carefully. *Vittaria appalachiana* and *Hymenophyllum tayloriae* gametophytes differ from *Trichomanes intricatum* in being thallose rather than filamentous. [= 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]

Trichomanes petersii A. Gray, Dwarf Filmy Fern. Mt (NC, SC), Cp (GA): 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; rare (GA Rare, NC Threatened, SC Rare). June-August. W. NC and w. SC southwest to FL, AL, MS, and LA, and north to AR and s. IL; also in Mexico and Guatemala. This diminutive species is often overlooked, except by bryologists and hepaticologists; it does superficially resemble a moss or liverwort more than a fern. It occurs on tree bark in some parts of its range. [= RAB, FNA, K, S, W; = *Didymoglossum petersii* (A. Gray) Copeland]

ISOETACEAE Dumortier 1829 (Quillwort, Merlin's-grass)

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).

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

Isoetes appalachiana Brunton & Britton, Appalachian Quillwort. Cp (NC, SC, VA), Pd (SC), Mt (VA): seepages, small woodland streams, ephemeral wetlands, backwaters; uncommon (GA Special Concern). 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; < *I. engelmannii* var. *engelmannii* – F, S; > *I. engelmannii* var. *georgiana* Engelmann]

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

Isoetes butleri Engelmann, Butler's Quillwort. Mt (GA): seepage areas on calcareous glades; rare (GA Special Concern). 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. Cp, Pd, Mt (NC, SC, VA): usually in permanent water bodies with active current; common. A diploid species (2n=22). Apparently there are 2 cryptic taxa currently called *I. engelmannii* (Hoot, Napier, & Taylor 2004), genotype NN and genotype SS. [= K, Z; < *I. engelmannii* – RAB, C, G, FNA, W (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. Cp (GA): springs, stream bottoms, river bottoms, ditches; rare. S. GA and FL. A diploid species (2n=22). [= FNA, K, S; < *I. flaccida* Z]

Isoetes georgiana N. Luebke, Georgia Quillwort. Cp (GA): {}. Known only from GA (Colquitt, Dodge, Irwin, Tift, Tucker, 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 Brunton, Wintergreen Quillwort. Cp (GA, NC, SC, VA), Pd (GA?, NC, VA): blackwater streams and sandy streambanks; rare (GA Special Concern, VA Rare). 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 Brunton & Britton, Rush Quillwort. Cp (GA): ephemeral wetland swales in bottomland hardwood swamps; rare (GA Special Concern). 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. Mt (VA): (VA Rare). July-September. A decaploid species (2n=110). [= FNA, C, K; > *I. macrospora* Durieu – F, G, W]

Isoetes mattaponica L.J. Musselman & W.C. Taylor, Mattaponi River Quillwort. Cp (VA): tidal rivers; uncommon? 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. **sylvatica*** Brunton & Britton, Eastern Blackfoot Quillwort. Pd (NC, SC, VA), Cp (GA, SC): clay soils in low woods, seeps on sandstone or granitic rocks; rare (GA Special Concern, VA Rare). S. NJ south (in the Piedmont and Coastal Plain) to sw. GA, s. and n. AL, and s. MS. 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. Pd (GA, SC): in pools on granite flatrocks; rare (US Endangered, GA Endangered). A diploid species (2n=22). [= Z, S; < *I. melanospora* – FNA, K; < *I. melanopoda* – RAB]

Isoetes microvela Brunton. Cp (NC): banks of rivers in the outer Coastal Plain; rare. May-July (-September). See Brunton & Britton (1998) for additional information. [= K]

Isoetes piedmontana (N.E. Pfeiffer) C.F. Reed, Piedmont Quillwort. Pd (GA, NC, SC, VA), Cp (GA): in seepage on granitic flatrocks; uncommon (VA Rare). [= K, Z; < *I. melanopoda* – RAB; < *I. virginica* – C, F, FNA, G]

Isoetes riparia Engelmann ex A. Braun, Shore Quillwort. (VA Watch List). 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. Cp (VA): {disentangle from *I. riparia*} [= K; < *I. riparia* – C, FNA; = *I. riparia* var. *palmeri* (A.A. Eaton) Proctor – G]

Isoetes sp. 1. Pd (SC): pools on granite flatrocks; rare. Forty Acre Rock, Lancaster County, SC. Being worked on by W.C. Taylor.

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

Isoetes tegetiformans Rury, Merlin's-grass. Pd (GA): in shallow pools on granite flatrocks; rare (US Endangered, GA Endangered). Endemic to a few granite flatrocks in ne. GA, near the SC line. A diploid species (2n=22), genotype=TT. [= FNA, K, Z]

Isoetes valida (Engelmann) Clute, Mountain Quillwort, Carolina Quillwort. Mt (NC, SC, VA): bogs (growing in *Sphagnum*), pools, ponds; common (GA Special Concern). A diploid species (2n=22). Genotype=VV. [= K, Z; = *I. caroliniana* (A.A. Eaton) N. Luebke – FNA; < *I. engelmannii* – RAB, C, W; = *I. engelmannii* A. Braun var. *caroliniana* A.A. Eaton – F, S]

Isoetes virginica N.E. Pfeiffer, Virginia Quillwort. Mt (VA), Pd (NC, SC?, VA): in woodland streams; rare (US Species of Concern, VA Rare). 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*)]

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

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

Isoetes tenella Léman, Spiny-spore Quillwort. 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. 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]

The following hybrids are known from our area, or nearby:

Isoetes ×*altonharvillii* Musselman & Bray [*I. engelmannii* × *valida*]. Known from Mountains, Piedmont, and Coastal Plain of VA. [= K]
Isoetes ×*bruntonii* Knepper & Musselman [*I. engelmannii* × *hyemalis*]. Known from Coastal Plain of VA. [= K]
Isoetes ×*fairbrothersii* Montgomery & Taylor [*I. engelmannii* × *macrospora*]. Known from s. NJ. [= K]
Isoetes ×*carltaylorii* Musselman [*I. engelmannii?* × *riparia*]. Known from Coastal Plain of VA.

LYCOPODIACEAE Mirbel 1802 (Clubmoss Family)

A family of 10-15 genera and about 400 species. Lycopodiaceae, along with Selaginellaceae and Isoetaceae, now appear 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 divide *Lycopodium* 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* into 3 genera: *Dendrolycopodium*, *Spinulum*, and *Lycopodium* s.s. 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 3 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. 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*]..... ***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; [subfamily *Lycopodioideae*].
  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] ..... ***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).....***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) ..... ***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 trailing, perennial; spores reticulate; [of uplands, mostly in moist to dry soils].

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

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 degree 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 degree 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 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) degree angle from the branchlet, thus the branchlet and leaves together ca. 6-9 mm wide..... ***D. obscurum***

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) degree angle from the branchlet, thus the branchlet and leaves together 3.5-6 (-7) mm wide..... ***D. hickeyi***

Dendrolycopodium dendroideum (Michaux) A. Haines, Tree Ground-pine, Round-branch Clubmoss, Prickly Tree-clubmoss. Mt (NC, VA): openings, grassy balds, high elevation spruce-fir and northern hardwood forests; rare (NC Watch List, VA Watch List). July-September. The northernmost of the *L. obscurum* complex, ranging from n. Québec and Newfoundland west to AK, south to 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; = *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. Mt (NC, VA): grassy balds, bog margins, forest openings; rare (NC Watch List, VA Watch List). July-September. N. Québec and Newfoundland west to MN, south to NJ, w. NC, and n. IN. [= Z; < *Lycopodium obscurum* var. *dendroideum* (Michaux) D.C. Eaton – RAB, F, G; = *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. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): acidic forests; common (uncommon in Piedmont and Coastal Plain). July-September. The southernmost of the *L. obscurum* complex, ranging from Nova Scotia and New Brunswick west to MI and WI, south to n. GA, n. AL, and IN. [= Z; = *Lycopodium obscurum* Linnaeus – FNA, K; = *Lycopodium obscurum* var. *obscurum* – RAB, F, G, W; < *L. obscurum* – C, S]

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. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): dry to mesic forests and openings, especially common in disturbed sites, such as successional pine forests; common. July-September. Widespread in e. North America. 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 – RAB, S; = *Lycopodium digitatum* Dillenius ex A. Braun – C, K, W; = *Lycopodium complanatum* Linnaeus var. *flabelliforme* Fernald – F, G]

Diphasiastrum tristachyum (Pursh) Holub, Blue Running-cedar, Ground-cedar. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): dry forests, glades, balds, barrens, forest openings; uncommon, rare in Piedmont and Coastal Plain (GA Special Concern, SC Rare). July-September. Widespread in ne. North America, south in the mountains to nw. SC, ne. GA, and AL. [= FNA, Z; = *Lycopodium tristachyum* Pursh – RAB, C, F, G, K, S, W]

Diphasiastrum ×*habereri* (House) Holub [*D. digitatum* × *tristachyum*; is known from widely scattered localities in our area. [= FNA, Z; = *Lycopodium* × *habereri* House – K]

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.

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. Mt (GA, NC, VA): 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); rare (NC Rare, VA Rare). June-August. N. Québec and Newfoundland west to Ontario, 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. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): moist forests and ravines; common (uncommon in Piedmont and Coastal Plain). June-August. Widespread in ne. North America, south to SC, TN, IN, IL, and MO. [= FNA, K, Z; = *Lycopodium lucidulum* Michaux – RAB, C, F, G, S, W]

Huperzia porophila (Lloyd & Underwood) Holub, Rock Clubmoss. Mt (GA, NC, SC, VA): rock outcrops and cliffs, especially in the spray of waterfalls, at low to medium elevations; rare (GA Special Concern, NC Rare, SC Rare, VA Rare). June-August. Centered in the sedimentary Central Appalachians, *H. porophila* ranges from ne. PA, WV, OH, and WI south to NC, TN, 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; < *Lycopodium selago* var. *patens* (Palisot de Beauvois) Desvaux – G, misapplied]

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. [= FNA, Z; >< *Lycopodium selago* Linnaeus var. *appressum* (Desvaux) Petrovic – C, F; >< *Lycopodium selago* var. *selago* – C, G; > *Huperzia selago* (Linnaeus) Bernhardi ex Martius & Schrank var. *selago* – K]

Huperzia ×*bartleyi* (Cusick) Kartesz & Gandhi [*H. lucidula* × *porophila*] is 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*] may be expected at cliff bases on high elevation rocky summits. It is known from Chimney Rock Park, Rutherford County (the lowest elevation occurrence of *H. appressa* in NC) and from Roan Mountain, Mitchell County, and Grandfather Mountain, Avery County. 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]

Lycopodiella Holub 1964 (Bog Clubmoss)

(also see *Pseudolycopodiella*)

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 (2002, 2003a, 2003b)=Z.

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. Cp, Pd, Mt (GA, NC, SC, VA): savannas, seepages, and other wet, sandy sites; common (rare in Mountains and Piedmont). July-September. Primarily Southeastern Coastal Plain: se. MA south to FL and west to se. 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). [= FNA, K, Z; < *Lycopodium alopecuroides* Linnaeus – RAB (also see *L. prostrata*); = *Lycopodium alopecuroides* Linnaeus – C, G, S, W]

Lycopodiella appressa (Chapman) Cranfill, Southern Bog Clubmoss. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): savannas, seepages, bogs; common (rare in Mountains and Piedmont). July-September. Primarily Southeastern Coastal Plain: se. Newfoundland and MA, south to FL, west to OK, AR, and TX, and disjunct in the mountains of KY, TN, NC, 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. Mt (NC, VA): gravelly or sandy seepage areas in bogs at middle to high elevations; rare (NC Rare, VA Rare). 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, W; = *Lycopodium inundatum* var. *inundatum* – F, G]

Lycopodiella prostrata (Harper) Cranfill, Featherstem Clubmoss, Prostrate Bog Clubmoss. Cp (GA, NC, SC); Pd (GA): savannas, seepages; uncommon. July-September. A Southeastern Coastal plain endemic: se. NC south to FL and west to TX. [= 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. Which occur in our area is uncertain at present.

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 (2002) 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.*

Lycopodium Linnaeus 1753 (Running Clubmoss)

(also see *Dendrolycopodium, Diphasiastrum*, *Huperzia*, *Lycopodiella, Palhinhaea, Pseudolycopodiella,* and *Spinulum*)

A genus of 5-10 species, mainly temperate and subarctic. The prospective 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 (2003a)=Z.

1 Strobili 2-5, borne on alternate "pedicels" branching from the central "peduncle"; leaves 4-6 mm, spreading to loosely ascending ..... ***L. clavatum***

1 Strobili 1 (rarely 2, if then, the 2 strobili not on separate "pedicels," but sessile at the top of the "peduncle"); leaves 3-5 mm long, ascending to appressed..... ***[L. lagopus]***

Lycopodium clavatum Linnaeus, Running Clubmoss. Mt (GA, NC, SC, VA), Pd, Cp (VA): openings, balds, roadbanks, open forests; uncommon (rare in Piedmont and Coastal Plain) (GA Special Concern). July-September. Circumboreal, south in e. North America along the Appalachians to NC and n. GA. [= RAB, FNA, K, W, Z; < *L. clavatum* – C (also see *L. lagopus*)]; = *L. clavatum* var. *clavatum* – F, G, S]

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

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. Cp (GA, SC): wet savannas, disturbed moist areas; uncommon (rare in SC). This species is pantropical, occurring in the both the Neotropics and the Paleotropics. Its occurrence in our area may be adventive. [= FNA; =*? Lycopodiella cernua* (Linnaeus) Pichi Sermolli var. *cernua* – K; = *Lycopodium cernuum* Linnaeus – S]

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. Cp (GA, NC, SC, VA): savannas, seepages; uncommon, rare in VA (VA Rare). 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 FL and west to e. TX. [= FNA, Z; = *Lycopodium carolinianum* Linnaeus – RAB, C, F, G, S; > *Lycopodiella caroliniana* (Linnaeus) Pichi Sermolli var. *caroliniana* – K]

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. Mt (VA): high elevation hardwood or coniferous forests; uncommon (NC Watch List). August-October. A circumboreal species, south in North America to NJ and MN, 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. There is also an old collection from the Great Smoky Mountains of TN. Its occurrence in NC is certainly plausible, and it should be sought. [= Z; *Lycopodium annotinum* Linnaeus – C, FNA, K, W; > *L. annotinum* var. *acrifolium* Fernald – F, G; > *L. annotinum* var. *annotinum* – F, G]

LYGODIACEAE C. Presl 1845 (Climbing Fern Family)

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

* ***Lygodium japonicum*** (Thunberg) Swartz, Japanese Climbing Fern. Cp, Pd (GA, NC, SC): disturbed areas; rare, introduced from Asia. June-September. Rare in our area, but common and weedy in FL, 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. Mt (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): bogs, moist thickets, swamp forests, in strongly acid soils; uncommon (GA Special Concern, SC Rare, VA Watch List). July-September. Widespread in e. North America, but uncommon or rare in most of its range. The species is perhaps most common in the Cumberland Plateau of KY and TN. 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]

MARSILEACEAE Mirbel 1802 (Water-clover Family)

A family of 3 genera and about 55-75 species, nearly cosmopolitan. References: 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 minuta*** Linnaeus, Small Water-clover. Pd (GA): lakes and streams; rare, native of the Old World. Known in North America from AL, FL, GA. [= FNA, Z; *M. crenulata* Desv.; *M. crenata* Presl]
* ***Marsilea mutica*** Mettenius, Nardoo, Australian Water-clover. Cp, Mt (VA), Pd (GA, SC, VA): ditches, ponds; rare, introduced from Australasia. Apparently spreading rapidly in VA. [= Z]
* ***Marsilea quadrifolia*** Linnaeus, European Water-clover. Pd (NC): shallow water of artificial impoundment; rare; native of Europe. Not seen fertile in NC. First reported for our area in 1992; 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 macropoda* Engelmann ex A. Braun, Bigfooted Water-clover. AL, FL. Native of s. TX and Mexico. [= FNA, K, Z]
* *Marsilea vestita* Hooker & Greville, Hairy Water-clover. AL?, FL, MS. Native of w. North America. [= FNA, K, Z]

Pilularia Linnaeus 1753 (Pillwort)

A genus of 3-6 species, nearly cosmopolitan. References: Dennis & Webb (1981); Kramer in Kramer & Green (1990).

Identification notes: It lacks a leaf-blade, the 1-8 cm long petiole being narrowly winged, appearing rather 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. Pd (GA, SC): vernal pools and seepage areas on granitic flatrocks; rare (GA Special Concern). This peculiar plant has a puzzling distribution, being known from several disjunct regions: OR to s. CA; NE to TX; AR; TN; and GA to SC. 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]

ONOCLEACEAE Pichi Sermolli 1970

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). References: 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.....***Matteucia***
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 genus of 1 species, north temperate in distribution. Two other species formerly included in *Matteucia* (or sometimes in *Onoclea*) are better treated in the genus *Pentarhizidium* Hayata (Gastony & Ungerer 1997). References: Johnson in FNA (1993b); Kramer et al. in Kramer & Green (1990).

Matteuccia struthiopteris (Linnaeus) Todaro ***var. pensylvanica*** (Willdenow) C.V. Morton, Ostrich Fern. Mt, Pd (VA): alluvial forests and calcareous wetlands; rare (VA Rare). The species is circumboreal; the North American var. *pensylvanica* ranges from Newfoundland west to AK, south to VA, MO, SD, and British Columbia. 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]

Onoclea Linnaeus 1753 (Sensitive Fern)

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

Onoclea sensibilis Linnaeus *var.* ***sensibilis***, Sensitive Fern, Bead Fern. Mt, Pd, Cp (GA, NC, SC, VA): marshes, swamps, wet disturbed places; common. May-June. The species ranges from 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. The genus is monotypic. 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]

OPHIOGLOSSACEAE (R. Brown) Agardh 1822 (Adder's-tongue Family)

A family of 7-8 genera and about 75-115 species. The Ophioglossaceae is only distantly related to the leptosporangiate ferns; 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 ..... ***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..... ***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 ..... ***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 ..... ***Botrypus***

Botrychium Swartz 1801 (Moonwort)
(also see *Botrypus* and *Sceptridium*)

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).

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. Mt (NC, VA): forests and grassy balds; rare (NC Rare, VA Rare). July-August. Var. *angustisegmentum* ranges from Newfoundland and Ontario 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; = *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. Mt (NC, VA): forests (often successional) and old fields; uncommon (NC Rare). June-August. Newfoundland and Alberta south to NC, TN, KY, WV, OH, IL, WI, MN, and ND. [= FNA, K, W; = *B. matricariaefolium* – F, G (orthographic variant); > *B. matricariaefolium* var. *matricariaefolium* – C]

Botrychium simplex E. Hitchcock *var.* ***simplex***, Least Moonwort. Mt (NC, VA): forests; rare (NC Rare, VA Rare). May-June. Widespread in n. North America, from Newfoundland and British Columbia 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]

Botrypus Richard 1801 (Rattlesnake Fern)

A genus of 1-2 species, of North America (and depending on circumscription) Asia. References: Hauk, Parks, & Chase (2003).

Botrypus virginianus (Linnaeus) Holub, Rattlesnake Fern, Sang-find. Mt, Pd, Cp (GA, NC, SC, VA): in a wide range of fairly dry, mesic, and wet forests, cove forests; common. April-June. Newfoundland and British Columbia south to FL and CA. [= *Botrychium virginianum* (Linnaeus) Swartz – RAB, C, FNA, G, K, W; = *B. virginianum* var. *virginianum* – F; = *Osmundopteris virginiana* (Linnaeus) Small – S]

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. Cp (GA, NC, SC), Pd (GA): moist ditch banks and grassy roadside flats; rare (or overlooked) north of GA. March-September. A Southeastern Coastal Plain species, ranging from 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; > *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. Mt (GA, NC?, VA), Pd (GA): dry barrens and glades over calcareous rocks, very rarely on granite; uncommon (GA Special Concern, VA Watch List). March-June. W. VA, IN, IL, KS, and AZ south to 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]

Ophioglossum nudicaule Linnaeus f., Slender Adder's-tongue. Cp (GA, NC, SC), Pd (GA): lawns and other moist, grassy areas; rare or overlooked. 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; > *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. Cp (GA, NC, SC, VA): maritime wet grasslands, moist ditch banks, and grassy roadside flats; rare or overlooked north of GA (NC Watch List, SC Rare, VA Rare). March-November. Widespread in se. United States, from 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; > *O. floridanum* E. St. John – S]

Ophioglossum pusillum Rafinesque, Northern Adder's-tongue. Mt (NC?, VA): moist streamside meadow; rare (VA Rare). March-July. Nova Scotia west to ND, south to VA, possibly NC, IN, and NE; and in the Pacific Northwest. [= FNA, K; = *O. vulgatum* Linnaeus var. *pseudopodum* (Blake) Farwell – C, F; < *O. vulgatum* – G]

Ophioglossum pycnostichum (Fernald) A. & D. Löve, Southern Adder's-tongue. Pd, Mt (GA, NC, SC, VA), Cp (NC, SC, VA): bottomland forests, moist loamy soils of successional forests and old fields; uncommon (or overlooked) (SC Rare). March-July. Fairly widespread in e. North America, mostly south of the Wisconsinan glaciation, from s. NJ, IN, IL, and s. MI south to FL, MS, and e. TX. *O. vulgatum* (defined narrowly) is Eurasian. The best treatment of this complex is uncertain. [= W; = *O. vulgatum* Linnaeus var. *pycnostichum* Fernald – RAB, C, F; < *O. vulgatum* Linnaeus – FNA, G, K, S]

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. Mt, Pd, Cp (GA, NC, SC, VA): moist forests, clearings, old fields; common. August-October. MD, PA, s. IN, s. IL, and se. MO south to FL and e. TX. [= *Botrychium biternatum* (Savigny) Underwood – RAB, C, FNA, K, S, W; = *B. dissectum* var. *tenuifolium* (Underwood) Farwell – F, G]

Sceptridium dissectum (Sprengel) Lyon, Cut-leaf Grape Fern, Dissected Grapefern. Mt, Pd, Cp (GA, NC, SC, VA): moist forests, clearings, old fields; common (rare in Coastal Plain of NC, SC, and GA). August-October. Nova Scotia and Québec west to Ontario and MI, south to FL and 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 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; < *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]

Sceptridium jenmanii (Underwood) Lyon, Alabama Grapefern. Mt (GA, NC, SC, VA), Pd (GA, NC, SC), Cp (GA): moist to dryish forests and disturbed areas; rare (NC Rare, VA Rare). August-October. VA and TN south to FL, 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; = *B. alabamense* Maxon – RAB, S]

Sceptridium lunarioides (Michaux) Holub, Winter Grapefern. Cp (GA, SC), Pd (GA, NC): old fields, pastures, young forests; rare (NC Rare, SC Rare). January-April. W. NC 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; = *Holubiella lunarioides* (Michaux) Škoda]

Sceptridium multifidum (S.G. Gmelin) M. Nishida, Leather Grapefern. Mt (NC, VA): grassy balds and high elevation meadows; rare (NC Rare, VA Rare). August-September. Labrador and Alaska south 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. Mt (NC, VA), Pd (VA): moist or boggy forests, bogs; rare (NC Rare, VA Watch List). July-October. Local in occurrence from New Brunswick, Québec, and Ontario 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; < *B. dissectum* var. *dissectum* – F ("forma *oneidense* (Gilbert) Clute – embarrassingly transitional"); = *B. multifidum* var. *oneidense* (Gilbert) Farwell – G]

OSMUNDACEAE Berchtold & J.C. Presl 1820 (Royal Fern Family)

A family of 1-3 genera and about 15-25 species. References: Lellinger (1985); Whetstone & Atkinson in FNA (1993b); Kramer in Kramer & Green (1990); Yatabe, Nishida, & Murakami (1999).

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

A genus of about 10 species (or if circumscribed more broadly as suggested by molecular phylogenetic analysis to include *Todea* and *Leptopteris*, of 15-25 species), tropical and temperate (most diverse in e. and se. Asia and e. North America). References: Lellinger (1985); Whetstone & Atkinson in FNA (1993b); Kramer in Kramer & Green (1990); Yatabe, Nishida, & Murakami (1999).

Identification notes: Sterile plants of *Osmunda cinnamomea* are sometimes confused with *Woodwardia virginica*, which also has rather coarse, pinnate-pinnatifid leaves and grows in similar wet, acid places. *Osmunda* is much coarser, 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).

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. regalis* var. *spectabilis***

1 Leaves pinnate-pinnatifid, each pinna pinnatifid but not divided into distinct pinnules; spores borne either on separate, modified, fertile leaves, or on modified pinnae in the middle of the leaf blade; veins mostly 1-forked.

2 Spores borne on modified pinnae in the middle of the leaf blade, pinnae above and below the fertile portion green and leafy; sterile pinnae lacking a tuft of brown tomentum at the base; [subgenus *Osmunda*]..... ***O. claytoniana* var. *claytoniana***

2 Spores borne on separate, modified fertile leaves which (normally) lack green leafy portions; sterile pinnae with a prominent tuft of brown tomentum at the base; [subgenus *Osmundastrum*].

3 Leaf surfaces and upper portion of the rachis not glandular..... ***O. cinnamomea* var. *cinnamomea***

3 Leaf surfaces and upper portion of the rachis densely glandular pubescent..... ***O. cinnamomea* var. *glandulosa***

Osmunda cinnamomea Linnaeus *var.* ***cinnamomea***, Cinnamon Fern. Cp, Pd, Mt (GA, NC, SC, VA): bogs, peatlands, pocosins, wet savannas, floodplains, blackwater stream swamps; common. March-May. Labrador west to MN, south to FL, TX, NM, Central America, and South America. The species also occurs in e. Asia, where generally treated as a separate variety. "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). [= C, F, K; < *O. cinnamomea* – RAB, FNA, G, S, W]

Osmunda cinnamomea Linnaeus *var.* ***glandulosa*** Waters, Glandular Cinnamon Fern. Cp (SC, VA), Mt (VA): acidic seepage swamps, sphagnous seeps; rare (VA Rare). March-May. This taxon is poorly understood, but appears to be worthy of taxonomic recognition. It is known from scattered locations in e. North America. [= F, K; < *O. cinnamomea* – FNA]

Osmunda claytoniana Linnaeus *var.* ***claytoniana***, Interrupted Fern. Mt (GA, NC, SC, VA), Pd (VA), Cp (VA): upland forests, woodlands, and balds, moist to rather dry; common (uncommon in Piedmont, rare in Coastal Plain). March-June. Newfoundland west to MN, south to n. GA, TN, and AR; another variety occurs in e. and sc. Asia. [= C, F; < *O. claytoniana* – RAB, FNA, G, K, S, W]

Osmunda regalis Linnaeus *var.* ***spectabilis*** (Willdenow) A. Gray, Royal Fern. Cp, Mt, Pd (GA, NC, SC, VA): bogs, marshes (including tidal), moist forests, floodplains, swamp forests; common. March-June. Newfoundland west to Saskatchewan, south to FL, TX, and Mexico; var. *regalis* is widespread in Eurasia, var. *japonica* is Japanese. [= RAB, C, F, FNA, G, K, W; < *O. regalis* – S]

The hybrid *Osmunda* ×*ruggii* R. Tryon [*O. claytoniana* var. *claytoniana* × *regalis* var. *spectabilis*] is known from Giles County, VA and one other historic population in CT. It has 2-pinnate sterile leaves, with the pinnules sessile. [= K]

POLYPODIACEAE Berchtold & J.C. Presl 1820 (Polypody Family)

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 permanently moist habitats, as in grottoes behind waterfalls] ... ***Micropolypodium***
1 Plants larger, the leave blades 7-30 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*).
    3 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***
    3 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 name *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. Mt (NC): on ceiling of grotto in spray cliff of waterfall in humid gorge; rare (US Species of Concern, NC Endangered). 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]

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

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

Phlebodium aureum (Linnaeus) J. Smith, Goldfoot Fern, Golden Polypody. Cp (GA, SC*): epiphytic on the old leaf bases of *Sabal palmetto*, and rarely terrestrial on calcareous soils or masonry; rare (GA Special Concern). E. GA (Chatham County), a county adjacent to the SC line) south to FL. 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" (including the above taxon) are more closely related to *Pleopeltis* and should be placed there, 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. Cp, Pd, Mt (GA, NC, SC, VA): on tree limbs and trunks (especially when leaning) and on rocks; common (rare in n. VA). June-October. Ssp. *michauxiana* ranges from se. MD, IL, MO, and se. KS, south to s. FL and TX; also in Mexico and Guatemala. Ssp. *polypodioides* ranges in the West Indies, Central America and South America. Four additional varieties 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; <*? Marginaria polypodioides* (Linnaeus) Tidestrøm – S]

Polypodium Linnaeus 1753 (Polypody)
(also see *Phlebodium* and *Pleopeltis*)

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).

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. Mt (GA, NC, SC, VA): moist rocks at low to high elevations, especially in ravines, on north-facing outcrops, and in other moist sites; uncommon. June-October. Newfoundland west to e. Ontario, 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, in part; < *P. vulgare* Linnaeus var. *virginianum* (Linnaeus) Eaton – G, in part]

Polypodium virginianum Linnaeus [*P. virginianum* complex], Common Rockcap Fern. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): moist rocks; common (rare in Coastal Plain). 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 (also see *P. appalachianum*); < *P. vulgare* Linnaeus var. *virginianum* (Linnaeus) Eaton – G (also see *P. appalachianum*)]

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.

PSILOTACEAE Kanitz 1887 (Whiskfern Family)

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. Cp (GA, NC, SC), Pd* (NC): in moist bottomland forests, on soil, stumps, and tree bases, along building foundations (where introduced); rare (GA Special Concern, NC Rare, SC Rare). 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]

PTERIDACEAE Reichenbach 1837 (Maidenhair Fern Family)

A family of about 40 genera and about 1000 species. This family may be further subdivided, into families Adiantaceae (*Adiantum*), Cheilanthaceae (*Cheilanthes, Notholaena, Astrolepis, Pellaea, Cryptogramma*), and Pteridaceae (*Pteris*). 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 ..... ***Vittaria***
1 Sporophytes present
  2 Leaves linear, 10-60 cm long and 1-3 mm wide ..... ***Vittaria***
  2 Leaves not linear, dissected, > 20 mm wide.
    3 Sori round or oblong, distinct and separate along the pinnule margins; leaves bright-green, glabrous, herbaceous, delicate, and flexible; [subfamily *Adiantoideae*] ..... ***Adiantum***
    3 Sori continuous along the pinnule margins; leaves mostly dark-green or glaucous, often pubescent, coriaceous, tough, and stiff.
      2 Leaves strongly dimorphic, the fertile leaves obviously longer than the sterile and with narrow elongate ultimate segments; [subfamily *Cheilanthoideae*] ..... ***[Cryptogramma]***
      2 Leaves essentially monomorphic.
        3 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*].
          4 Lower leaf surfaces covered with whitish powder, otherwise glabrous or sparsely pubescent..... ***[Argyrochosma]***
          4 Lower leaf surfaces pubescent (or glabrous in *Cheilanthes alabamensis*), never with conspicuous whitish powder ..... ***Cheilanthes***
        3 Leaves 1-2-pinnate, the ultimate leaf-segments 8-100 mm long, glabrous or sparsely and inconspicuously hairy.
          5 Leaf undersurface densely covered with stellate and ciliate scales; [subfamily *Cheilanthoideae*] ..... ***Astrolepis***
          5 Leaf undersurface glabrous or with non-stellate scales.
            6 Rachis dark-brown or purple; [subfamily *Cheilanthoideae*] ..... ***Pellaea***
            6 Rachis green or tan; [subfamily *Pteridoideae*] ..... ***Pteris***

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 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 capillus-veneris Linnaeus, Venus'-hair Fern, Southern Maidenhair. Cp (GA, NC, SC), Mt (GA, VA): moist calcareous rocks, in the Coastal Plain of NC and SC on "marl" (coquina limestone), in the mountains of VA (formerly) on

limestone, in the Coastal Plain adventive on lime mortar of old buildings and walls (as in Wilmington and Fayetteville, NC); rare (NC Rare, VA Rare). 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 British Columbia, 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*** Sw., Rough Maidenhair, Garden Maidenhair. Cp (GA): stone walls; rare, introduced from Asia. Reported for GA (FNA, Kartesz 1999). [= FNA, K, S]

Adiantum pedatum Linnaeus, Northern Maidenhair. Mt, Pd (GA, NC, SC, VA), Cp (GA, NC, VA): moist forests and cliffs, especially in seepage; common (uncommon in Piedmont, rare in Coastal Plain). June-August. Widespread in e. United States, from Nova Scotia and New Brunswick west to Ontario and MN, south to GA, AL, MS, LA, and OK. [= RAB, FNA, G, K, S, W; = *A. pedatum* ssp. *pedatum* – C; = *A. pedatum* var. *pedatum* – F]

Adiantum aleuticum (Ruprecht) Paris is disjunct on serpentine in se. PA and MD (FNA). It occurs as well at scattered locations in ne. and 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]

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 occurs on calcareous rocks east to AR and KY. It has leaves 3-5-pinnate, the small ultimate segments covered below with a whitish powder. [= FNA, K; = *Notholaena dealbata* (Pursh) Kunze – C, F, G; = *Cheilanthes dealbata* Pursh; = *Pellaea dealbata* (Pursh) Prantl]

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 sinuata (Lagasca ex Swartz) D.M. Benham & Windham ***ssp. sinuata***, Wavy Cloak-fern. Pd (GA): granitic outcrops and boulders; rare (GA Special Concern). TX west to AZ, south into Central and South America; 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]

Astrolepis integerrima (Hooker) D.M. Benham & Windham occurs as a disjunct on Ketona dolomite in c. AL (Bibb County). Its primary distribution is in sw. United States and Mexico. 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]

Cheilanthes Swartz 1806 (Lip-fern)
(also see *Argyrochosma, Astrolepis*)

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).

1 Leaf surfaces glabrescent; ["*Cheilanthes alabamensis* group"] ..... ***Ch. alabamensis***
1 Leaf surfaces pubescent (tomentose, villous, or lanose).
  2 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*].

3 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) ..... ***Ch. castanea***

3 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 ..... ***Ch. tomentosa***

2 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*].

4 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 ..... ***Ch. feei***

4 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 ..... ***Ch. lanosa***

Cheilanthes alabamensis (Buckley) Kunze, Alabama Lip-fern. Mt (GA, NC, VA): dry outcrops of limestone; rare (GA Special Concern, NC Rare, VA Rare). June-September. VA, w. NC, s. MO, and OK south and west to n. GA, AL, TX, NM, se. AZ, and Mexico. 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 *Ch. 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 *Ch. 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 *Ch. 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]

Cheilanthes castanea Maxon, Chestnut Lip-fern. Mt, Pd (VA): dry outcrops of sedimentary or metamorphic rocks (including calcareous shales and siltstones); rare (VA Rare). June-September. Sw. TX to s. AZ, 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 tend to be 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 *Ch. castanea* is distinct from or merely a form of *Ch. eatonii* is controversial. The complex of the 2 taxa includes apogamous triploids and sexual tetraploids. [= W, Z; < *Ch. eatonii* Baker – C, FNA, K]

Cheilanthes feei T. Moore, Slender Lip-fern. Mt (VA): dry outcrops of calcareous sedimentary rocks (dolostone); rare (VA Rare). June-September. WI, MN SD, MT, Alberta, and British Columbia south to AR, TX, NM, AZ, s. CA, and n. Mexico; 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]

Cheilanthes lanosa (Michaux) D.C. Eaton, Hairy Lip-fern. Mt, Pd (GA, NC, SC, VA); Cp (GA): dry outcrops of felsic or intermediate metamorphic and igneous rocks; uncommon. 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, W, S, Z; = *Ch. vestita* (Sprengel) Swartz – F]

Cheilanthes tomentosa Link, Woolly Lip-fern. Mt, Pd (GA, NC, SC, VA), Cp (GA, SC): dry outcrops of intermediate or calcareous metamorphic, igneous, or sedimentary rocks (including sandstone outcrops in the Coastal Plain of GA and SC); uncommon (rare in Coastal Plain). 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. The species is an apogamous triploid. [= RAB, C, FNA, G, K, W, S, Z; = *Ch. lanosa* – F, misapplied]

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, ranges south to c. PA and WV (Randolph County). It is a small fern of calcareous rocks, with dimorphic pinnate-pinnatifid to 2-pinnate leaves to 20 cm long. [= FNA, C, F, G, K]

Pellaea Link 1841 (Cliff-brake)

(also see *Argyrochosma, Astrolepis, Cheilanthes*)

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).

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. Mt, Pd, Cp (GA, NC, SC, VA): outcrops of limestone and other rocks (usually either calcareous or mafic), rarely on masonry walls (Wieboldt 1995); common only in the Ridge and Valley of VA, otherwise uncommon to rare (SC Rare). 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, Saskatchewan, and Alberta south to FL, AL, TN, AR, TX, NM, AZ, and Mexico; also in Guatemala. [= RAB, C, F, FNA, K, S, W; = *P. atropurpurea* var. *atropurpurea* – G; = *P.* ×*atropurpurea*]

Pellaea glabella Mettenius ex Kuhn ***ssp. glabella***, Smooth Cliff-brake. Mt (VA): dry, exposed outcrops of calcareous rocks (limestone, dolostone), rarely on masonry walls (Wieboldt 1995); rare (VA Watch List). 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]

Pellaea ternifolia (Cavanilles) Link ***ssp. arizonica*** Windham, Arizona Cliff-brake. Pd (SC): on granitic outcrops; rare. A remarkable disjunct from sw. United States and Mexico 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. Cp (GA): outcrop of Altamaha Grit; rare, introduced from 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. Pd (NC): south-facing outcrops of Carolina slate or granitic rock with infrequent nutrient-rich seepage; rare (NC Endangered). May-September. OK west to se. CO and sw. UT, south to TX, AZ, and Mexico, 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]

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 Rachis winged; 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 ..... ***P. multifida***
1 Rachis not winged; pinnae strictly simple, without lobes or pinnules; outline of leaf blade lanceolate, typically 3× or more as long as wide ..... ***P. vittata***

* ***Pteris multifida*** Poiret, Spider Brake. Cp, Pd (GA, NC, SC, VA), Mt (GA): old walls with lime mortar; rare, introduced from the Tropics. [= RAB, FNA, K; = *Pycnodoria multifida* (Poiret) Small – S]

* ***Pteris vittata*** Linnaeus, Ladder Brake. Cp (GA, SC): old walls with lime mortar; rare, introduced from China. [= RAB, FNA, K; = *Pycnodoria vittata* (Linnaeus) Small – S]

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." Mt (GA, NC, SC, VA), Pd (NC, VA): 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; rare (NC Watch List, VA Watch List). 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]

Vittaria lineata (Linnaeus) Smith, Shoestring Fern. Cp, Pd (GA, SC*): epiphyte on the bark of *Sabal palmetto*, but the northernmost native site (in Lincoln County, GA, adjacent to SC) was on rock; rare. Se. GA and formerly ec. GA south through FL; 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]

SALVINIACEAE Dumortier 1829 (Floating Fern Family)

A family of a single genus and about 10 species. References: Nauman in FNA (1993b); Schneller in Kramer & Green (1990).

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. Cp (GA, SC): quiet waters; rare, probably introduced in our area from further south. [= FNA, K, Z; *S. auriculata* – S, misapplied]

* ***Salvinia molesta*** D.S. Mitchell. Cp (NC, SC), Pd (NC), Mt (VA): still waters of farm ponds, calcareous seepage ponds, and other situations; rare, introduced (potentially a serious weed in our area). *S. molesta* has been found at scattered sites in 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, Z]

SCHIZAEACEAE Kaulfuss 1827 (Curly-grass Family)

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. Cp (NC): moist, peaty soil under *Chamaecyparis thyoides*; rare, apparently introduced. May-July. In acid, boggy sites in DE, NJ, NY, Newfoundland, Nova Scotia, and New Brunswick; 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]

SELAGINELLACEAE Willkomm 1861 (Spikemoss Family)

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 likely 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. Cp (GA, NC, SC): sandhills, Altamaha Grit glades; uncommon. June-August. *S. acanthonota* ranges from se. NC south to s. FL, west to 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. *S. arenicola* Underwood ssp. *arenicola* is more southern, from n. GA south to s. FL and west to e. panhandle FL. *S. arenicola* ssp. *riddellii* (Van Eseltine) R. Tryon occurs in TX, OK, AR, LA, AL, and GA. 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. Cp, Pd, Mt (GA, NC, SC, VA): seepages, bogs, spray cliffs, stream margins, other moist habitats; common. June-October. S. ME, NY, OH, s. IN, AR, and e. OK south to FL, GA, AL, MS, LA, and e. TX. 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. [= RAB, C, F, FNA, G, K, W; = *Diplostachyum apodum* (Linnaeus) Beauvois – S; **= *Lycopodioides apodum*** (Linnaeus) Kuntze]

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

* ***Selaginella braunii*** Baker, Treelet Spikemoss, Braun's Spikemoss. Cp (NC): naturalized around graveyards or gardens; rare, introduced, native of China. [= FNA, K; ***Lycopodioides***]

Selaginella corallina (Riddell) Wilbur & Whitson, Riddell's Spikemoss. Pd, Cp (GA): dry sands, granite outcrops; uncommon? E. and c. GA west to TX and 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. Cp (GA, NC, SC, VA?): naturalized around gardens or lawns; rare, introduced. [= FNA, K; ***Lycopodioides***]

Selaginella ludoviciana (A. Braun) A. Braun, Gulf Spikemoss, Louisiana Spikemoss. Cp (GA): swamp margins, wet meadows; rare (GA Special Concern). Gulf Coastal Plain from n. 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. Pd, Mt (GA, NC, SC, VA): granite flatrocks, other, mostly acidic, rock outcrops, occasionally on greenstone or calcareous shales; common. June-September. S. Greenland and Nova Scotia west to Alberta, south to GA, AL, AR, OK, and NE. 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. [= RAB, C, F, FNA, G, K, S, W; **= *Bryodesma rupestre*** (Linnaeus) J. Soják]

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

* ***Selaginella uncinata*** (Desvaux ex Poiret) Baker, Blue Spikemoss. Cp, Mt (GA): moist forests; rare, introduced from China. Introduced in sw. GA and other places in the Southeastern United States. [= FNA, K; ***Lycopodioides***] {not keyed at this time}

Selaginella eclipes W.R. Buck, Hidden Meadow Spikemoss. Québec and Ontario south to NY, OH, KY, AR, and OK. Separable from *S. apoda* in having the dorsal leaves with long attenuate apices with a well-developed midrib (vs. with acute apices, or if attenuate, then usually keeled and without a well-developed midrib), and the mature megaspores shiny, the reticulation lax (observed at 40× magnification) (vs. dull and closely reticulate). Given its semi-cryptic separation from *S. apoda*, it could easily be present in our area. [= FNA, K; = *S. apoda* (Linnaeus) Spring ssp. *eclipes* (W.R. Buck) Škoda; ***Lycopodioides***] {not keyed at this time}

THELYPTERIDACEAE Pichi Sermolli 1970 (Marsh Fern Family)

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. Cp, Pd (GA, SC), Mt (VA): disturbed areas; uncommon, introduced from the Asian and African tropics. Leonard (1972) discusses the history of this species in the southeastern United States. [= FNA, K; = *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 ..... ***Ph. 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..... ***Ph. hexagonoptera***

Phegopteris connectilis (Michaux) Watt, Northern Beech Fern. Mt (NC): moist cliffs where wet by spray from waterfalls (at medium elevations), also on high elevation cliffs wet by seepage and in spruce-fir forests; rare (NC Rare). April-August. A circumboreal species, at its southern limit in North America in NC, TN, IA, MT, and OR. Most of the occurrences in NC are at waterfalls in the escarpment gorges of Transylvania, Macon, and Jackson counties, near Highlands. The Southern Appalachian occurrences are disjunct; the species ranges south to WV, and is apparently absent from VA, n. NC, and n. TN. The species is a triploid, reproducing apogamously. [= FNA, K; = *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. Mt, Pd, Cp (GA, NC, SC, VA): mesic to submesic forests; common (uncommon in the Coastal Plain). April-August. Widespread in eastern North America, from Québec west to Ontario, WI, and MN, south to FL and e. TX. [= FNA, K, S; = *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. kunthii*, *Th. ovata* var. *ovata*), and subgenus or genus *Stegnogramma* (*Th. pilosa* var. *alabamensis*). The appropriate names, should the segregate genera be adopted, are listed in synonymy. References: Smith (1981); Smith in Kramer & Green (1990).

1 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.
  2 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*] ..... ***Th. noveboracensis***
  2 Leaf blade broadest near the base, the pinnae stopping abruptly, the petiole 2/3 to fully as long as the blade; [of wetland habitats].
    3 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*] ..... ***Th. palustris*** *var.* ***pubescens***
    3 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*] ..... ***Th. simulata***
1 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*].
  4 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.
    5 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 ... . ***Th. dentata***

5 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..... ***Th. hispidula* var. *versicolor***

4 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.

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

6 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.

7 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 ..... ***Th. hispidula* var. *versicolor***

7 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..... ***Th. kunthii***

* ***Thelypteris dentata*** (Forsskål) E. P. St. John, Downy Maiden Fern. Cp (GA, SC), Pd (GA): disturbed areas; rare, native to tropical and subtropical Asia and Africa. [= FNA, K, S; **= *Christella dentata* (Forsskål) Brownsey & Jermy**]

* ***Thelypteris hispidula*** (Decaisne) C.F. Reed *var.* ***versicolor*** (R. St. John) Lellinger, Hairy Maiden Fern. Cp (GA, SC): on soil in disturbed areas; rare. In our area, probably only adventive from further south. [= FNA, K; = *Th. versicolor* R. St. John – S; **< *Christella hispidula* (Decaisne) Holttum**; = *Th. quadrangularis* (Fee) Schelpe var. *versicolor* (R. St. John) A.R. Smith]

Thelypteris kunthii (Desvaux) C.V. Morton, Kunth's Maiden Fern, Southern Shield Fern. Cp (GA, NC, SC), Pd (GA, NC): 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; rare (in NC, perhaps only recently adventive from further south). May-August. In North America, ranging from se. NC south to FL and west to TX. [= RAB, FNA, K; < *Th. normalis* (C. Christensen) Moxley – S; **< *Christella normalis* (C. Christensen) Holttum**]

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

Thelypteris ovata R. P. St. John *var.* ***ovata***, Ovate Maiden Fern. Cp (GA, SC): on coquina limestone ("marl") or in disturbed, calcareous areas; rare (GA Rare). S. SC south to s. FL, west to s. AL; and in the Bahamas. In our area, perhaps only adventive from further south. Var. *lindheimeri* (C. Christensen) A.R. Smith occurs in TX, Mexico, Belize, Guatemala, and Jamaica. [= FNA, K; > *Th. ovata* var. *ovata* – S, in a narrower sense; > *Th. ovata* var. *harperi* (C. Christensen) R. P. St. John – S; **= *Christella ovata* (R.P. St. John) Löve & Löve**]

Thelypteris palustris Schott *var.* ***pubescens*** (Lawson) Fernald, Marsh Fern. Cp, Pd, Mt (GA, NC, SC, VA): bogs, marshes (including freshwater tidal marshes), and bottomland forests; common. June-September. The species is circumboreal, occurring in n. Europe, n. Asia, and n. North America. Var. *pubescens* is the American variety, ranging from Newfoundland and Manitoba south to FL and TX. [= C, FNA, G, K, W; < *Th. palustris* – RAB; = *Dryopteris thelypteris* (Linnaeus) Swartz var. *pubescens* (Lawson) A.R. Prince ex Weatherby – F; < *Th. thelypteris* (Linnaeus) Nieuwland – S]

Thelypteris simulata (Davenport) Nieuwland, Bog Fern, Massachusetts Fern. Mt (NC), Cp (VA): in NC in acid peat bogs at about 1000 meters in elevation, in VA in acid seepage swamps in the Coastal Plain; rare (NC Threatened, VA Rare). July-September. Northeastern, ranging from Nova Scotia 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; = *Dryopteris simulata* Davenport – F; **= *Parathelypteris simulata* (Davenport) Holttum**]

Thelypteris burksiorum J.E. Watkins & D.R. Farrar is a narrow endemic of moist sandstone rocks in 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. It differs from all our species in having elongate sori (vs. round to slightly oblong), sporangia with minute puberulence (vs. glabrous), and small (< 20 cm long) evergreen leaf blades. It is in a fourth group (see discussion above), subgenus or genus *Stegnogramma*. 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; **= *Stegnogramma pilosa* (M. Martens & Galeotti) K. Iwatsuki var. *alabamensis* (Crawford) K. Iwatsuki**] {not keyed at this time}

WOODSIACEAE Herter 1949 (Lady Fern Family)

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..... ***Athyrium***

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 ..... ***Deparia***
3 Leaves 1-pinnate, the pinnae entire ..... ***Diplazium***

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] ..... ***Gymnocarpium***
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..... ***Cystopteris***
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***

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).

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 strands); *Athyrium* and *Deparia* have 2, *Dryopteris* has 4-7.

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. Mt (NC, VA?): rock outcrops on grassy balds at high elevations; rare (NC Watch List). 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. Newfoundland and n. Québec west to Saskatchewan, south to w. NC, e. TN, OH, MO, and NE. Reported for VA by Kartesz (1999). [= S; = *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. Mt, Pd, Cp (GA, NC, SC, VA): moist forests; common. May-September. MA, WV, IL, and KS south to n. FL and e. TX. [= RAB, S; = *A. filix-femina* (Linnaeus) Roth ex Mertens var. *asplenioides* (Michaux) Farwell – C, F, FNA, G; = *A. filix-femina* ssp. *asplenioides* (Michaux) Hultén – K, W]

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.

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. Mt (GA, NC, VA), Pd (NC, VA): moist outcrops and talus of calcareous rocks, rarely up to 1500m elevation; uncommon, rare in Piedmont (SC Rare). May-August. Newfoundland west to MN, south to NC, 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]

Cystopteris fragilis (Linnaeus) Bernhardi, Fragile Fern, Brittle Fern. Mt (NC, VA): cliffs, ascending in our area to 1650m; rare (VA Rare). June-September. Circumboreal, in North America ranging from 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]

Cystopteris protrusa (Weatherby) Blasdell, Lowland Bladder Fern. Mt, Pd (GA, NC, SC, VA): rich woods or on moss- and soil-covered talus in boulderfields, occasionally on ledges of rock outcrops; common (SC Rare). April-June. NY and Ontario west to MN, south to GA, 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; = *C. fragilis* var. *protrusa* Weatherby – F, G, S]

Cystopteris tennesseensis Shaver, Tennessee Bladder Fern. Mt (GA, NC, VA), Cp (NC): moist to dry outcrops of calcareous rocks, including coquina limestone ("marl") in the outer Coastal Plain; rare (GA Special Concern, NC Rare, VA Rare). April-June. PA, KY, IL, WI, and IA south to NC, 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]

Cystopteris tenuis (Michaux) Desvaux, Mackay's Bladder Fern. Mt (GA, NC, VA), Pd (VA): moist outcrops and cliffs of metamorphic and sedimentary rocks, occasionally in moist soils near rock outcrops; uncommon (NC Rare). May-August. 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]

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].

Deparia Hooker & Greville 1829

A genus of about 40-50 species, primarily in tropical to warm temperate Asia and Africa. Our species is the only species native to the New World; it has several very closely related species in e. Asia (in section *Lunathyrium*). References: Kato in FNA (1993b); Kramer et al. in Kramer & Green (1990).

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. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): moist forests, cove forests; common (uncommon in Piedmont, rare in Coastal Plain). June-September. Nova Scotia west to MN, south to NC, SC, n. GA, n. AL, and AR. Unlike *Athyrium*, *Deparia* has the costal groove not continuous with the rachis groove. In addition, *Deparia* has multicellular hairs on the leaf blades. It stores starch in the swollen, persistent petiole bases. [= FNA, K, W; = *Athyrium thelypteroides* (Michaux) Desvaux – RAB, C, F, G; = *Diplazium acrostichoides* (Swartz) Butters – S]

* ***Deparia petersenii*** (Kunze) M. Kato. Cp (GA): disturbed areas; rare, native to se. Asia. Introduced and naturalized in the Southeast, including in c. and s. GA, AL, 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, Glade 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).

Diplazium pycnocarpon (Sprengel) M. Broun, Glade Fern. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): 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); uncommon (rare in Coastal Plain and south of VA) (NC Watch List, SC Rare). July-September. Widespread in e. North America, much more common in limestone areas of the Ridge and Valley than in the primarily acid-soil Blue Ridge and Piedmont. [= FNA, K; = *Athyrium pycnocarpon* Sprengel – RAB, C, F, G; = *Homalosorus pycnocarpos* (Sprengel) Pichi-Sermolli – S, W]

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 pinnule 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. Mt (NC, VA): moist, rocky forests, at medium to high elevations; uncommon (US Species of Concern, NC Rare, VA Watch List). 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. [= FNA, K, Z; < *G. dryopteris* (Linnaeus) Newman – C, G, W; < *Dryopteris disjuncta* (Ledebour) C.V. Morton – F]

Gymnocarpium dryopteris (Linnaeus) Newman is circumboreal, occurring throughout northern and central Eurasia, Greenland, south in North America to MD (?), s. PA, OH, MI, WI, IA, w. SD, CO, n. NM, and c. AZ. Since it approaches our area from the north and closely resembles *G. appalachianum*, it should be carefully sought in our area, especially in the mountains of VA. See Pryer & Haufler (1993) for a detailed analysis of the distinguishing features between *G. appalachianum* and *G. dryopteris*.

Gymnocarpium robertianum (Hoffmann) Newman of n. North America, south to MI, MN, and WI. [= FNA, K, Z; *Dryopteris disjuncta* (Ledebour) C.V. Morton – F, misapplied; < *G. dryopteris* – C, G (also see *G. appalachianum*)]

Triploids are known from the mountains of VA. Their identity is uncertain; based on geography they are presumably *G. appalachianum* × *dryopteris*, but could be *G.* ×*brittonii* (Sarvela) Pryer & Haufler [= *G. disjunctum* × *dryopteris*]. Triploids can be distinguished from *G. appalachianum* 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]

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 distinct 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. Mt (GA, NC, VA), Pd (NC, VA): on cliffs of sandstone, shale, granite, granitic gneiss, and hornblende gneiss; uncommon, rare in North Carolina (NC Rare). June-September. Endemic to the Southern and Central Appalachians of VA, WV, NC, and 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 Ontario and Québec). 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; = *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. Mt (NC, VA): cliffs of amphibolite, greenstone, other rocks; uncommon, rare in NC and apparently only in the northernmost few counties of that state (NC Rare). June-September. Circumboreal, ranging in North America from Newfoundland and AK south to VA, nw. NC, OH, n. IL, nw. IA, Saskatchewan, and British Columbia. [= RAB, C, F, FNA, G, K, S, W]

Woodsia obtusa (Sprengel) Torrey *ssp.* ***obtusa***, Common Woodsia, Blunt-lobed Cliff Fern. Mt, Pd, Cp (GA, NC, SC, VA): rock outcrops of various sorts, moist talus, terrestrial near rock outcrops; common. June-September. ME, Québec, MN, and e. NE, south to FL and TX. [= FNA, K; < *W. obtusa* – RAB, C, F, G, S, W]

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 borne singly in a soft fleshy to leathery aril ..... ***TAXACEAE***
    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***

Key to Genera, Emphasizing Vegetative Characters

1 Leaves pinnately compound..... ***Zamia*** (ZAMIACEAE)
1 Leaves simple.
  2 Leaves fan-shaped, dichotomously-veined, deciduous ..... ***Ginkgo*** (GINKGOACEAE)
  2 Leaves needle-like or scale-like, not dichotomously veined, evergreen (deciduous in *Taxodium* and *Larix*).
    3 Leaves either borne on short spur-shoots or in fascicles of 2-5; leaves rounded to somewhat flattened in cross-section, but not 4-sided.
      4 Leaves evergreen, > 3 cm long, borne in fascicles of 2-5..... ***Pinus*** (PINACEAE)
      4 Leaves deciduous or evergreen, < 3 cm long, borne on short spur-shoots.
        5 Leaves evergreen; cones 6-12 cm long..... ***Cedrus*** (PINACEAE)
        5 Leaves deciduous; cones 1-2 cm long ..... ***Larix*** (PINACEAE)
    3 Leaves borne singly, alternate, opposite, or whorled; leaves flattened, scale-like, or 4-sided in cross-section.
      6 Leaves opposite or whorled, generally scale-like.
        7 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 ..... ***Juniperus*** (CUPRESSACEAE)
        7 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.
          8 Female cones globose and woody, the hard scales peltate, not imbricate; ultimate branchlets (including the scale leaves) about 1 mm broad..... ***Chamaecyparis*** (CUPRESSACEAE)
          8 Female cones ellipsoid and leathery, the pliable scales basally attached, imbricate; ultimate branchlets (including the scale leaves) about 1.5 mm broad
            9 Branchlets flattened in vertical planes; seeds wingless; [planted tree, sometimes persistent] ..... ***Platycladus*** (CUPRESSACEAE)
            9 Branchlets flattened in horizontal planes; seeds winged; [native tree, but also sometimes planted]..... ***Thuja*** (CUPRESSACEAE)
      6 Leaves alternate, needle-like or flattened.
        10 Leaves 4-sided in cross-section..... ***Picea*** (PINACEAE)
        10 Leaves flattened in cross-section.
          11 Leaves rounded, blunt, or minutely notched at the tip (at 10×), prominently whitened beneath (with stomatal stripes); cone scales imbricate.
            12 Leaves attached directly to twig; cones 4-5 cm long, erect ..... ***Abies*** (PINACEAE)
            12 Leaves jointed, on short, persistent base; cones 1-3.8 cm long, pendant .... ***Tsuga*** (PINACEAE)
          11 Leaves acute to acuminate (distinctly pointed at the tip), green beneath; seeds borne in a fleshy aril **or** cone scales valvate.
            13 Leaves deciduous, soft-textured ..... ***Taxodium*** (CUPRESSACEAE)
            13 Leaves evergreen, firm-textured.
              14 Leaves tapering from near the base to a long-acuminate apex; seeds borne in a woody cone with valvate scales..... ***Cunninghamia*** (CUPRESSACEAE)
              14 Leaves parallel-sided for most of their length, the apex acute; seeds borne singly in a soft fleshy to leathery aril.
                15 Leaves 2.0-7.5 cm long (at least the larger on a branch > 4 cm long)..... ***Cephalotaxus*** (CEPHALOTAXACEAE)
                15 Leaves 1.0-3.8 cm long.

16 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)
16 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)

CEPHALOTAXACEAE Neger 1907 (Plum-yew Family)

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. Pd (NC): suburban woodlands; rarely grown horticulturally, rarely naturalizing in the vicinity of plantings (as in Chapel Hill, Orange County, NC), introduced from Asia. [? *Cephalotaxus harringtonia* (Knight ex J. Forbes) K. Koch] {not yet keyed in family key}

CUPRESSACEAE Bartlett 1830 (Cypress Family)
(including *TAXODIACEAE*)

A family of about 25-30 genera and about 120 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*].....***Cunninghamia***
  2 Leaves deciduous, flexible, < 2 cm long, parallel-sided, the apex short-acute; [subfamily *Taxodioideae*].....***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.....***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.
    4 Female cones globose and woody, the hard scales peltate, not imbricate; ultimate branchlets (including the scale leaves) about 1 mm broad ..... ***Chamaecyparis***
    4 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] ..... ***Platycladus***
      5 Branchlets flattened in horizontal planes; seeds winged; [native tree, but also sometimes planted] ..... ***Thuja***

Callitropsis Linnaeus (Cypress)

As newly circumscribed, a genus of ca. 18 species. Little (2006) demonstrates the monophyly of the New World *Cupressus*. References: Little (2006)=Z; Little et al. (2004).

* *Callitropsis ×leylandii* (A.B. Jackson & Dallimore) D.P. Little, Leyland Cypress, is commonly planted as an ornamental tree in our area. It is a hybrid between *Cupressus nootkatensis* D. Don in Lambert [*Chamaecyparis nootkatensis* (D. Don in Lambert) Spach; *Callitropsis nootkatensis* (D. Don in Lambert) Ørsted], Nootka Cypress, and *Cupressus macrocarpa* Hartweg, Monterey Cypress. [= Z; = ×*Cupressocyparis leylandii* (A.B. Jackson & Dallimore) Dallimore & A.B. Jackson; = *Cupressus ×leylandii* A.B. Jackson & Dallimore] {not keyed at this time}

Chamaecyparis Spach 1841 (White Cedar)

A genus of about 5 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. Cp (GA, NC, SC, VA): peat dome and streamhead pocosins, blackwater stream swamps, hillside seepages, in highly acidic, peaty or sandy soils; uncommon (GA Rare, VA Rare). 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, *Ch. 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; > *Ch. thyoides* var. *henryae* (H.L. Li) Little – Y, Z; > *Ch. thyoides* var. *thyoides* – Y, Z; = *Cupressus thyoides* Linnaeus]

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. Pd (NC): planted horticulturally; rare, perhaps only persistent, introduced from China. A variety of forms are seen, some with dark-green, others with glaucous-blue foliage. [= K, Z; *C. sinensis* R. Brown]

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 in FNA (1993b); Adams (1986); Adams & Demeke (1993); Adams (1995); 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 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. Mt (NC, SC, VA), Pd (GA, NC, VA), Cp (SC, VA): 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); rare (GA Special Concern, NC Rare, SC Rare, VA Rare). March-April; fleshy cone maturing in second or third year. This species is circumpolar, widespread in n. North America, n. Europe, and n. Asia. In North America it 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. As a native species, it is very rare in the Southeast; in NC known only from a few sites, notably Mount Satulah (Macon County) and King's Pinnacle (Gaston County). In SC, a notable population occurs in sandy soils in Aiken County (Hitchcock Woods). 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; *J. sibirica* Burgsdorff – S]

Juniperus virginiana Linnaeus *var.* ***silicicola*** (Small) E. Murray, Southern Red Cedar, Coastal Red Cedar. Cp (GA, NC, SC, VA?): maritime forests and scrub, hammocks, coastal shell middens and natural shell deposits, brackish marshes, and other

sandy or peaty, circumneutral situations; common. January-February; October-November. Var. *silicicola* ranges from e. NC south to s. FL, and possibly west to MS. 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; = *Juniperus silicicola* (Small) Bailey – RAB; = *Sabina silicicola* Small – S; = *Juniperus virginiana* ssp. *silicicola* (Small) J. Silba]

Juniperus virginiana Linnaeus *var. **virginiana***, Eastern Red Cedar. Pd, Mt, Cp (GA, NC, SC, VA): 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; common (especially in the Piedmont). 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 moth-deterrent properties of cedar wood). [= C, F, FNA, G, K; = *Juniperus virginiana* – RAB, W; = *Sabina virginiana* (Linnaeus) Antoine – S]

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. Cp, Mt (NC): commonly planted, especially in graveyards, and rarely persisting and spreading to pastures, fields, and roadsides; rare, introduced from Asia. [= FNA, K; = *Biota orientalis* (Linnaeus) Endlicher – S; = *Thuja orientalis* Linnaeus]

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." At least in our area, 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); there are no intermediates, and with both species present for comparison, even juvenile trees are readily identifiable. 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); Watson in FNA (1993b); Page in Kramer & Green (1990). 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 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. Cp (GA, NC, SC, VA): limesink ponds (dolines), clay-based Carolina bays, wet savannas, pocosins and other wet, peaty habitats, shores of natural blackwater lakes, swamps of blackwater streams; common. March-April; October. Se. VA 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, Z; < *T. distichum* – F; = *T. distichum* var. *imbricarium* (Nuttall) Croom – FNA; = *T. distichum* var. *nutans* (Aiton) Sweet]

Taxodium distichum (Linnaeus) L.C. Richard, Bald-cypress. Cp (GA, NC, SC, VA), Pd* (NC): brownwater and blackwater swamps, usually in riverine situations; common. March-April; October. DE and e. MD south to 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, Z; = *T. distichum* var. *distichum* – C, FNA; < *T. distichum* – F (also see *T. ascendens*)]

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. Mt (NC?, VA), Pd (VA): 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); uncommon (rare in VA Piedmont, rare in NC, where perhaps only introduced). March-April. Nova Scotia, Hudson Bay, and Manitoba 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]

GINKGOACEAE Engler in Engler & Prantl 1897 (Ginkgo Family)

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. Pd, Mt (NC): frequently planted, rarely escaped to suburban woodlands and yards; rare, native to se. China. As pointed out by Whetstone in FNA (1993b), *Ginkgo* is only weakly naturalized. [= C, FNA, K]

PINACEAE Lindley 1836 (Pine Family)

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 flat and linear; [subfamily *Abietoideae*].
  2 Leaves attached directly to twig; cones 4-5 cm long, erect ..... ***Abies***
  2 Leaves jointed, on short, persistent base; cones 1-3.8 cm long, pendant ..... ***Tsuga***
1 Leaves needle-like, angular rather than flat in cross-section.
  3 Leaves borne singly, 4-sided; [subfamily *Abietoideae*] ..... ***Picea***
  3 Leaves either borne on short spur-shoots or in fascicles of 2-5, rounded to somewhat flattened in cross-section, but not 4-sided.
    4 Leaves evergreen, > 3 cm long, borne in fascicles of 2-5; [subfamily *Pinoideae*] ..... ***Pinus***
    4 Leaves deciduous or evergreen, < 3 cm long, borne on short spur-shoots; [subfamily *Laricoideae*].
      5 Leaves evergreen; cones 6-12 cm long ..... ***Cedrus***
      5 Leaves deciduous; cones 1-2 cm long ..... ***Larix***

Abies P. Miller 1754 (Fir)

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 10-15 cm long; [section *Abies*] ..... ***A. alba***
1 Cones 3.5-8 cm long; [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, 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, from Grayson and Smyth counties, VA, southward].....***A. fraseri***

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

Abies balsamea (Linnaeus) P. Miller, Balsam Fir, Northern Balsam. Mt (VA): high elevation forests and cliffs; rare (VA Rare). April-May. Newfoundland and Labrador west to n. Alberta, 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; < *A.* ×*phanerolepis* (Fernald) Liu – Y; < *A. intermedia* Fulling]

Abies fraseri (Pursh) Poiret, Fraser Fir, She Balsam, Southern Balsam. Mt (*GA, NC, VA): high elevation forests, from about 1500-2037m; uncommon (US Species of Concern, NC Rare, VA Rare). May-June; September-November. Southern Appalachian endemic, from Grayson and Smyth counties, VA (notably, Mount Rogers) south to e. TN and sw. NC. 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. Most Christmas tree plantations are at 1000-1500m in elevation; below 1000m, Fraser Fir is very susceptible to a fungal root rot (*Phytophthora*), above 1500m 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, 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. Pd, Cp (NC, SC): frequently planted, rarely escaped to suburban woodlands; rare. [= 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; [alien species rarely planted] ..... ***L. decidua***
1 Leaves 1-2.5 cm long; cones 1.2-2 cm long; [native species south to MD and WV].....***[L. laricina]***

* ***Larix decidua*** P. Miller, European Larch. Mt (NC): forests; rare, introduced from 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 or Tamarack, ranges south in bogs and swamps to Garrett County, MD and Preston County, WV. [= FNA, C, F, G, K]

Picea A. Dietrich 1824 (Spruce)

A genus of about 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 1.5-4.5 cm long; upper branches ascending, the lower spreading; outer bud scales prolonged into minute hairlike projections; [plant native].
2 Cones 1.5-2.5 cm long, gray at maturity, long-persistent.....***[P. mariana]***
2 Cones 2.5-4.5 cm long, red-brown at maturity, short-persistent .....***P. rubens***

* ***Picea abies*** (Linnaeus) H. Karsten, Norway Spruce. Mt (NC, VA): persisting and escaping from forestry plantations at moderate or high elevations, notably in Great Smoky Mountains National Park (Kephart Prong), Mount Mitchell State Park, and the Biltmore Estate; rare, introduced from n. Europe. [= FNA, K]

Picea rubens Sargent, Red Spruce, He Balsam. Mt (NC, VA): 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 1000m), ranging in moisture tolerance from dry ridges (though these are often fog-bathed) to saturated peats; uncommon. May-June; October. Nova Scotia and New Brunswick south (interruptedly) to w. NC and e. TN. Hardin (1971b) discusses the existence of 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 seems warranted. [= RAB, C, F, FNA, G, K, S, W, Z; > *P. australis* Small – S]

* *Picea mariana* (P. Miller) Britton, Sterns, & Poggenburg, Black Spruce, ranges south to s. PA. It 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* (see discussion under *P. rubens*). [= C, F, FNA, G; > *P. mariana* var. *mariana* – K]

Pinus Linnaeus 1753 (Pine)

A genus of about 110 species, trees, of the Northern Hemisphere, south to Central America. 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.

Main Key

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 stout, 1.3-2 mm wide.
        10 Needles 7-16 cm long; cones 4-6 cm long, each scale bearing a small depressed mucro; [introduced tree, usually planted only on Coastal Plain barrier islands]; [subgenus *Pinus*, section *Pinus*, subsection *Pinus*] ..... ***P. thunbergiana***
        10 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 tree south to MD and WV].

11 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***
11 Cones 3-6 cm long, unarmed; [introduced tree south to MD and WV]; [subgenus *Pinus*, section *Pinus*, subsection *Pinus*]..... ***[P. sylvestris]***

9 Needles slender to somewhat stout, 0.5-1.2 mm wide.
12 Needles 15-25 cm long; [trees naturalized on barrier islands]; [subgenus *Pinus*, section *Pinus*, subsection *Pinaster*]..... ***P. pinaster***
12 Needles 2-17 cm long; [trees generally elsewhere].
13 Needles 10-17 cm long; branches brittle; spring shoots with a single node, with 1 whorl of branches; [trees of the north, sometimes planted in our Mountains]; [subgenus *Pinus*, section *Pinus*, subsection *Pinus*]..... ***P. resinosa***
13 Needles 2-13 cm long; branches flexible; spring shoots usually with several nodes (several whorls of branches); [trees of various habitats].
14 Needles 2-8 cm long, generally twisted; cones opening at maturity, not serotinous, the scales bearing prominent, slender prickles 2-5 mm long; [subgenus *Pinus*, section *Trifoliae*, subsection *Contortae*]..... ***P. virginiana***
14 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.
15 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***
15 Anthers dark orange; bark flaky, the laminated layers sloughing off in a manner typical of a pine; [non-native (in our immediate area) trees of xeric sands]; [subgenus *Pinus*, section *Trifoliae*, subsection *Contortae*] ..... ***P. clausa***

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 clausa (Chapman ex Engelmann) Vasey ex Sargent, Sand Pine. Cp (GA, *NC): persisting after experimental planting in plantations; rare, native to Florida. *P. clausa* is closely related to *P. virginiana*, the northeastern North American *P. banksiana*, and the northwestern North American *P. contorta* complex. [= FNA, K, S, Z]

Pinus echinata P. Miller, Shortleaf Pine, Rosemary Pine, Yellow Pine. Pd, Mt, Cp (GA, NC, SC, VA): dry rocky ridges and slopes, sandhills, old fields, forests, generally in rather xeric sites, but also occurring in mesic to even wet sites; common. 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, Z]

Pinus elliottii Engelmann *var. **elliottii***, Slash Pine. Cp (GA, NC*, SC): native in wet pine flatwoods and maritime forests in SC, extensively planted in SC and NC in silvicultural plantations on a wide variety of soils, many of them unsuitable for its successful growth; common. 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 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 revealing reddish patches). [= FNA, K, Z; < *P. elliottii* – RAB; *P. caribaea* Morelet – S in part, misapplied; *P. palustris* P. Miller – S in part, misapplied; *P. heterophylla* – S]

Pinus glabra Walter, Spruce Pine, Walter's Pine. Cp (GA, SC): bottomland forests, rich, moist soils; common, uncommon in SC. 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, Z]

Pinus palustris P. Miller, Longleaf Pine, Southern Pine. Cp, Pd (GA, NC, SC, VA), Mt (GA): 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 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; common (locally) (VA Rare). 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 the state tree of NC. A hybrid with *P. taeda*, *P.* ×*sondereggeri* H.H. Chapman, occurs. [= RAB, C, FNA, K; = *P. australis* Michaux f. – F, G, S]

* ***Pinus pinaster*** Aiton, Maritime Pine, Cluster Pine. Cp (NC): planted and naturalized on barrier islands; rare, introduced from 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 12 (Dare County, NC), further south at Bodie Island Lighthouse (Dare County, NC), on Ocracoke Island (Hyde County, NC), and elsewhere. It has needles in 2's, (10-) 15-20 (-25) cm long. [= K]

Pinus pungens Lambert, Table Mountain Pine, Burr Pine, Hickory Pine. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): dry ridges, cliffs, shale barrens, usually requiring fire for its reproduction, occurring at least up to 5000 feet in elevation; common (rare in Coastal Plain). 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, Z]

* ***Pinus resinosa*** Aiton, Red Pine. Mt (NC, VA): in pine plantations, and persisting after silvicultural planting; rare. This species is native as far south as WV (Pendleton and Hardy counties) and PA (Luzerne, Wyoming, Tioga, and Centre counties). [= C, F, FNA, G, K]

Pinus rigida P. Miller, Pitch Pine. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): 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; uncommon (rare in Coastal Plain of VA). 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, Z; = *P. rigida* ssp. *rigida*]

Pinus serotina Michaux, Pocosin Pine, Pond Pine, Marsh Pine. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): peaty soils of pocosins, swamps of small blackwater streams; common, rare in Piedmont. 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 pond 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, Z; = *P. rigida* P. Miller ssp. *serotina* (Michaux) Clausen]

Pinus strobus Linnaeus, Eastern White Pine. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (SC, VA): moist to dry forests, bottomlands, dry, rocky ridges in humid gorges; common (rare in Coastal Plain). 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, Z; = *Strobus strobus* (Linnaeus) Small – S]

Pinus taeda Linnaeus, Loblolly Pine, Old Field Pine. Cp, Pd (GA, NC, SC, VA): forests, fields, pine plantations; common, much more abundant and widespread than formerly, occurring further west than as a native. March-April; October-November. Widespread in se. North America, ranging north to s. NJ, VA, TN, AR, and se. OK. See *P. elliottii* for additional characters to distinguish these two species. [= RAB, C, F, FNA, G, K, S, W, Z]

* ***Pinus thunbergiana*** Franco, Japanese Black Pine. Cp (GA?, NC, SC): planted and persisting, sometimes appearing native, on barrier islands; rare, 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. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): 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; common (rare in the Coastal plain). 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, Z]

* *Pinus sylvestris* Linnaeus var. *sylvestris*, Scots Pine, is 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]

The following pines occur on barrier islands in NC and SC: *P. taeda*, *P. palustris*, *P. elliottii* var. *elliottii*, *P. thunbergii*, and *P. pinaster* (the latter two not native). In the Coastal Plain, the pines are *P. palustris*, *P. serotina*, *P. echinata*, *P. taeda*, *P. glabra*, and *P. elliottii* var. *elliottii*. In the Piedmont, three pines are common and typically present in disturbed upland soils. The auxiliary key is useful in separating these sometimes confusing trees.

Tsuga Carrière 1847 (Hemlock)

A genus of about 14 species, trees, of North America and e. Asia (China, Japan, and Taiwan). References: Taylor in FNA (1993b); Page in Kramer & Green (19\90).

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 ..... ***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, more or less normally sized, mostly 3/4 to 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 ..... ***T. caroliniana***

Tsuga canadensis (Linnaeus) Carrière, Eastern Hemlock, Canada Hemlock. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): 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); common (rare in Piedmont south of VA, rare in Coastal Plain in VA only). 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 is often left by loggers. The hemlock woolly adelgic is severely affecting this species. [= RAB, C, F, FNA, G, K, S, W, Z]

Tsuga caroliniana Engelmann, Carolina Hemlock. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): 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; uncommon (rare in piedmont) (GA Special Concern). 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 n. 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]

The folk taxonomy of conifers in our area is an interesting, though 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."

TAXACEAE S.F. Gray 1821 (Yew Family)

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 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 British Columbia and Alberta 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); Farjon (1998)=Z; Page in Kramer & Green (1990).

1 Leaf undersurfaces usually lacking cuticular papillae along the stomatal bands; shrubs to 2 m tall; [of w. NC and VA northward]..... ***T. canadensis***
1 Leaf undersurfaces with cuticular papillae along the stomatal bands; shrubs or small trees to 10 m tall; [of Panhandle FL]..... ..... ***[T. floridana]***

Taxus canadensis Marshall, Canada Yew, American Yew. Mt (NC, VA), Pd (VA): cliffs, bluffs, and rocky slopes over calcareous or mafic rocks, red spruce and hemlock swamps and bogs; uncommon in VA, rare in NC (NC Rare). April-May. Newfoundland, Labrador, MN, and s. Manitoba 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 rather common. Deer have a devastating effect on populations of this species in our area. [= C, F, FNA, G, K, W, Z; = *T. baccata* Linnaeus ssp. *canadensis* (Marshall) Pilger]

* *Taxus baccata* Linnaeus, English Yew. Planted as hedges and ornamentals, escaping locally, as in Rock Creek Park, Washington, DC (Shetler & Orli 2000). [= C, G, K, Z; = *T. baccata* ssp. *baccata*] {not keyed}
* *Taxus cuspidata* Siebold & Zuccarini, Japanese Yew. Planted as hedges and ornamentals, possibly escaping locally (Shetler & Orli 2000). [= C, G, K; > *T. cuspidata* var. *cuspidata* – Z; = *T. baccata* Linnaeus ssp. *cuspidata* (Siebold & Zuccarini) Pilger] {not keyed}
Taxus floridana Nuttall ex Chapman, Florida Yew. Mesic bluffs and ravines. Endemic to Panhandle FL. [= FNA, K, S, Z; = *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. Cp (GA), *Mt (*NC): moist ravines and bluffs, and also rarely established near plantings; rare (US Endangered, GA Endangered). 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; = *Tumion taxifolium* (Arnott) Greene – S]

ZAMIACEAE Reichenbach 1837 (Sago-palm Family)

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. Cp (GA): maritime forests, pinelands; rare (GA Special Concern). E. GA (Glynn Co.) 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) 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]

DICOTYLEDONS

ACANTHACEAE Durande 1762 (Acanthus Family)

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 Leaves in a basal rosette (sometimes with smaller leaves on a scape).
- 2 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***
- 2 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].
  - 3 Leaves 2-10 cm long, 1-3 cm wide; corolla 3-4 cm long; calyx lobes 15-30 mm long..... ..... ***Ruellia ciliosa***
  - 3 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***

1 Leaves cauline.
- 4 Stamens 2; corolla distinctly 2-lipped (except with 4 nearly equal lobes in *Yeatesia*).
  - 5 Bracts and bractlets inconspicuous, 2-5 mm long, linear or triangular; stem subterete or obscurely 4-angled .... ***Justicia***
  - 5 Bracts and/or bractlets subtending the flowers conspicuous, 5-15 mm long, obovate; stem terete or 6-angled.
    - 6 Stem six-angled in cross-section; corolla conspicuously 2-lipped ..... ***Dicliptera***
    - 6 Stem terete in cross-section; corolla 4-lobed, the lobes nearly equal ..... ***Yeatesia***
- 4 Stamens 4; corolla not distinctly 2-lipped, the corolla lobes of nearly equal size (except distinctly 2-lipped in *Hygrophila*).
  - 7 Corolla distinctly 2-lipped..... ***Hygrophila***
  - 7 Corolla not distinctly 2-lipped, the corolla lobes of nearly equal size.
    - 8 Calyx lobes linear-aristate; anther sacs awned or pointed at the base ..... ***Dyschoriste***
    - 8 Calyx lobes lanceolate or linear; anther sacs blunt..... ***Ruellia***

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}

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.

Dicliptera brachiata (Pursh) Sprengel, Dicliptera, Branched Foldwing. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): bottomland forests; uncommon. 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, Y; = *Diapedium brachiatum* (Pursh) Kuntze – S; > *Dicliptera brachiata* var. *brachiata* – 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 10-15 mm long (including the 3-5 mm lobes); capsule 8-10 mm long; [of floodplain forests]..... ***D. humistrata***
1 Corolla 25-27 mm long (including the 5-10 mm lobes); capsule 10-14 mm long; [of pinelands]..... ***D. oblongifolia***

Dyschoriste humistrata (Michaux) Kuntze, Swamp Twinflower, Swamp Dyschoriste. Cp (GA, SC): bottomland forests, especially on soils over limestone; uncommon, rare north of GA (SC Rare). April-May. SC to c. peninsular FL, west to panhandle FL. [= RAB, GW, K, S, Y]

Dyschoriste oblongifolia (Michaux) Kuntze, Blue Twinflower, Pineland Dyschoriste. Cp (GA, SC): pine savannas, flatwoods, and sandhills; uncommon. April-May. SC to s. FL, west to panhandle FL. The basis of Small's (1933) attribution of this species to VA is unknown. [= RAB, K, S, 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. Cp (GA, SC): swamp forests over coquina limestone ("marl"); rare. 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 Augustin de Candolle) D.B. Ward, in ne. and Panhandle FL, south to c. peninsular FL. [= K, Y, Z; < *E. caroliniensis* – RAB; = *E. carolinensis* var. *carolinensis* – GW, misspelling; = *Tubiflora carolinensis* J.F. Gmelin – S, misspelling]

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. Cp (GA): shallow water of swamps and shores; rare (GA Special Concern). Sw. GA south to FL Peninsula, west to e. TX; West Indies. [= GW, K, S; = *Hygrophila costata* Nees et al.; = *Ruellia lacustris* Schlectendahl & Chamisso]

* ***Hygrophila polysperma*** (Roxburgh) T. Anderson. Cp (VA): lakes, doubtfully established but frequently reintroduced; rare, 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, 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 Spike densely flowered; seeds verrucose; primary leaves averaging 6-8× as long as wide; [of the Piedmont, Mountains, and Coastal Plain]..... ***J. americana***
1 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].
  2 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].
    3 Upper leaf blades 4-7 cm long, not channeled, tough but not fleshy; calyx segments 5-7 mm long, < 1 mm wide .... ***J. angusta***
    3 Upper leaf blades 8-13.5 cm long, channeled, fleshy; calyx segments 11-15 mm long, ca. 1 mm wide ..... ***J. crassifolia***
  2 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].
    4 Spikes lax, the flowers usually borne singly, secund; seeds smooth; leaves averaging ca. 5× as long as wide..... ***J. ovata*** *var.* ***lanceolata***
    4 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. Pd, Mt (GA, NC, SC, VA), Cp (NC, VA): river and stream beds, in shallow water, often rooted in rocky shallows; common. June-October. W. Québec west to MI and WI, south to GA, TX, and KS. [= RAB, C, GW, K, W, 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. Cp (GA): roadside ditches, savannas; rare (GA Special Concern). Se. GA (Camden County) (Sorrie 1998b) south to s. FL. [= K, Y; < *J. ovata* – GW; < *J. crassifolia* (Chapman) Chapman ex Small – S; = *J. ovata* (Walter) Lindau var. *angusta* (Chapman) R.W. Long – Z]

Justicia crassifolia (Chapman) Chapman ex Small. Cp (GA): flatwoods, cypress ponds; rare. S. GA to the FL Panhandle. [= GW, K, Y; < *J. crassifolia* – S]

Justicia ovata (Walter) LIndau *var.* ***lanceolata*** (Chapman) R.W. Long. Cp (GA): swamps, marshes; uncommon. 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, Y, Z; < *J. ovata* – GW; = *J. lanceolata* (Chapman) Small – S]

Justicia ovata (Walter) Lindau *var.* ***ovata***, Coastal Plain Water-willow, Loose-flower Water-willow. Cp (GA, NC, SC, VA): swamps, marshes; common. May-July. S. VA south to c. peninsular FL, Panhandle FL, and se. AL. [= C, K, 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) Radlk., Night-and-Afternoon, has been reported as a greenhouse weed from SC (Nelson & Kelly 1997). It is not included as a regular member of the flora of this region because "it is unlikely that it could persist anywhere in South Carolina outside a greenhouse environment" (Nelson & Kelly 1997). [= K]

Ruellia Linnaeus (Wild-petunia)

A genus of about 150 species, of the tropics and temperate North America. References: Wasshausen (1998)=Y; Long (1970)=Z.

1 Principal leaves linear-lanceolate, > 10 × as long as wide (8-27 cm long, 0.7-2 cm wide); [alien, cultivated and naturalized]... ***R. tweediana***
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).
    3 Corolla 6-10 cm long, opening at night and withering by mid-morning; calyx lobes 2.5-4.5 cm long; [of Coastal Plain bogs and wet pine flatwoods]... ***R. noctiflora***
    3 Corolla 3-7 cm long, opening during the day; 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.
        5 Stem usually divergently branched; 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 or with a few ascending branches; 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.
        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; [plant widespread in our area and common]... ***R. caroliniensis***
          7 Plant with a rosette of basal leaves; leaves spatulate to obovate; [plant rare, restricted to dry pinelands in the Coastal Plain] ... ***R. ciliosa*** *var.* ***cinerascens***

Ruellia caroliniensis (J.F. Gmelin) Steudel, Carolina Wild-petunia, Common Wild-petunia. Cp, Pd, Mt (GA, NC, SC, VA): dry to moist forests and woodlands; common. May-September. NJ, s. OH, and s. IN, south to FL and TX. [= RAB, C, G; > *R. caroliniensis* var. *caroliniensis* – F; > *R. caroliniensis* var. *cheloniformis* Fernald – F; > *R. caroliniensis* var. *dentata* (Nees) Fernald – F; > *R. caroliniensis* var. *membranacea* Fernald – F; > *R. caroliniensis* var. *nanella* Fernald – F; > *R. caroliniensis* var. *salicina* Fernald – F; > *R. caroliniensis* var. *semicalva* Fernald – F; = *R. caroliniensis* ssp. *caroliniensis* var. *caroliniensis* – K, Y, Z; *R. parviflora* (Nees) Britton – S; < *R. caroliniensis* – W (also see *R. ciliosa*)]

Ruellia ciliosa Pursh *var.* ***cinerascens*** Fernald, Sandhills Wild-petunia. Cp (GA, NC, SC): sandhills, particularly in loamy, submesic swales; rare (NC Rare, SC Rare). 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. [= RAB, S; = *R. caroliniensis* (J.F. Gmelin) Steudel ssp. *ciliosa* (Pursh) R.W. Long var. *cinerascens* (Fernald) Kartesz & Gandhi – K, Y, Z; < *R. caroliniensis* – W]

Ruellia humilis Nuttall, Low Wild-petunia, Hairy Wild-petunia. Mt (GA, VA), Pd (NC, VA): diabase glades and woodlands; rare (NC Threatened, VA Watch List). May-September. PA west to se. MN and NE, south to c. NC, AL, and TX.

Piedmont plants of NC are uniformly white-flowered. [= RAB, K, W, Y, Z; > ***R. humilis*** var. *calvescens* Fernald – C, F, G; > ***R. humilis*** var. *frondosa* Fernald – F, G; > ***R. humilis*** var. *humilis* – C, F, G]

Ruellia noctiflora (Nees) A. Gray, Night-flowering Wild-petunia. Cp (GA): wet pinelands and savannas; rare (GA Special Concern). (May-) June-July (-August). E. GA (in counties immediately adjacent to SC) south to n. FL and west to se. LA. [= GW, K, S, Y]

Ruellia pinetorum Fernald, Pineland Wild-petunia. Cp (GA, SC): dry to wet pinelands; rare (SC Rare). May-September. SC south to Panhandle FL, west to 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; = ***R. pedunculata*** Torrey ex A. Gray ssp. *pinetorum* (Fernald) R.W. Long – K, Y, Z]

Ruellia purshiana Fernald, Pursh's Wild-petunia. Pd (GA, NC, SC, VA), Mt (GA, NC, VA): dry woodlands and forests, especially over mafic or calcareous rocks; uncommon (NC Rare). May-September. MD south to GA and AL, in and adjacent to the Appalachians. [= RAB, F, K, W, Y, Z; < ***R. pedunculata*** Torrey ex A. Gray – C, G]

Ruellia strepens Linnaeus, Limestone Wild-petunia. Mt (GA, VA), Pd (NC, VA), Cp (NC, SC, VA): calcareous forests; uncommon, rare south of VA (NC Rare, SC Rare). 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, Y, Z]

* ***Ruellia tweediana*** Grisebach, Mexican Bluebell. Cp (GA, SC): disturbed areas; rare, introduced from e. Mexico. May-September. [***R. brittoniana*** Leonard emend Fernald – RAB, GW, K, Z; ***R. caerulea*** – K, orthographic variant; ***R. malacosperma*** Greenman – S, misapplied; ***R. coerulea*** Morong – Y]

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. Cp (GA): pine savannas; rare. 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*** var. *floridanum* A. Gray – 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, Cp (GA): rich bottomlands; rare. Sw. GA (Jones & Coile 1988) and FL west to TX (Kartesz 1999). [= K, S, Y; = *Dicliptera viridiflora* (Nees) R.W. Long – Z; *Dicliptera halei* Riddell]

ACERACEAE (Maple Family)

(see *SAPINDACEAE*)

ACTINIDIACEAE Hutchinson 1926 (Kiwi-fruit Family)

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 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): suburban woodlands; rare, native of e. Asia. Also naturalized in nc. TN.

ADOXACEAE Trautvetter 1853 (Moschatel Family)

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 (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, Pd, Mt (GA, NC, SC, VA): streambanks, thickets, moist forests, disturbed areas; common. Late April-July; July-August. The species ranges from Nova Scotia west to Manitoba, south to 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, 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, Y; > *S. canadensis* var. *canadensis* – F, G; > *S. canadensis* var. *submollis* Rehder – F, G; = *S. nigra* Linnaeus ssp. *canadensis* (Linnaeus) R. Bolli – K, Z; > *S. canadensis* – S, in a narrow sense; > *S. simpsonii* Rehder ex Sargent – S; > *Sambucus canadensis* Linnaeus var. *laciniata* A. Gray]

Sambucus racemosa Linnaeus *var. **pubens*** (Michaux) Koehne, Red Elderberry. Mt (GA, NC, 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; uncommon (GA Special Concern). 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 Newfoundland west to British Columbia (?), 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; = *S. racemosa* ssp. *pubens* (Michaux) House var. *pubens* – C; < *S. pubens* ssp. *pubens* – Y; < *S. racemosa* var. *racemosa* – K, Z]

* *Sambucus nigra* Linnaeus, European Elder, is escaped from cultivation, introduced from Europe. [= C, F, G; = *S. nigra* ssp. *nigra* – K, Z]

Viburnum Linnaeus 1753 (Viburnum)

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. References: McAtee (1956)=Z; Ferguson (1966a)=Y; Weckman et al. (2002); Winkworth & Donoghue (2005).

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 *Odontotinus*] ..... ***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 *Viburnum*].

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.

14 Leaves oblong-obovate, wider towards the tip; inflorescence paniculate, with an elongate central axis, the lowest branches opoosite 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 5-8 lateral veins on each iside; flowers all alike and fertile; winter buds with > 2, imbricate scales; [section *Odontotinus*].

16 Fruit orange or red; [aliens, planted and escaping].

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 0-10 (-15) mm long; linear stipules persistent ..... ***V. rafinesquianum***

18 Petioles (12-) 20-50 mm long; linear stipules caducous (persistent in *V. bracteatum* and *V. molle*).

19 Stylopodium glabrous; pubescence of petioles of red-glandular trichomes; [of KY, TN, AL westward] ..... ***[V. molle]***

19 Stylopodium pubescent; pubescence of petioles various (or absent), but not red-glandular.

20 Linear stipules persistent; bracts in inflorescence persistent; [of calcareous bluffs of nw. GA, se. TN, and ne. AL] ..... ***V. bracteatum***

20 Linear stipules caducous; bracts in inflorescence soon falling.

21 Petioles glabrous; lower leaf-surfaces glabrous (or with simple trichomes in the vein axils only) ..... ***V. recognitum***

21 Petioles stellate-pubescent; lower leaf-surfaces stellate-pubescent beneath, at least on the veins.

22 Leaves thin in texture, mostly ovate, distinctly longer than wide, typically bluntly acuminate at the tip; lower leaf-surface thinly stellate-pubescent, the veins not particularly prominent..... ***V. dentatum*** *var.* ***dentatum***

22 Leaves subcoriaceous in texture, mostly suborbicular, about as wide as long, the tip often broadly rounded; lower leaf surface thickly stellate-pubescent, the veins strongly raised.

23 Upper leaf surface vestiture primarily of appressed, simple hairs; [of the Mountains, Piedmont, and (?) Coastal Plain] .... ***V. dentatum*** *var.* ***semitomentosum***

23 Upper leaf surface vestiture primarily of erect, stellate hairs; [primarily of the Coastal Plain].

24 Hypanthium and corolla densely setose or hirsute; upper leaf surface often very scabrous; [of e. SC southward] .... ***V. dentatum*** *var.* ***scabrellum***

24 Hypanthium and corolla glabrous or glandular-pubescent; upper leaf surface slightly scabrous; [of e. VA northward]..... ..... ***V. dentatum*** *var.* ***venosum***

Viburnum acerifolium Linnaeus, Mapleleaf Viburnum, Dockmackie. Mt, Pd, Cp (GA, NC, SC, VA): mesic to dry forests and woodlands; common (rare in Coastal Plain south of VA). Late April-early June; August-October. New Brunswick, Ontario, and WI south to panhandle FL and TX. [= RAB, C, G, K, S, W, 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 (GA Endangered). Late April-early May. Se. TN south to nw. GA and ne. AL. [= K, S, Y, Z]

Viburnum cassinoides Linnaeus, Northern Wild Raisin, Withe-rod, Shonny Haw. Mt (GA, NC, SC, VA), Pd (NC, SC): bogs, moist forests, high elevation forests and outcrops; common. Late May-June; August-October. Newfoundland, Ontario, and WI south to n. GA and AL. [= RAB, F, G, S, W, 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 (NC, SC, VA), Pd, Mt (NC, SC, VA): marshes, streambanks, other moist places; common. Late March-April; July-September. [= C, F, G, K; < *V. dentatum* var. *dentatum* – RAB (also see *V. carolinianum*); < *V. dentatum* – GW, W, Y; < *V. semitomentosum* (Michaux) Rehder – S; = *V. dentatum* – Z]

Viburnum dentatum Linnaeus *var.* ***scabrellum*** Torrey & A. Gray. Cp (GA, SC): streambanks, marshes, other moist sites; common. E. SC (Horry County) south to FL, west to TX. [< *V. dentatum* var. *dentatum* – RAB; < *V. dentatum* var. *venosum* (Britton) Gleason – G, K; < *V. dentatum* – GW, W, Y; < *V. semitomentosum* (Michaux) Rehder – S, misapplied; > *V. scabrellum* var. *scabrellum* – Z; > *V. scabrellum* var. *ashei* Bush – Z]

Viburnum dentatum Linnaeus *var.* ***semitomentosum*** Michaux, 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. The epithet used here is conjectural and may need correction. [<? *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 dentatum Linnaeus *var.* ***venosum*** (Britton) Gleason. Cp (VA): moist places; rare? E. MA south to e. MD and e. VA. [= G, K; < *V. dentatum* – GW, W, Y; < *V. semitomentosum* (Michaux) Rehder – S; = *V. scabrellum* Torrey & A. Gray var. *venosum* (Britton) McAtee – Z]

* ***Viburnum dilatatum*** Thunberg, Linden Viburnum. Pd (VA): suburban woodlands; rare, native of e. Asia. [= C, K]

Viburnum lantanoides Michaux, Hobblebush, Witch's-hobble, Tangle-legs. Mt (GA, NC, VA): spruce-fir forests, northern hardwood forests, boulderfields; common. April-early June; June-July. New Brunswick and Ontario south to w.NC, ne. GA, e. TN, and OH. [= K, S, W, Y; = *V. alnifolium* Marshall – RAB, C, F, G; = *V. grandifolium* Aiton – Z]

Viburnum lentago Linnaeus, Nannyberry, Sheepberry. Mt (VA), {GA}: shrubby stream-bottoms, other wetlands and wetland margins; rare. New Brunswick and Saskatchewan south to w. VA, MO, and CO. Reported in the past for NC (see Radford, Ahles, & Bell 1968), but there is no known documentation. Also reported for GA. [= RAB, C, F, G, K, S, W, Y, Z]

Viburnum nudum Linnaeus, Southern Wild Raisin, Possumhaw. Cp, Pd, 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, Y, Z; = *V. nudum* var. *nudum* – C, K; > *V. nudum* var. *nudum* – F; > *V. nudum* var. *angustifolium* Torrey & A. Gray – F; < *V. nudum* – GW (also see *V. cassinoides*)]

Viburnum obovatum Walter, Small-leaf Viburnum, Walter's Viburnum. Cp (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*. ***opulus***, Guelder-rose, Snowball. Mt (VA): {habitat}; rare, native of Europe. Well-established in KY (Weckman et al. 2002). [= C, G, K, Z; > *V. opulus* var. *opulus* – F; > *V. opulus* var. *roseum* Linnaeus – F]

* ***Viburnum plicatum*** Thunberg, Japanese Snowball, Doublefile Viburnum. Pd (NC): suburban woodlands; rare, 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, Mt, Cp (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, Y, Z; > *V. prunifolium* var. *prunifolium* – F, G]

Viburnum rafinesquianum J.A. Schultes, Downy Arrow-wood. Pd (GA, NC, VA), Mt (VA): dry-mesic to dry woodlands and forests, especially common over mafic rocks (but not at all restricted to such sites). Mid April-May; June-July. NH, Québec and Manitoba south to n. GA, AL, AR, and OK; apparently not yet recorded for SC. [= RAB, K, S, W; > *V. rafinesquianum* var. *rafinesquianum* – C, F, G, Y; =*? V. affine* Bush ex Schneider var. *hypomalacum* Blake – Z]

Viburnum recognitum Fernald, Smooth Arrow-wood. Cp (NC, SC, VA), Pd, Mt (GA, NC, SC, VA): marshes, moist forests, streambanks; common. Late March-May; July-September. ME, NY, and OH south to e. SC, c. GA, and ne. AL. [= F, K; = *V. dentatum* Linnaeus var. *lucidum* A iton – RAB, C, G; < *V. dentatum* – GW, W; = *V. dentatum* – S, misapplied; > *V. recognitum* var. *recognitum* – Z; > *V. recognitum* var. *alabamense* McAtee – 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, Cp, 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. Late March-April; September-October. C. VA, OH, IL, and KS south to n. peninsular FL and TX. [= RAB, C, F, G, K, W, Y, Z; > *V. rufidulum* – S; > *V. rufotomentosum* Small]

* ***Viburnum setigerum*** Hance, Tea Viburnum. Pd (NC): suburban forests; rare, planted horticulturally, rarely escaping, native of China. Naturalizing at Guilford Courthouse National Military Park (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 Viburnum. (VA). Also naturalizing in KY (Weckman et al. 2002). [= C, F, K; = *V. sieboldi* – Z, orthographic variant]

* *Viburnum lantana* Linnaeus, Wayfaring Tree, native of Eurasia, is widely planted and sometimes escaped or persistent, reportedly as far south as MD (Kartesz 1999) and KY (Weckman et al. 2002). May; September. [= C, F, G, K, Z]

* *Viburnum macrocephalum* Fortune, Chinese Snowball. Reported as naturalized in the Mountains of NC (Pittillo 2003, pers. comm.). {investigate}

Viburnum molle Michaux. PA and IA, south to KY, TN, AL, MS, and OK. In c. TN (Chester, Wofford, & Kral 1997). [= C, F, G, K, Y, Z]

Viburnum opulus Linnaeus var. *americanum* Aiton, Cranberry-tree, Highbush-cranberry. Newfoundland and British Columbia south to s. PA (Rhoads & Klein 1993), NJ, n. WV, OH, NE, and WY. [= C, G, K; = *V. trilobum* Marshall – F; = *V. opulus* var. *trilobum* (Marshall) McAtee – Z]

AIZOACEAE Rudolphi 1830 (Fig-marigold Family)

[also see *MOLLUGINACEAE*]

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).

1 Leaves linear, lanceolate, or oblanceolate, the blade much longer than wide; [subfamily *Sesuvioideae*] ..... ***Sesuvium***
1 Leaves orbicular, obovate, or triangular-ovate, the blade about as wide as long.
  2 Leaves alternate; fruit an indehiscent nut; [subfamily *Tetragonioideae*] ..... ***Tetragonia***
  2 Leaves opposite to subopposite; fruit a circumcissile capsule; [subfamily *Sesuvioideae*] ..... ***Trianthema***

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. It is native to Africa. [= FNA, K, S, Z]

Sesuvium maritimum (Walter) Britton, Sterns, & Poggenburg, Small Sea-purslane, Slender Sea-purslane. Cp (GA, NC, SC, VA): island end flats and sea beaches, salt flats; uncommon (NC Watch List, VA Watch List). May-December. NY south to s. FL, west to TX; also in the West Indies. [= RAB, C, F, FNA, G, GW, K, S, Z]

Sesuvium portulacastrum (Linnaeus) Linnaeus, Large Sea-purslane, Shoreline Sea-purslane. Cp (GA, NC, SC): island end flats and sea beaches; uncommon (NC Watch List). 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, Z]

Tetragonia Linnaeus 1753 (New Zealand Spinach)

A genus of about 60-85 species, mostly tropical and warm temperate. References: Boetsch (2002)=Y; Vivrette in FNA (2003b); Taylor (1994)=Z; Hartmann in Kubitzki, Rohwer, & Bittrich (1993).

* ***Tetragonia tetragonioides*** (Pallas) Kuntze, New Zealand Spinach. Pd (NC): persistent after cultivation; rare, introduced from e. Asia. July-November. *Tetragonia* is sometimes segregated into the Tetragoniaceae. ***T. tetragonioides*** is a member of subgenus *Tetragonioides* (Taylor 1994). [= C, F, FNA, G, K, Y, Z; = ***T. expansa*** Murray – RAB]

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, introduced from the Gulf Coast and the tropics. April-November. [= RAB, C, F, FNA, G, GW, K, S, Z]

ALTINGIACEAE Lindley 1846 (Sweet-gum Family)

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. Cp, Pd, Mt (GA, NC, SC, VA): swamp forests, floodplains, moist forests, depressional wetlands, old fields, disturbed areas; common (absent from much of the Mountains). April-May; August-September. CT west to s. OH, s. IL and OK, south to 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]

AMARANTHACEAE A.L. de Jussieu 1789 (Amaranth Family)

A family of about 65-71 genera and 750-1000 species, mostly herbs, but including shrubs and trees, of tropical and warm temperate (rarely cold temperate) regions. References: Robertson & Clemants in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993).

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.*

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 (SC): waste areas around wool-combing mills; rare, native of Asia, perhaps merely a waif. [= FNA, K; = *Centrostachys indica* (Linnaeus) Standley – S]

* *Achyranthes aspera* Linnaeus var. *pubescens* (Moquin-Tandon) C.C. Townsend, Devil's-horsewhip. Reported for MD and FL FNA, K). Native of West Indies and perhaps s. FL. [= FNA, K; = *Centrostachys aspera* (Linnaeus) Standley – S]
* *Achyranthes japonica* (Miq.) Nakai var. *hachijoensis* Honda, Japanese Chaff-flower. 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]

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; [of aquatic to wet sites] ....***A. philoxeroides***
1 Inflorescences sessile, in the leaf axils; [of dry to moist sites].
2 Tepals dimorphic; tepal hairs barbed.
3 Leaf blades longer than broad; tepals 3-5 mm long, densely villous.....***A. caracasana***
3 Leaf blades as broad as long; tepals 5-7 mm long, sparsely villous ..... ***[A. pungens]***
2 Tepals monomorphic; tepal hairs not barbed.
4 Mature fruit included within the tepals; spikes globular; stems sericeous.....***A. paronychioides***
4 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 (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; = *Achyranthes repens* Linnaeus – S, misapplied]
* ***Alternanthera paronychioides*** St.-Hilaire. Cp (GA, NC, SC): disturbed areas; rare, native of tropical America. July-October. [= FNA; > *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 (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. [= RAB, C, FNA, K; = *Achyranthes philoxeroides* (Martius) Standley – S]
* ***Alternanthera sessilis*** (Linnaeus) R. Brown ex Augustin de Candolle, Sessile Joyweed. Cp (GA, SC): disturbed wet muck; rare, introduced from 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]

* *Alternanthera pungens* Kunth. Known from scattered locations in AL, FL, LA, NY, and TX (Clemants in FNA 2003b); native of tropical America. [= FNA, K; = *Achyranthes leiantha* (Seubert) Standley – S]

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 lacking, or rudimentary (often only 1-2 present, these <1 (2) mm long and lacking a visible midvein); subgenus *Acnida*, section *Acnida*].
    3 Seed 2-3 mm long; utricle 2.5-4 mm long.....***A. cannabinus***
    3 Seed 0.7-1.2 mm long; utricle 1-2.5 mm long.
      4 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***
      4 Utricle smooth or irregularly tuberculate; bract < 1.5 mm long, with a slender excurrent midrib.....***A. tuberculatus***
  2 Tepals present and well-developed (usually 5 present, at least the outer tepals >2 mm long and with a visible midvein).
    5 Tepals 1 or 2, lanceolate to linear; [subgenus *Acnida*, section *Acnida*].....***A. tuberculatus***
    5 Tepals 5, at least the inner spatulate; [subgenus *Acnida*, section *Saueranthus*].
      6 Outermost tepal obtuse or notched (similar to the others), the midvein excurrent slightly or not at all .....***A. arenicola***
      6 Outermost tepal acute or acuminate (dissimilar to the inner obtuse tepals), the midvein excurrent into a rigid point.....***A. palmeri***
1 Plants staminate (some identifications following this lead may not be reliable).
  7 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*).
    8 Bracts < 1 mm long; midribs scarcely excurrent.....***A. cannabinus***
    8 Bracts > 1mm long; midribs often conspicuously excurrent.
      9 Bracts with moderately prominent midribs; midribs of outer tepals excurrent.....***A. australis***
      9 Bracts with slender midribs; midribs of outer sepals not excurrent.....***A. tuberculatus***
  7 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.
    10 Outer tepals with apex acute or obtuse; dark midribs not excurrent.....***A. arenicola***
    10 Outer tepals with apex acuminate; midribs excurrent as rigid spines.
      11 Bracts ca. 4 mm long, equaling or exceeding the outer tepals.....***A. palmeri***
      11 Bracts ca. 2 mm long, shorter than the outer tepals.....***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, Pd, Mt (VA), ?? (GA, NC, SC): disturbed areas, agricultural fields; common. July-October. [= C, FNA, G, K, W, Y; < *A. graecizans* Linnaeus – RAB, misapplied; > *A. albus* var. *albus* – F]

* ***Amaranthus arenicola*** I.M. Johnston, Sandhill Amaranth. Cp, Pd (VA): rare, introduced from western North America. [= C, FNA, G, K, X; = *A. torreyi* A. Gray – F]

*? ***Amaranthus australis*** (A. Gray) J.D. Sauer, Southern Water-hemp. Cp (GA, NC, VA): tidal marshes, ditches; uncommon. VA, 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 sometimes get as large as 9 m tall and 30 cm diameter at the base of the stem! [= FNA, GW, K, X; > *Acnida cuspidata* Bertero ex Sprengel – S; > *Acnida alabamensis* Standley – S]

Amaranthus blitoides S. Watson, Matweed Amaranth, Prostrate Pigweed. (GA, SC, VA): [= C, FNA, K, S, Y; < *A. graecizans* Linnaeus – RAB, F, misapplied]

* ***Amaranthus blitum*** Linnaeus, Purple Amaranth, Livid Amaranth. Pd (SC) ?? (GA, NC, VA): disturbed habitats; uncommon, native of the tropics. First reported from South Carolina by Hill & Horn (1997). [= C, FNA, K; = *A. lividus* – RAB, F, misapplied; > *A. blitum* – G; > *A. lividus* – G; > *A. blitum* Linnaeus ssp. *emarginatus* (Moquin-Tandon ex Uline & Bray) Carretero – Y; > *A. blitum* ssp. *polygonoides* (Moquin-Tandon) Carretero]

Amaranthus cannabinus (Linnaeus) J.D. Sauer, Salt-marsh Water-hemp. Cp (GA, NC, SC, VA): salt, brackish, and freshwater tidal marshes, especially along the banks of tidal guts; common. July-December. 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, X; = *Acnida cannabina* Linnaeus – F, G, S]

*? ***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; < *A. crassipes* – RAB, C, FNA, G, GW, K, S]

* ***Amaranthus crispus*** (Lespinasse & Thévenau) A. Braun, Crisp-leaved Amaranth. Cp (NC, VA): disturbed areas, especially around seaports; rare, native of South America. [= FNA, C, F, G, K, S]

* ***Amaranthus cruentus*** Linnaeus, Red Amaranth, Blood Amaranth, Purple Amaranth. (NC, SC): native of Central America. [= RAB, C, F, FNA, K, S, Y]

* ***Amaranthus deflexus*** Linnaeus, Large-fruit Amaranth, Argentine Amaranth. (GA, VA): native of South America. Reported for VA by Kartesz (1999) and FNA. [= FNA, C, F, G, K]

* ***Amaranthus hybridus*** Linnaeus, Smooth Amaranth, Green Amaranth, Hybrid Amaranth, Smooth Pigweed. Cp, Pd, Mt (GA, NC, SC, VA): July-October. [= RAB, C, F, FNA, G, K, S, W; = *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. (GA, NC, SC, VA): [= RAB, C, F, FNA, G, K, X]
* ***Amaranthus polygonoides*** Linnaeus, Tropical Amaranth, Smartweed Amaranth. Cp (SC): disturbed areas; rare, introduced from tropical America. Reported for SC (FNA, K). [= FNA, K, S]
* ***Amaranthus powellii*** S. Watson, Green Amaranth, Powell's Amaranth. (GA, NC, SC, VA): 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 (NC, SC, VA): sea beaches, fore-dunes, island end flats, rarely on sound-side beaches; rare (US Threatened, NC Threatened, SC, Rare, VA 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, Pd, Cp (GA, NC, SC, VA): July-October. [= RAB, C, F, FNA, G, K, S, W, Y; = *A. retroflexus* var. *retroflexus*]
* ***Amaranthus spinosus*** Linnaeus, Spiny Amaranth. Cp, Pd, Mt (GA, NC, SC, VA): introduced from tropical America. July-October. [= RAB, C, F, FNA, G, K, S, W, Y]
* ***Amaranthus tuberculatus*** (Moquin-Tandon) J.D. Sauer, Inland Water-hemp. (GA, NC, SC). 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, misapplied; > *Amaranthus tuberculatus* – K, X; > *Amaranthus rudis* J.D. Sauer – K; > *Amaranthus tamariscinus* Nuttall – X, misapplied]
* ***Amaranthus viridis*** Linnaeus, Slender Amaranth, Tropical Green Amaranth. (GA, NC, SC, VA): native of South America. [= RAB, C, F, FNA, G, K, Y; = *Amaranthus gracilis* Desfontaines – S]

* *Amaranthus caudatus* Linnaeus, Love-lies-bleeding, is 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 thunbergii* Moquin-Tandon, Thunberg's Amaranth. Native of Africa. Collected from near wool-combing mills in SC; probably not naturalized. [= FNA, K]

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 Inflorescence of crowded spikes ..... ***C. argentea***
1 Inflorescence crested, fanlike, or elaborately lobed ..... ***C. cristata***

* ***Celosia argentea*** Linnaeus. Cp, Pd, Mt (NC): commonly cultivated, rarely escaped or persistent in disturbed areas, such as along creeks; rare, introduced from the Tropics. July-November. [= RAB, C, FNA, G, K, Z; = *C. argentea* var. *argentea* – F]
* ***Celosia cristata*** Linnaeus, Cockscomb. Pd (NC): commonly cultivated, rarely escaped or persistent in disturbed areas; rare, introduced from 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 (1997) calls it "probably the world's ugliest plant." [= C, FNA, G, K, Z; = *C. argentea* Linnaeus var. *cristata* (Linnaeus) Kuntze – F]

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 flask-shaped in fruit, ca. 5 mm long; plant 10-20 dm tall, not branching from the base ..... ***F. floridana***
1 Calyx conical in fruit, ca. 3-4 mm long; plant 2-7 dm tall, branching from the base ..... ***F. gracilis***

Froelichia floridana (Nuttall) Moquin-Tandon, Florida Cottonseed, Common Cottonweed. Cp (GA, NC, SC): sandhills, sandy fields, sandy roadsides; common (rare in NC). 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]
* ***Froelichia gracilis*** (Hooker) Moquin-Tandon, Slender Cottonweed. Cp, Pd (GA, NC, SC, VA), Mt (NC, VA): vacant lots, sandy fields, railroad banks; rare, introduced from mw. United States. June-October. [= RAB, C, F, FNA, G, K, W, 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, introduced from 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 (GA), (VA?): sandy woodlands and disturbed areas; rare. Also reported for VA by Kartesz (1999) {investigate}. [= FNA, K; > *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, introduced from 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..... ***. 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 rhizomatosa Standley. Cp (GA, NC, SC, VA), Pd (VA): moist interdune thickets, edges of maritime forests, moist thickets inland; rare (VA Watch List). 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]

Iresine diffusa Humboldt & Bonpland ex Willdenow was reported for NC by Small (1933), so far as is known in error. It is known from n. FL, not far from GA. [= FNA, K; < *Iresine celosia* Linnaeus – S]

ANACARDIACEAE Lindley 1830 (Cashew Family)

A family of about 70 genera and about 875 species, trees, shrubs, lianas, and rarely herbs, of tropical, subtropical, and temperate regions. References: Barkley (1937).

1 Leaves simple ..... ***Cotinus***
1 Leaves compound.
  2 Fruits red, glandular pubescent; foliage and stems lacking contact poisons; inflorescences dense, either terminal or lateral on last year's growth..... ***Rhus***
  2 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 (Smoketree)

A genus of 3-5 species, of southeastern United States and temperate Eurasia.

1 Leaves elliptic, to 10 cm long; [planted tree]..... ***[C. coggygria]***
1 Leaves obovate, to 20 cm long; [native tree of calcareous habitats] ..... ***C. obovatus***

Cotinus obovatus Rafinesque, American Smoketree. Mt (GA): limestone woodlands and glades; rare (GA Special Concern). Se. TN (Cumberland Plateau) (Chester, Wofford, & Kral 1997), nw. GA, and n. AL west to OK and TX. It is a small tree of limestone woodlands and glade margins. It is occasionally planted as an ornamental tree. [= K; = *C. americanus* Nuttall – S]

* *Cotinus coggygria* Scopoli, European Smoketree, is planted as an ornamental. It is reported as naturalized in various states in ne. United States. There is no evidence of its naturalization or persistence in our area. [= K]

Rhus Linnaeus (Sumac)

A genus of about 25 species, trees, shrubs, and lianas, temperate and subtropical, of Eurasia, Hawaii, North America, and n. Central America. References: Hardin & Phillips (1985a); Miller, Young, & Wen (2001).

1 Leaves 3-foliolate; shrub to 2 m tall; inflorescence of small lateral and terminal clusters; [subgenus *Lobadium*] ..... ***Rh. 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 11-23, attenuate to base, 4-9 cm long, 1-2 cm wide, typically with an obtuse tip ..... ***Rh. copallinum* var. *copallinum***
    3 Leaflets 5-13, rounded to base on the upper side, 4-9 cm long, 1.5-4 cm wide, typically with an acute to acuminate tip ..... ***Rh. 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 ..... ***Rh. 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 ..... ***Rh. glabra***
      5 Stems densely long-pubescent; pubescence of the fruit long and pointed ..... ***Rh. typhina***

Rhus aromatica Aiton var. ***aromatica***, Fragrant Sumac, Squawbush. Pd, Mt (GA, NC, SC, VA), Cp (GA): rocky, rather dry, woodlands, usually over mafic rocks (such as gabbro or diabase) or calcareous rocks, less commonly in sandy soils; uncommon. 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, widespread in e. North America west to TX, KS, and MI. The foliage of *Rh. aromatica* bears some superficial resemblance to *Toxicodendron pubescens*. [= C, F, G, K; < *Rh. aromatica* – RAB, W; = *Schmaltzia crenata* (P. Miller) Greene – S]

Rhus copallinum Linnaeus var. ***copallinum***, Winged Sumac, Flameleaf Sumac. Cp, Pd, Mt? (GA, NC, SC, VA): sandhills, dry woodlands, old fields, roadsides; common. The relative ranges, habitats, and characteristics of the varieties of *R. copallinum* need further elucidation. [= K; < *Rh. copallina* – RAB, W; < *Rh. copallinum* – C, G, S; = *Rh. copallina* var. *copallina* – F]

Rhus copallinum Linnaeus var. ***latifolia*** Engler, Eastern Winged Sumac. Mt (GA, NC, SC?, VA), Pd (GA?, NC?, SC?, VA): rocky glades, dry woodlands; uncommon. See comments under var. *copallinum*. [= K; < *Rh. copallina* – RAB, W; < *Rh. copallinum* – C, G, S; = *Rh. copallina* var. *latifolia* – F]

Rhus copallinum Linnaeus *var.* ***leucantha*** (Jacquin) Augustin de Candolle, Southern Winged Sumac. Cp (GA, NC, SC, VA?): [= K; < *Rh. copallina* – RAB; > *Rh. leucantha* Jacquin – S; > *Rh. obtusifolia* (Small) Small – S] {not keyed at this time}

Rhus glabra Linnaeus, Smooth Sumac. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas, clearings, roadsides, woodlands; common (rare in Coastal Plain). Late May-July; June-October. Widespread in e. North America. [= RAB, C, G, K, S, W; > *Rh. glabra* var. *glabra* – F]

Rhus michauxii Sargent, Michaux's Sumac, Dwarf Sumac. Cp (NC, SC), Pd (GA, NC, VA): 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; rare (US Endangered, GA Endangered, NC Endangered, SC Rare, VA Rare). June; August-September. Rare and scattered (though formerly more common) from s. VA south to GA. 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; = *Rh. pumila* Michaux]

Rhus typhina Linnaeus, Staghorn Sumac. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): roadsides, old pastures, thickets, clearings, rock outcrops, barrens; common (uncommon in upper Piedmont only) (GA Special Concern). May-June; June-September. Widespread in ne. North America, south in the mountains to n. GA. 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; = *Rh. hirta* (Linnaeus) Sudworth – S]

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*.

Toxicodendron P. Miller (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.

1 Leaflets 7-13, entire; small tree.....***T. vernix***
1 Leaflets 3, toothed, lobed, or entire; shrub or vine.
  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.
    3 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***
    3 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***
  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*).
    4 Leaves sparsely pubescent (rarely pilose beneath), the apex and the lobes (if present) generally acute to acuminate; drupes; plant a high-climbing vine or stoloniferous shrub; [of mesic, swampy, or dry habitats] ....***T. radicans*** *var*. ***radicans***
    4 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***

Toxicodendron pubescens P. Miller, Poison Oak. Cp, Pd, Mt (GA, NC, SC, VA): dry woodlands, around dry rock outcrops in the Piedmont and Mountains, especially prevalent in sandhills; common (uncommon in Piedmont and Mountains). 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; = *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. Mt, Pd (VA): in a wide range of habitats, including mesic forests, rock outcrops, open areas, and disturbed ground; uncommon? 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) Augustin de Candolle forma *negundo* (Greene) Fernald – F, G; = *T. radicans* ssp. *negundo* (Greene) Gillis – K, Z]

Toxicodendron radicans (Linnaeus) Kuntze *var.* ***radicans***, Eastern Poison Ivy. Pd, Cp, Mt (GA, NC, SC, VA): 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; common. 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 Nova Scotia 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; > *Rhus radicans* var. *vulgaris* (Michaux) Augustin de Candolle forma *vulgaris* – F, G; < *T. radicans* – GW, S, W; = *T. radicans* ssp. *radicans* – K]

Toxicodendron rydbergii (Small ex Rydberg) Greene, Western Poison Ivy. Mt (VA): acid pine-oak forests and woodlands at moderate elevations; rare (VA Rare). Nova Scotia west to British Columbia, 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; = *T. radicans* (Linnaeus) Kuntze var. *rydbergii* (Small ex Rydberg) Erskine]

Toxicodendron vernix (Linnaeus) Kuntze, Poison Sumac, Thunderwood. Cp, Mt, Pd (GA, NC, SC, VA): in peaty habitats, in the Coastal Plain frequent in streamhead pocosins and sandhill seepage bogs, in the mountains in bogs; uncommon (rare in Mountains and Piedmont). May-early June; August-September. Widespread in e. North America. 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; = *Rhus vernix* Linnaeus – RAB, F, G]

Toxicodendron radicans (Linnaeus) Kuntze var. *pubens* (Engelmann ex S. Watson) Reveal is associated with xerix limestone sites in the Mountains of VA (Virginia Botanical Associates 2006). [< ***T. radicans*** – GW, W; = ***T. radicans*** ssp. *pubens* (Engelmann ex S. Watson) Gillis – K, Z] {not keyed at this time}

ANNONACEAE A.L. de Jussieu 1789 (Custard-apple Family)

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

Asimina Adanson 1763 (Pawpaw)

A genus of 8 species of shrubs and small trees, endemic to e. North America. References: Kral (1960)=Z; Wilbur (1970a)=Y; Godfrey (1988)=X; Ward (2001); Kessler in Kubitzki, Rohwer, & Bittrich (1993).

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]; [section *Asimina*, subsection *Asimina*].
  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]; [section *Asimina*, subsection *Pityothamna*].
  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 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***
    5 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.
      6 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***
      6 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. Cp (GA): dry pinelands; common. 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, Y; < *Pityothamnus angustifolius* (Rafinesque) Small – S]

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

Asimina parviflora (Michaux) Dunal, Small-flowered Pawpaw, Small-fruited Pawpaw. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, SC): sandy or rocky, dry to fairly moist forests; common. 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, X, Y, Z]

Asimina pygmaea (W. Bartram) Dunal, Dwarf Pawpaw. Cp (GA): pine flatwoods, wet savannas; rare (GA Special Concern). 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, Y, orthographic variant; = *Pityothamnus pygmeus* (W. Bartram) Small – S]

Asimina reticulata Chapman, Netleaf Pawpaw. Cp (GA): wet flatwoods, savannas; rare (GA Special Concern). Reported for GA by GAHP (2003) and Kartesz (1999). [= FNA, K, X, Y, Z; = *Pityothamnus reticulatus* (Shuttleworth ex Chapman) Small – S; = *A. cuneata* Shuttleworth ex A. Gray] {not keyed at this time; synonymy incomplete}

Asimina spatulata (Kral) D.B. Ward, Slimleaf Pawpaw. Cp (GA, SC): dry pinelands, dry maritime forest; rare. E. GA (very near se. SC), southward to n. FL, west to Panhandle FL and s. AL; disjunct in Charleston County, SC (P. McMillan, pers.comm. 2004). [= *Asimina longifolia* Kral var. *spatulata* Kral – FNA, X, Z; < *Pityothamnus angustifolius* (Rafinesque) Small – S; < *A. angustifolia* Rafinesque – K, Y]

Asimina triloba (Linnaeus) Dunal, Common Pawpaw, Indian-banana. Mt, Pd, Cp (GA, NC, SC, VA): alluvial forests, other moist, nutrient-rich forests; common. March-May; August-October. NJ, w. NY, and s. Ontario west to s. MI and e. NE, south to panhandle FL, s. LA, and ne. TX. [= RAB, C, F, FNA, G, K, S, W, X, Y, Z]

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.

APIACEAE Lindley 1836 or ***UMBELLIFERAE*** A.L. de Jussieu 1789 (Carrot Family)
(also see *ARALIACEAE*)

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.

[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 (Goutweed)

A genus of 7 species of herbs of temperate Eurasia. References: Mathias & Constance (1945)=MC.

* ***Aegopodium podograria*** Linnaeus, Goutweed. Mt, Pd (GA, NC, VA), Cp (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; > *Ae. podograria* var. *podograria* – RAB, G; > *Ae. podograria* var. *variegatum* Bailey – RAB, G]

Aethusa Linnaeus

References: Mathias & Constance (1945)=MC.

* *Aethusa cynapium* Linnaeus, Fool's-parsley, is introduced and naturalized in ne. United States, at least as far south as se. PA (Rhoads & Klein 1993) and Pocahontas County, WV. [= C, F, G, K, MC]

Ammi Linnaeus (Bishop's-weed)

A genus of about 4 species of herbs, distributed in Eurasia. References: Mathias & Constance (1945)=MC.

1 Lower leaves with elliptic to narrowly elliptic segments; fruits 1.5-2 mm long; rays 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 rigid and thickened at maturity; bracts strongly reflexed in fruit ..... ***A. visnaga***

* ***Ammi majus*** Linnaeus, Bullwort. Cp (GA, SC): disturbed areas; rare, native of Mediterranean Europe. June. [= RAB, K, MC, S]

* ***Ammi visnaga*** (Linnaeus) Lamarck, Toothpick-plant. Cp (NC): dry sandy roadsides; rare, native of Mediterranean Europe. May-June. [= RAB, K, MC, S]

Ammoselinum Torrey & A. Gray (Sand-parsley)

A genus of 3 species of 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. Pd (NC): disturbed places; rare, native further south and west. March-April. Boufford (1977) reports the naturalization of this diminutive midwestern umbel on a grassy, weed-covered slope. [= GW, K, MC]

Ammoselinum popei Torrey & A. Gray, Sand-parsley, ranges from 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 (Dill)

A monotypic genus, the single species apparently native to sw. Asia. References: Mathias & Constance (1945)=MC.

* ***Anethum graveolens*** Linnaeus, Dill, Dillweed. Mt, Pd (NC, VA): roadsides, disturbed areas, abandoned garden plots; rare, native of Mediterranean Europe. June-July. [= RAB, C, F, G, K, MC, S]

Angelica Linnaeus (Angelica)

A genus of about 110 species, herbs of the northern hemisphere. References: Mathias & Constance (1945)=MC.

1 Umbels densely pubescent; ovary and fruit pubescent; larger leaflets 3-6 cm long, 1-2.5 cm wide, obtuse at the apex; [widespread in our area, in dry to mesic habitats].....***A. venenosa***
1 Umbels glabrous or sparsely pubescent; ovary and fruit glabrous or sparsely pubescent; larger leaflets 8-15 cm long, 4-8 cm wide, acute to acuminate at the apex; [restricted to the Mountains in our area, in mesic habitats].
  2 Leaflets acute, the margin hyaline and mostly glabrous; [rare and possibly only introduced in our area] ....***A. atropurpurea***
  2 Leaflets acuminate, the margin ciliolate; [native] ..... ***A. triquinata***

*? ***Angelica atropurpurea*** Linnaeus, Purple Angelica. Mt (NC): moist roadsides and streambanks; rare, possibly introduced from nc. North America. May-June; July-August. [= RAB, C, G, K, MC, W; > *A. atropurpurea* var. *atropurpurea* – F]

Angelica triquinata Michaux, Mountain Angelica, Filmy Angelica. Mt (GA, NC, VA): mesic forests at moderate to high elevations, grassy balds, brookbanks; common. 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, Pd, Cp (GA, NC, SC, VA): dry forests and woodlands, woodland borders, longleaf pine sandhills; common. 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]

Angelica dentata (Chapman) Coulter & Rose, Sandhill Angelica. Cp (GA): sandhills; rare (GA Special Concern). Sw. GA, sc. GA, and Panhandle FL. [= K, MC, S] {not keyed at this time}

Angelica lucida Linnaeus. 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}

Anthriscus Persoon (Chervil)

A genus of about 10 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; plant an annual; umbel rays pubescent; [section *Anthriscus*] .....***A. cerefolium***
  2 Beak of fruit ca. 1 mm long; plant a perennial; umbel rays glabrous (or nearly so); [section *Cacosciadium*] .....

.....***A. sylvestris** ssp. **sylvestris***

* ***Anthriscus caucalis*** Bieberstein, Bur Chervil, Bur-parsley. Mt (NC), Pd (NC, SC, VA), Cp (NC, SC): disturbed areas; rare, introduced from Europe. April-May; May-June. First reported for South Carolina by Hill & Horn (1997). [= C, K, Z; = *A. scandicina* (Weber ex Wiggers) Mansfeld – RAB, F, G, MC]
* ***Anthriscus cerefolium*** (Linnaeus) Hoffmann, Garden Chervil. Pd (VA): cultivated in gardens, sometimes persistent or escaped; rare, introduced from Europe. May-July. [= C, F, G, K, MC, Z]
* ***Anthriscus sylvestris*** (Linnaeus) Hoffmann ***ssp. sylvestris***, Wild Chervil, Cow-parsley. Mt (VA): moist disturbed areas; rare, introduced from Europe. 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. [= Z; < *A. sylvestris* – C, F, G, K, MC]

Apium Linnaeus (Celery)

A genus of about 25 species, herbs, of temperate and subtropical regions. References: 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.....***A. nodiflorum***

* ***Apium graveolens*** Linnaeus ***var. dulce*** (P. Miller) Augustin de Candolle, Celery. Cp (NC, SC): disturbed areas, escaped or persisting from cultivation; rare, native of Europe. June-July; July-August. [= K; < *A. graveolens* Linnaeus – RAB, C, F, G, MC; < *Celeri graveolens* (Linnaeus) Britton – S]
* ***Apium nodiflorum*** (Linnaeus) Lagasca y Segura, Fool's Watercress. Cp (SC): disturbed areas near old seaports; rare, introduced from Europe. [= RAB, K, MC; = *Ciclospermum nodiflorum* (Linnaeus) W.D.J. Koch – S]

Bupleurum Linnaeus (Hare's-ear, Thoroughwax)

A genus of about 190 species, herbs and shrubs, primarily Eurasian. References: Mathias & Constance (1945)=MC.

1 Upper leaves linear, sessile.....***B. gerardii***
1 Upper leaves ovate, perfoliate.....***B. rotundifolium***

* ***Bupleurum gerardii*** Allioni. Mt (VA): disturbed areas over limestone; rare, native of Eurasia. Also reported for c. TN (Cox, 2005, pers. comm..). [= *B. odontites* Linnaeus – K, apparently misapplied; = *B. fontanesii* Guss. ex Careul – C, G, MC, apparently misapplied]
* ***Bupleurum rotundifolium*** Linnaeus, Hare's-ear, Thoroughwax. Mt (VA), Pd (NC, VA): lawns, disturbed areas; rare, native of Eurasia. June. [= RAB, C, F, G, K, MC, S, W]

* *Bupleurum lancifolium* Hornemann is reported as a waif for MD by Shetler & Orli (2000) and Reed (1964). [= K] {not keyed at this time}
* *Bupleurum odontites* Linnaeus is reported as a waif for MD by Shetler & Orli (2000) and Reed (1964). [= K; > *B. fontanesii* Guss. ex Careul – C, G, MC] {not keyed at this time}

Carum Linnaeus (Caraway)

A genus of about 30 species, temperate. References: Mathias & Constance (1945)=MC.

* ***Carum carvi*** Linnaeus, Caraway. Mt (NC, VA): disturbed areas; rare, native of Eurasia. May-June. [= RAB, C, F, G, K, MC]

Centella Linnaeus (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 (GA, NC, SC, VA): savannas, pondshores, ditches, and a wide variety of other moist to wet habitats; common. June-August; July-September. DE south to FL, west to 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 (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.
  2 Fruit pubescent.....***Ch. tainturieri** var. **dasycarpum***
  2 Fruit glabrous.....***Ch. tainturieri** var. **tainturieri***
1 Ribs of fruit narrow, the intervals between the ribs equal to or wider than the ribs.
  3 Fruit glabrous, 6-10 mm long, 1.5-2 mm broad ..... ***Ch. procumbens** var. **procumbens***
  3 Fruit densely puberulent, 4.5-6.5 mm long, 2-2.5 mm broad.....***Ch. procumbens** var. **shortii***

Chaerophyllum procumbens (Linnaeus) Crantz *var.* ***procumbens***, Common Spreading Chervil. Pd, Cp (NC, SC, VA), Mt (VA), province {GA}: alluvial forests; common (uncommon in NC, rare in SC) (GA Special Concern). Late March-April; April-May. NY and s. Ontario to MI, s. WI, and e. NE, south to GA, AR, and OK. [= RAB, C, F, G, K, MC; < *Ch. procumbens* – GW, W; = *Ch. procumbens* – S]

Chaerophyllum procumbens (Linnaeus) Crantz *var.* ***shortii*** Torrey & A. Gray, Short's Spreading Chervil. Mt (VA), 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; < *Ch. procumbens* – GW, W; = *Ch. shortii* (Torrey & A. Gray Bush – S]

Chaerophyllum tainturieri Hooker *var.* ***dasycarpum*** Hooker ex S. Watson, Southern Chervil. Cp (GA?, SC): disturbed areas; rare. March-April; April-May. E. SC south to s. AL and west to TX. The distinctiveness of this taxon needs further evaluation. [= K, MC; < *Ch. tainturieri* – RAB, GW; = *Ch. dasycarpum* (Hooker ex S. Watson) Nuttall ex Small – S]

Chaerophyllum tainturieri Hooker *var.* ***tainturieri***, Southern Chervil. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, disturbed areas, fields; common. March-April; April-May. MD west to NE, south to FL, TX, and AZ. *Ch. texanum* Coulter & Rose is reported as a native in the Nashville Basin of TN (Chester, Wofford, & Kral 1997); it is usually now included in *Ch. tainturieri* var. *tainturieri*. [= K; < *Ch. tainturieri* – RAB, C, GW, W; > *Ch. tainturieri* var. *tainturieri* – F, G, MC; > *Ch. tainturieri* var. *floridanum* Coulter & Rose – F; > *Ch. texanum* Coulter & Rose – F, G, MC; > *Ch. teinturièri* – S, orthographic variant; > *Ch. floridanum* (Coulter & Rose) Bush – S]

* *Chaerophyllum bulbosum* Linnaeus, Parsnip Chervil. Waif in DC. [= C, G, K, MC] {not keyed}
* *Chaerophyllum temulem* Linnaeus, Rough Chervil, introduced, as a waif south to PA and NJ (Kartesz 1999). [= C, G, K, MC] {not keyed}

Ciclospermum Lagasca y Segura (Marsh-parsley)

A genus of 3 species, herbs, of tropical and warm temperate America. References: Mathias & Constance (1945)=MC.

Ciclospermum leptophyllum (Persoon) Sprague ex Britton & Wilson, Marsh-parsley. Cp (GA, NC, SC), Pd (GA, SC): freshwater marshes, disturbed areas, roadside ditches; uncommon. April-early June; June-July. Widespread in se. North America, from NC and OK south into tropical America. [= *Apium leptophyllum* (Persoon) F. Mueller ex Bentham – RAB, C, G, GW, MC; = *Cyclospermum leptophyllum* – K, orthographic variant; *Ciclospermum ammi* Lagasca y Segura – S]

Cicuta Linnaeus (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. Mt, Pd (NC), {GA}: marshes, bogs, seepages, ditches, swamp forests; rare. 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. Pd (VA), Cp (NC): marshes and swamps; rare (VA Rare). July-September. 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. Cp, Pd, Mt (GA, NC, SC, VA): marshes, bogs, seepages, ditches, swamp forests; common. May-August; July-September. Nova Scotia west to Alaska, south to FL, CA, and Mexico. Two other varieties are more northern or western: var. *victorinii* (Fernald) Boivin of Québec 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*)]

Cicuta mexicana Coulter & Rose, Southern Water-hemlock. Cp (GA, NC, SC, VA), Pd, Mt (GA, NC?): marshes, bogs, seepages, ditches, swamp forests, floating vegetation mats; uncommon. 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. curtissii* Coulter & Rose – S]

Conioselinum Hoffmann (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. Mt (NC, VA): 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); rare (NC Endangered, VA Rare). July-September. The specific epithet is a misnomer, the species Native to n. North America (the specific epithet a misnomer): south to PA, IN, and IA, 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 (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. Pd (GA, NC, SC, VA), Mt, Cp (NC, SC, VA): ditches, roadsides, streambanks, disturbed areas; common, native of Eurasia. May-June; June-July. All parts of the plant are highly toxic if ingested, often causing respiratory failure in humans and other mammals. [= RAB, C, F, GW, K, MC, S, W]

Coriandrum Linnaeus (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. Pd (NC, SC, VA), Mt (VA): disturbed areas, cultivated in gardens, sometimes persisting or escaped; rare, native of Eurasia. June-July. [= RAB, C, F, G, K, MC, S]

Cryptotaenia Augustin de Candolle (Honewort)

A genus of 6 species, herbs, in north temperate areas (and montane Africa). References: Mathias & Constance=MC.

Cryptotaenia canadensis (Linnaeus) Augustin de Candolle, Honewort. Mt, Pd, Cp (GA, NC, SC, VA): moist and nutrient-rich forests (alluvial, bottomland, slope, and cove forests); common (rare in Coastal Plain south of VA). May-June; June-August. New Brunswick and Québec to Manitoba, south to e. GA, sw. GA, panhandle FL, AL, and TX; also in Japan. [= RAB, C, F, GW, K, MC; = *Deringa canadensis* (Linnaeus) Kuntze – S]

Cynosciadium Augustin de Candolle

A genus of 2 species, of sc. North America. References: Mathias & Constance (1945)=MC.

Cynosciadium digitatum Augustin 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 (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. Pd, Mt, Cp (GA, NC, SC, VA): pastures, fields, roadsides, waste places; common, 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]

Daucus pusillus Michaux, American Queen-Anne's-lace. Cp (GA, NC, SC, VA?), Pd (GA, SC, VA?), Mt (GA): pastures, fields, roadsides, waste places; uncommon. 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]

Erigenia Nuttall (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. Mt (GA, NC?, VA), Pd (VA): mesic, nutrient-rich forests, either over calcareous substrate or on very rich alluvial deposits (such as riverbanks); rare (GA Special Concern, NC Watch List, VA Watch List). February-April. S. PA, w. NY, s. Ontario, c. MI, and se. WI south to MD, DC, w. VA, e. TN, nw. GA, c. AL, n. MS, sw. AR, and se. KS. Reported a number of times from NC, perhaps never with documentation. Rodgers (1950) states "reported in mtns. of N.C. by Kephart and Hyams." The past or present existence of *Erigenia* in NC remains uncertain. It occurs in several counties of TN immediately adjacent to the NC line (Chester, Wofford, & Kral 1997). See Buddell & Thieret (1985) for a very interesting and entertaining account of this plant. [= RAB (excluded), C, F, G, K, MC, S, W, Z]

Eryngium Linnaeus 1753 (Eryngo)

A genus of about 250 species, herbs, tropical and temperate. References: Bell (1963)=Z; Mathias & Constance (1945)=MC.

1 Leaves thickly coriaceous, palmately lobed, the lobes and teeth tipped with stout spines..... ***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.
    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..... ***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 ..... ***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 ..... ***[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] .... ***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].....***[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.

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 parallel-veined, 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 1-2 (-4), those on the lower portion of the leaf usually in fascicles of 2-3 .....***E. yuccifolium* var. *synchaetum***

9 Leaves evidently reticulate-veined, 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 (GA, NC, SC, VA): tidal freshwater to brackish marshes; uncommon. July-September. NJ to ne. FL along the Atlantic coast, mostly in brackish marshes. [= RAB, K, MC, Z; < *E. aquaticum* – C, F, G; < *E. aquaticum* – GW; = *E. virginianum* Lamarck – S]

Eryngium aquaticum Linnaeus ***var. ravenelii*** (A. Gray) Mathias & Constance, Ravenel's Eryngo. Cp (GA, NC, SC): wet savannas, mostly or entirely over calcareous substrate; rare (NC Watch List, SC 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; = *E. ravenelii* A. Gray – S]

Eryngium aromaticum Baldwin, Fragrant Eryngo. Cp (GA): dry pinelands; uncommon. E. GA west to s. AL, south to FL. [= K, MC, S, Z]

Eryngium baldwinii Sprengel. Cp (GA): pinelands, temporary pools, ditches, other moist to wet sites; uncommon. Se. GA and sw. GA south to FL. [= GW, K, S, Z; = *E. baldwini* – MC, orthographic variant]

* ***Eryngium divaricatum*** Hooker & Arnott. Cp (NC): disturbed areas, introduced on ballast at Wilmington port; rare, introduced from South America. July-October. Not seen in recent years and probably not persistent. [= RAB, K, MC, S, Z]

Eryngium integrifolium Walter, Savanna Eryngo. Cp (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 FL, west to OK and TX, inland in c. TN. [= RAB, K, MC, W, Z; > *E. integrifolium* – S; > *E. ludovicianum* Morong – S]

* ***Eryngium maritimum*** Linnaeus, Sea Holly. Cp (NC): ocean and soundside dunes; rare, presumably introduced from Europe, though perhaps adventive. July. [= RAB, C, G, K, MC, Z]

Eryngium prostratum Nuttall ex Augustin de Candolle, Spreading Eryngo. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC): moist ditches and lawns, other moist, open habitats; uncommon, definitely native further south, perhaps only rather recently spread north to our area. May-October. Se. VA south to FL, west to OK and TX. [= RAB, C, GW, K, MC, S, W, 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 (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; = *E. synchaetum* (Gray ex Coulter & Rose) Coulter & Rose – S]

Eryngium yuccifolium Michaux ***var. yuccifolium***, Northern Rattlesnake-master. Pd, Mt, Cp (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 (VA Rare). 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; < *E. yuccifolium* – GW (also see *E. yuccifolium* var. *synchaetum*); = *E. aquaticum* – S, misapplied]

* *Eryngium campestre* Linnaeus, Field Eryngo. Ballast waif around ports, in AL (Mobile), MD, and NJ (Z; Kartesz 1999). [= K, MC, 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]

Falcaria Fabricius (Sickleweed)

A monotypic genus, an herb, of Eurasia. References: Mathias & Constance (1945)=MC.

* ***Falcaria vulgaris*** Bernhardi, Sickleweed. Mt (VA): disturbed areas; rare, native of Eurasia. July-September. [= C, F, K; = *F. sioides* (Wibel) Ascherson – G, MC]

Foeniculum P. Miller (Fennel)

A genus of 4-5 species, herbs, of Asia and Mediterranean Europe. References: Mathias & Constance (1945)=MC.

* ***Foeniculum vulgare*** P. Miller, Fennel. Cp, Mt (GA, NC, SC, VA), Pd (NC, SC, VA): fields, dredge spoil, old gardens, waste places, vacant lots; uncommon (locally common), 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; = *Foeniculum foeniculum* (Linnaeus) Karsten – S]

Heracleum Linnaeus (Cow-parsnip, Hogweed)

A genus of about 65 species, herbs, north temperate (and tropical mountains). References: Mathias & Constance (1945)=MC.

Heracleum maximum W. Bartram, Masterwort, Cow-parsnip, American Hogweed. Mt (GA, NC, VA): forests, roadbanks, meadows, forest openings; uncommon (GA Special Concern). May-July; July-August. Labrador west to AK, south to 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; = *H. lanatum* Michaux – RAB, C, G, MC, W; = *H. sphondylium* Linnaeus var. *lanatum* (Michaux) Dorn; *? H. sphondylium* Linnaeus ssp. *montanum* (Schleicher ex Gaudin) Briquet]

* *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}

Hydrocotyle Linnaeus (Water-pennywort)
(see *ARALIACEAE*)

Ligusticum Linnaeus (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, Pd (GA, NC, SC, VA), Cp (NC): moist to dryish, nutrient-rich forests and woodlands; common (rare in Coastal Plain). June-July; August-September. S. PA south to c. GA and AL; 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]

Lilaeopsis Greene (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.

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 ..... ***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 ..... ***L. chinensis***

Lilaeopsis carolinensis Coulter & Rose, Carolina Lilaeopsis. Cp (GA, NC, SC, VA): freshwater marshes and pondshores, ditches, interdune ponds, shores of brackish to freshwater estuarine sounds and rivers; rare (GA Special Concern, NC Rare, SC Rare, VA Rare). May-June. Se. VA south to FL and west to LA; it is also found in s. South America, in Argentina, Brazil, and Paraguay. [= RAB, F, GW, K, S, Z; = *L. attenuata* (Hooker & Arnott) Fernald – C, G, MC]

Lilaeopsis chinensis (Linnaeus) Kuntze, Marsh Lilaeopsis. Cp (GA, NC, SC, VA): brackish and freshwater tidal marshes, especially in mud-flats in the intertidal zone; uncommon. May-June. Nova Scotia 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, Z; = *L. lineata* (Michaux) Greene – S]

Oenanthe Linnaeus (Water-dropwort)

* ***Oenanthe javanica*** Augustin de Candolle, Water Celery, Water Parsley. Pd (VA): edge of a swamp forest; rare, native of Asia. [] {not keyed at this time; synonymy incomplete}

Osmorhiza Rafinesque (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 (-8) per umbellet; 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 (7-) 9-18 per umbellet; 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), Pd (NC, SC, VA), Cp (VA): cove forests, other moist fertile forests; common, rare in Piedmont and Coastal Plain (SC Rare). April-May; May-June. Nova Scotia and Québec west to Saskatchewan, south to NC, n. GA, AL, and AR. [= RAB, C, F, G, K, MC, W, Z; = *Osmorrhiza claytonii* – S, misspelling]

Osmorhiza longistylis (Torrey) Augustin de Candolle, Anise-root, Smooth Sweet Cicely. Pd (GA, NC, SC, VA), Mt, Cp (GA, NC, VA): moist, fertile forests; common, rare in Coastal Plain. April-May; May-June. Québec west to Saskatchewan, south to GA, TX, and CO. [= RAB, C, F, G, K, W, Z; > *O. longistylis* var. *brachycoma* Blake; > *O. longistylis* var. *longistylis* – F, MC; > *O. longistylis* var. *villicaulis* Fernald – F, MC; = *Osmorrhiza longistylis* – S, misspelling]

Oxypolis Rafinesque (Dropwort, Hog-fennel, Cowbane)

A genus of about 7 species, herbs, of temperate North America. References: Mathias & Constance (1945)=MC; Kral (1981); Tucker et al. (1983).

1 Leaves reduced to hollow, linear, nodose-septate quills, consisting of the petiole and leaflet-less rachis, undivided.
  2 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***
  2 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 ..... ***O. filiformis***

1 Leaves with 1-13 leaflets, the leaflets flat.
  3 Leaflets 1-3, entire, palmately disposed, parallel-veined ..... ***O. denticulata***
  3 Leaflets (5-) 7-11 (-13), pinnately disposed, usually toothed (rarely entire), net-veined ..... ***O. rigidior***

Oxypolis canbyi (Coulter & Rose) Fernald, Canby's Cowbane. Cp (GA, NC, SC): clay-based Carolina bays and other depressional wetlands; rare (US Endangered, GA Endangered, NC Endangered, SC 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]

Oxypolis denticulata (Baldwin) J.R. Edmondson, Savanna Cowbane. Cp (GA, NC, SC, VA): wet pine savannas, sandhill seepages; rare (US Species of Concern, GA Special Concern, NC Watch List, VA Rare). September-October; October-November. Scattered from se. VA south to Panhandle FL; alleged occurrences in e. TX are based on mis-identifications of narrow-leafleted forms of ***O. rigidior*** (Sorrie et al. 2003). Edmondson (2005) shows that the correct name for this species is ***O. denticulata***. [= *Oxypolis ternata* (Nuttall) A. Heller – RAB, C, F, G, GW, K, MC, S]

Oxypolis filiformis (Walter) Britton, Water Dropwort. Cp (GA, NC, SC): wet savannas, sandhill seepages; uncommon. July-August; August-September. Se. NC south to s. FL, west to se. TX, and in the West Indies. [= RAB, GW, K, MC, S]

Oxypolis rigidior (Linnaeus) Rafinesque, Cowbane, Pig-potato. Mt, Pd, Cp (GA, NC, SC, VA): bogs, swamps, wet meadows, streambanks, sandhill seepages; common. August-October; October-November. NY west to MN and south to n. FL and TX. It is very variable in the size and shape of the leaflets. [= RAB, C, G, GW, K, MC, W; > ***O. rigidior*** var. *rigidior* – F; > ***O. rigidior*** var. *ambigua* (Nuttall) Robinson – F; > ***O. rigidior*** – S; > ***O. turgida*** Small – S]

Pastinaca Linnaeus (Parsnip)

A genus of about 14 species, herbs, of temperate Eurasia. References: Mathias & Constance (1945)=MC.

* ***Pastinaca sativa*** Linnaeus, Parsnip. Mt, Pd (NC, SC, VA), Cp (NC, VA): roadsides, fields; common, native of Europe. June-July; July-August. [= RAB, C, F, K, MC, S, W; > ***P. sativa*** var. *hortensis* Ehrhart – G; > ***P. sativa*** var. *sativa* – G]

Perideridia Reichenbach

A genus of about 13 species, mainly of w. North America. References: Mathias & Constance (1945)=MC.

Perideridia americana (Nuttall ex Augustin 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 Augustin de Candolle – S]

Petroselinum J. Hill (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 (SC), Pd (GA, NC): commonly cultivated in gardens, rarely persistent or weakly escaped, introduced from Mediterranean Europe. June-July. [= RAB, C, F, G, K, MC; = *Apium petroselinum* Linnaeus – S]

Peucedanum Linnaeus (Masterwort)

* *Peucedanum ostruthium* (Linnaeus) W.D.J. Koch, Masterwort. Naturalized in ne. United States from Europe. Reported from Carter County, TN (a county immediately adjacent to our area) (Chester, Wofford, & Kral 1997), and also is reported for scattered localities in PA (Rhoads & Klein 1993). [= C, K; = *Imperatoria ostruthium* Linnaeus – MC]

Pimpinella Linnaeus

A genus of about 150 species, herbs, of Europe and Africa.

* ***Pimpinella saxifraga*** Linnaeus, Burnet-saxifrage. Mt (VA): disturbed areas; rare, introduced from Eurasia. [= C, F, G; < ***P. saxifraga*** ssp. *saxifraga* – K, MC]

Polytaenia Augustin de Candolle

References: Mathias & Constance (1945)=MC.

Polytaenia nuttallii Augustin de Candolle, Prairie-parsley, ranges from 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* (Augustin de Candolle) Coulter & Rose – S]

Pseudotaenidia Mackenzie (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 likely correct, but the conclusion that they should be united in a single genus does not necessarily follow (particularly considering the narrow generic concepts used in the Apiaceae). References: Cronquist (1982)=Z; Mathias & Constance (1945)=MC.

Pseudotaenidia montana Mackenzie, Mountain Pimpernel, Shale-barren Pimpernel. Mt (VA): shale barrens and rocky woodlands over shale, greenstone, calcareous sandstone, and other calcareous and mafic rocks; rare (VA Watch List). May-June. A Central Appalachian endemic: w. VA and e. WV north to sc. PA. [= F, G, MC, W; = *Taenidia montana* (Mackenzie) Cronquist – C, K, Z]

Ptilimnium Rafinesque (Bishopweed, Harperella)

A genus of 5-8 species, herbs, temperate, of e. North America. References: 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.
  2 Leaves 8-30 cm long; plants 4-10 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] ..... ***Pt. nodosum***
  2 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]..... ***Pt. viviparum***
1 Leaves dissected into filiform or linear segments.
  3 Leaf segments verticillate on the rachis (4 or more segments at major nodes of each leaf); styles 1.5-3.0 mm long..... ..... ***Pt. costatum***
  3 Leaf segments alternate, opposite, or in whorls of 3 on the rachis; styles 0.2-1.5 mm long.
    4 Styles 0.5-1.5 mm long; fruits 1-2 mm long..... ***[Pt. nuttallii]***
    4 Styles 0.2-0.5 mm long; fruits 1.4-4.2 mm long.
      5 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 ..... ***Pt. ahlesii***
      5 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..... ***Pt. capillaceum***

Ptilimnium ahlesii Weakley & Nesom, Carolina Bishopweed, Coastal Bishopweed. Cp (GA, NC, SC): tidal freshwater marshes; rare (GA Special Concern, NC 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 closely approach the quill-leaves of *Pt. fluviatile* and *Pt. nodosum*, corroborating Easterly's combination of *Harperella* into *Ptilimnium*. [= Q; < *Pt. capillaceum* – RAB; = *Pt. macrospermum* – K, nomen nudum]

Ptilimnium capillaceum (Michaux) Rafinesque, Eastern Bishopweed, Atlantic Bishopweed. Cp, Pd (GA, NC, SC, VA): ditches, marshes, other wet places; common. June-August; July-September. MA, NY, and MO south to FL and TX. [= RAB, C, F, G, GW, K, MC, Q, S, W, Z; < *Pt. capillaceum* – RAB]

Ptilimnium costatum (Elliott) Rafinesque, Big Bishopweed. Cp (NC), Pd, Mt (GA): tidal freshwater marshes (NC), wet prairies (GA), bottomland hardwood forests (GA); rare (GA Special Concern, NC Rare). July-August. Se. NC south to GA, and west to IL, MO, and TX; 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 *Pt. species 1* or *Pt. capillaceum*. [= RAB, C, F, G, GW, K, MC, Q, S, Z]

Ptilimnium nodosum (Rose) Mathias, Pond Harperella. Cp (GA, SC): upland depression ponds, seepage on granite outcrops; rare (US Endangered, GA Endangered, SC Rare). June. Known only from a few sites in SC and c. GA. See *Pt. viviparum* for comments. [= RAB, GW, MC, Z; < *P. nodosum* (Rose) Mathias – C, K, Y (also see *Pt. fluviatile*); = *Harperella nodosa* Rose – S, X]

Ptilimnium viviparum (Rose) Mathias, Atlantic River Harperella. Pd (NC, VA): rocky riverbeds; rare (US Endangered, NC Endangered). July-August. Some authors, such as C, K, and Kral (1981a) prefer to include *Pt. fluviatile* and *Pt. viviparum* in *Pt. nodosum*, but recent electrophoretic and morphologic data suggest the existence of 3 taxa: *Pt. viviparum* of w. MD, e. WV, VA, and c. NC, *Pt. fluviatile* of n. AL and AR, and *Pt. nodosum* of SC and GA. See Maddox & Bartgis (1990) and Kress, Maddox, & Roesel (1994) for additional information. Further electrophoretic and morphologic studies are underway. Belden et al. (2004) provide details on the Virginia occurrence in Aquia Creek, Stafford County. [= MC; < *Pt. fluviatile* (Rose) Mathias – RAB, G, GW, Z; < *Pt. nodosum* (Rose) Mathias – C, K, Y; = *Pt. viviparum* (Rose) Mathias – F; < *Harperella fluviatilis* Rose – S; = *Harperella vivipara* Rose – X]

Ptilimnium fluviatile (Rose) Mathias, Gulf River Harperella. Similar to *Pt. viviparum*. N. AL and AR. [= *Pt. fluviatilis* – MC, orthographic variant; < *Pt. fluviatile* (Rose) Mathias – RAB, G, GW, Z; < *Pt. nodosum* (Rose) Mathias – C, K, Y; < *Harperella fluviatilis* Rose – S, X] {not keyed at this time}

Ptilimnium nuttallii (Augustin de Candolle) Britton, Midwestern Bishopweed, ranges from KY, MO, and KS south to se. TN (Chester, Wofford, & Kral 1997), AL, LA, and e. TX. [= C, F, G, GW, K, MC, Q, S, Z]

Sanicula Linnaeus (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 notes: *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, Pd, Cp (GA, NC, SC, VA): dry-mesic to mesic forests; common. April-May; June-July. VT and s. Ontario west to MN and SD, south to Panhandle FL and e. TX. [= F, G, Z; < *S. canadensis* – RAB, C, MC, W; < *S. canadensis* var. *canadensis* – K; = *S. canadensis* – S]

Sanicula canadensis Linnaeus *var.* ***floridana*** (Bicknell) H. Wolff, Florida Sanicle, Florida Snakeroot. Cp (GA, NC, SC, VA): dry-mesic to mesic, sandy forests, often associated with *Fagus grandifolia* (and southward *Magnolia grandiflora*); uncommon? 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; < *S. canadensis* var. *canadensis* – K; = *S. floridana* Bicknell – S]

Sanicula canadensis Linnaeus *var.* ***grandis*** Fernald, Large Sanicle. Mt? (NC?, VA?): {attributed to our area in various floras, possibly incorrectly; confirmation needed from herbarium work, and information on habitats, rarity, phenology}. VT and n. NY west to s. Ontario, WI, se. MN, and n. IA, south to PA, 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]

Sanicula marilandica Linnaeus, Maryland Sanicle. Mt, Cp (GA, NC, SC, VA), Pd (NC, SC, VA): mesic to dry-mesic nutrient-rich forests; (common, uncommon in Coastal Plain). May-June; July-August. Québec and 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, 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, Pd, Cp (GA, NC, SC, VA): mesic to dry-mesic nutrient-rich forests; uncommon. May-June; June-July. Nova Scotia and Québec west to MN and e. SD, south to Panhandle FL and e. TX. [= K, Z; = ***S. gregaria*** Bicknell – RAB, C, F, G, MC, S, W]

Sanicula smallii Bicknell, Southern Sanicle, Small's Sanicle. Pd, Cp, Mt (GA, NC, SC, VA): mesic to dry-mesic forests; common (uncommon in Coastal Plain). April; May-June. C. VA, sw. VA, KY, se. MO, south to Panhandle FL, se. LA, c. LA, and e. TX. [= RAB, C, F, G, K, MC, S, W]

Sanicula trifoliata Bicknell, Beaked Sanicle, Large-fruited Sanicle. Mt (GA, NC, SC, VA), Pd (VA): cove forests, other mesic, nutrient-rich forests; common (rare in Piedmont) (GA Special Concern). May; June-July. Québec 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, Z]

Scandix Linnaeus (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): roadsides, fields, disturbed areas; rare, native of Mediterranean Europe. March-April. [= RAB, C, G, K, MC, S]

Sium Linnaeus (Water-parsnip)

A genus of about 14 species, herbs, of the northern hemisphere. References: Mathias & Constance (1945)=MC.

Sium suave Walter, Water-parsnip. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): freshwater marshes, brackish marshes, swamp forests; uncommon (rare in Piedmont and Mountains). June-August; August-October. Newfoundland west to Alaska and Siberia, south to 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; > ***S. suave*** – F, G, GW, MC; > ***S. floridanum*** Small – F, G, GW, MC, S; > ***S. cicutaefolium*** Schrank – S]

Spermolepis Rafinesque (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 (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]

* ***Spermolepis echinata*** (Nuttall ex Augustin de Candolle) Heller, Bristlefruit Spermolepis, Hooked Spermolepis. Cp (GA, SC, VA): sandy roadsides, disturbed areas; rare, introduced from sc. United States. April; May. [= RAB, C, F, G, K, MC, S]

Spermolepis inermis (Nuttall ex Augustin 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 introduced from sc. United States. April; May. [= RAB, C, F, G, K, MC; *? S. patens* (Nuttall ex Augustin de Candolle) B.L. Robinson – S]

Taenidia (Torrey & A. Gray) Drude (Yellow Pimpernel)
(also see *Pseudotaenidia*)

A monotypic genus (unless *Pseudotaenidia* is included), an herb, temperate, of e. North America. References: Mathias & Constance (1945)=MC.

Taenidia integerrima (Linnaeus) Drude, Yellow Pimpernel. Pd, Mt (GA, NC, SC, VA), 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). April-May; May-June. Widespread in e. North America, south to c. GA. [= RAB, C, F, G, K, MC, S, W]

Thaspium Nuttall (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.

[Note: 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, Pd, Cp (GA, NC, SC, VA): moist forests; common. April-May; July-August. NY and Ontario west to MN, south to panhandle FL and OK. 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, 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 (GA Rare, NC 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, Pd, Cp (NC, SC, VA), {provinces (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, Z; < *T. trifoliatum* – G]

Thaspium trifoliatum (Linnaeus) A. Gray *var*. ***trifoliatum***. Mt, Pd, Cp (NC, SC, VA), {provinces (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, Y, Z; < *T. trifoliatum* – G]

Thaspium chapmanii (Coulter & Rose) Small. Mt (GA): calcareous bluffs; rare. S. OH south to Panhandle FL. [= *T. barbinode* var. *angustifolium* Coulter & Rose – F; < *Th. barbinode* (Michaux) Nuttall – C, G, K, MC, Z; > *Th. barbinode* var. *angustifolium* – Y; > *Th. barbinode* var. *chapmanii* Coulter & Rose – Y] {not keyed at this time; etc.}

Torilis Adanson (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), Cp (GA, SC, VA), Pd (GA, NC, SC, VA): roadsides, fields, disturbed areas; uncommon, introduced from Europe. May-June. [= RAB, C, MC, W; *T. japonica* – F, G, misapplied; > *T. arvensis* ssp. *arvensis* – K]
* ***Torilis japonica*** (Houttuyn) Augustin de Candolle. (VA): {habitat}; rare, native of Eurasia, naturalized south to se. PA and VA. [= K, MC; *T. anthriscus* (Linnaeus) Gmelin]
* ***Torilis nodosa*** (Linnaeus) Gaertner, Knotted Bur-parsley. Cp (GA?, NC, SC): disturbed areas; rare, introduced from Mediterranean Europe. May. [= RAB, G, K, MC, S]

Trepocarpus Nuttall ex Augustin de Candolle

A monotypic genus, an herb, temperate, of se. United States. References: Mathias & Constance (1945)=MC.

Trepocarpus aethusae Nuttall ex Augustin de Candolle. Pd (SC), ?? (GA): rich moist forests, sometimes weedy in disturbed soils; rare (GA 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]

Zizia W.D.J. Koch (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, Pd, Cp (GA, NC, SC, VA): moist forests, openings, and woodland edges; common (rare in Coastal Plain). April-May; July-August. NY west to British Columbia, south to GA, panhandle FL, MO, and CO. [= RAB, F, G, GW, K, MC, W, Z; > *Z. aptera* var. *aptera* – C; = *Z. cordata* W.D.J. Koch ex Augustin de Candolle – S]
Zizia aurea (Linnaeus) W.D.J. Koch, Common Golden-Alexanders. Mt, Pd, Cp (GA, NC, SC, VA): moist forests; common (rare in Coastal Plain). April-May; June-July. New Brunswick west to Saskatchewan, south to sw. GA, panhandle FL, and e. TX. [= RAB, C, F, G, GW, K, MC, S, W, Z]
Zizia trifoliata (Michaux) Fernald, Mountain Golden-Alexanders. Mt, Pd, Cp (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; > *Z. trifoliata* – MC; > *Z. latifolia* Small – MC, S; > *Z. bebbii* (Coulter & Rose) Britton – S]

APOCYNACEAE A.L. de Jussieu 1789 (Dogbane Family)

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).

Key to the tribe Asclepiadeae

1 Stem erect or spreading, never twining or climbing.....***Asclepias***
1 Stem climbing, trailing, or sprawling, vinelike.
  2 Leaves linear; [of brackish marshes and coastal hammocks] ..... ***Cynanchum***
  2 Leaves ovate and cordate; [of various habitats, sometimes maritime].
    3 Plants in flower.
      4 Petals white .....***Cynanchum laeve***
      4 Petals brown, yellow, yellow-green, cream, or maroon.
        5 Corolla lobes glabrous on the outer surface, very stiff in texture; carpels smooth and angled ....***Gonolobus***
        5 Corolla lobes glandular-puberulent on the outer surface, herbaceous in texture; 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***

Ampelamus Rafinesque (Sandvine)
(see *Cynanchum*)

Amsonia Walter (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 elliptic; [of seasonally flooded depression wetlands and moist pinelands] .....***A. rigida***
  2 Leaves linear to lanceolate; [of dry, sandy habitats, such as sandhills].
    3 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..... ***A. ciliata* var. *ciliata***
    3 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 .....***A. ciliata* var. *tenuifolia***
1 Corolla pubescent on the outer surface; stem glabrous; [more widespread in our area].
  4 Leaf blades ovate to oblong-lanceolate, 3-6 cm wide .....***A. tabernaemontana* var. *tabernaemontana***
  4 Leaf blades lanceolate to linear-lanceolate, 1-3 cm wide.
    5 Inflorescence dense, many-flowered; leaves pubescent (glabrate in age) ..... ***[A. tabernaemontana* var. *gattingeri]***
    5 Inflorescence loose, few-flowered; leaves glabrous, glaucous beneath.....***A. tabernaemontana* var. *salicifolia***

Amsonia ciliata Walter *var. **ciliata***, Broadleaf Sandhills Blue-stars. Cp (GA, NC, SC): sandhills; uncommon (rare in NC). April; September-October. Se. NC south to n. FL, west to AL. [= K, S, Z; < *A. ciliata* – RAB]

Amsonia ciliata Walter *var. **tenuifolia*** (Rafinesque) Woodson, Threadleaf Sandhills Blue-stars. Cp (GA, NC, SC): sandhills; uncommon (rare in NC). April; September-October. Se. and sc. NC south to FL, west to AL. [= K; < *A. ciliata* – RAB; = *A. ciliata* var. *filifolia* Wood – F, G, S; = *A. ciliata* var. *tenuifolium* – Z, misspelling]

Amsonia rigida Shuttleworth ex Small, Stiff Bluestar, Pond Bluestar. Cp (GA): seasonally flooded depression wetlands and moist pinelands; uncommon. S. GA to n. peninsular FL, west to s. MS. [= GW, K, S, Z]

Amsonia tabernaemontana Walter *var. **salicifolia*** (Pursh) Woodson, Willowleaf Blue-stars. Mt (GA, NC, SC), Pd, Cp (NC, SC, VA): floodplain forests, moist, rich slope forests; common (uncommon in VA). April; August-September. Se. VA west to s. IN, IL, and MO, south to GA and TX. The two varieties, while strikingly different in their extreme expressions, have nearly the same distribution and do intergrade; they may not be worthy of recognition. [= RAB, G, K, Z; < *A. tabernaemontana* – C, GW, W; < *A. salicifolia* Pursh – S (also see var. *gattingeri*]

Amsonia tabernaemontana Walter *var. **tabernaemontana***, Wideleaf Blue-stars. Mt (GA, NC, SC), Pd, Cp (GA, NC, SC, VA): floodplain forests, moist, rich slope forests; common (uncommon in VA, uncommon in Mountains). April; August-September. Se. VA west to s. IL, MO, and KA, south to GA, LA, and e. OK. [= RAB, G, K, Z; < *A. tabernaemontana* – C, GW, W; = *A. amsonia* (Linnaeus) Britton – S]

Amsonia ludoviciana Vail, Louisiana Bluestar. Pd (GA): open woodlands around outcrops of Lithonia granitic gneiss; rare (GA Special Concern). 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] {not keyed at this time}

Amsonia tabernaemontana Walter *var. **gattingeri*** Woodson. Mt (GA): {habitat}; 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. Kartesz (1999) shows a more restricted distribution, with this taxon endemic to TN and KY. [= F, K, Z; < *A. tabernaemontana* – C, GW, W; < *A. salicifolia* Pursh – S]

Angadenia Miers

A genus of 2 species, of Florida and the West Indies.

* ***Angadenia berteroi*** (Alphonse de Candolle) Miers, Pineland Golden-trumpet, Lice-root. Cp (NC): disturbed, acid, peaty soil; rare, introduced from 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; > *Rhabdadenia corallicola* Small – S]

Apocynum Linnaeus (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), Pd (GA, VA): forests, woodlands, roadsides, pastures; common. June-August; September-October. Newfoundland to British Columbia 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, Pd, Mt (GA, NC, SC, VA): forests, woodlands, roadsides, pastures; common. May-July; September-October. Québec, Manitoba, 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* (Bég. & Bel.) Woodson – Z; < *A. cannabinum* – K]

Apocynum ×floribundum Greene (pro sp.) [***A. androsaemifolium* × *cannabinum***]. Mt (NC, VA): forests, woodlands, roadsides, pastures; uncommon. 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. Mt, Pd, Cp (VA): forests, woodlands, roadsides, pastures; uncommon. July-September; September-October. Newfoundland and British Columbia 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) Bég. & Bel. – Z]

Asclepias Linnaeus 1753 (Milkweed)

A genus of about 100 species, herbs, temperate and tropical, of North and Central America. References: Woodson (1954)=Z.

1 Sap clear; leaves alternate; corolla orange to yellow ..... **Key A**
1 Sap milky; 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 (*A. viridiflora* will key here and in the second lead) ..... **Key C**
    3 Leaves with petioles 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 linear to lanceolate, hastate at the base; leaf margins usually crisped; [of sandhills of the fall-line Sandhills and middle Coastal Plain of se. VA southward] ..... ***A. tuberosa*** *var.* ***rolfsii***
1 Leaves obovate to oblanceolate, cuneate at the base; leaf margins usually flat; [widespread in our area] ..... ***A. tuberosa*** *var.* ***tuberosa***

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 ..... ***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; [of Coastal Plain pinelands].
    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; [of dry pinelands] ..... ***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** of 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; [of 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; [of 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; [of 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; [of 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; [of 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; [of 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, 4-10 dm tall; 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, 2-7 dm tall; 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. Cp, Pd, Mt (GA, NC, SC, VA): dry woodlands of various types; common. May-July; June-August. NH and NY west to MN, IA, and KS, south to n. FL and e. TX. [= RAB, C, F, G, K, S, W, Z]

Asclepias cinerea Walter, Carolina Milkweed. Cp (GA, SC): pine savannas; rare. June-July; August-September. Se. SC south to n. peninsular FL, west to panhandle FL. [= RAB, K, S, Z]

Asclepias connivens Baldwin. Cp (GA, SC): wet pine flatwoods; common (rare in SC). July-August. Se. SC (McMillan et al. 2002) south to panhandle FL, west to Santa Rosa County, FL. [= GW, K, Z; = *Anantherix connivens* (Baldwin) Feay – S]

Asclepias exaltata Linnaeus, Tall Milkweed. Mt (GA, NC, SC, VA), Pd (VA): moist forests, slopes, and forest margins; common (rare in VA Piedmont). June-July; August-September. ME and s. Ontario west to MN and IA, south to n. GA, e. and c. TN (Chester, Wofford, & Kral 1997), KY, and IL. [= RAB, C, F, G, K, S, W, Z]

Asclepias hirtella (Pennell) Woodson, Barrens Milkweed. Mt (GA): limestone glades, prairies; rare (GA Special Concern). W. WV (Mason County), KY, e. TN (Bradley County) (Chester, Wofford, & Kral 1997), and nw. GA (Jones & Coile 1988). It is a species of midwestern prairies and barrens that closely resembles *A. longifolia*. [= C, F, K, Z; = *Asclepias longifolia* Michaux var. *hirtella* (Pennell) Farmer & Bell; = *Acerates hirtella* Pennell – S]

Asclepias humistrata Walter, Fleshy Milkweed. Cp (GA, NC, SC), Pd (GA): sandhills; common. May-June; June-July. E. NC south to s. FL, west to e. LA. [= RAB, K, S, Z]

Asclepias incarnata Linnaeus *var.* ***incarnata***, Western Swamp Milkweed. Mt, Pd, Cp (VA): swamps, marshes; rare. July-September; August-October. ME and s. Québec west to Manitoba, south to VA, s. TN (Chester, Wofford, & Kral 1997), AR, TX, and CO, disjunct in FL, TX, NM, and UT. [= C, F, G, GW; = *Asclepias incarnata* ssp. *incarnata* – RAB, K, W, Z; = *Asclepias incarnata* – S]

Asclepias incarnata Linnaeus *var.* ***pulchra*** (Ehrhart ex Willdenow) Persoon, Eastern Swamp Milkweed. Mt, Pd, Cp (GA, NC, SC, VA): marshes, bogs, swamps; common (rare in SC). July-September; August-October. Nova Scotia 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. Cp (GA, NC, SC, VA): swamps, fresh to slightly brackish marshes, wet pine savannas; uncommon (rare in VA) (VA Watch List). June-August; August-September. NJ south to s. peninsular FL, west to e. TX. [= RAB, C, GW, K, S, Z; > *Asclepias lanceolata* var. *lanceolata* – F, G; > *Asclepias lanceolata* var. *paupercula* (Michaux) Fernald – F, G]

Asclepias longifolia Michaux, Savanna Milkweed. Cp (GA, NC, SC, VA): wet pine savannas; uncommon (NC Watch List, VA Rare). May-June; June-July. DE south to s. FL, west to e. TX. [= RAB, C, F, GW, K, Z; = *Acerates longifolia* (Michaux) Elliott – G; *Acerates floridana* (Lamarck) A.S. Hitchcock – S]

Asclepias michauxii Decaisne, Michaux's Milkweed. Cp (GA, SC): pine savannas; uncommon. May. S. SC south to peninsular FL, west to e. LA. [= RAB, K, S, Z]

Asclepias obovata Elliott, Pineland Milkweed. Cp (GA, SC): sandhills; uncommon. June-September. Se. SC south to panhandle FL, west to AR and TX. [= RAB, K, S, Z]

Asclepias pedicellata Walter, Stalked Milkweed, Savanna Milkweed. Cp (GA, NC, SC): dry pine savannas; rare (GA Special Concern, NC Rare, SC Rare). July-August. Se. NC south to s. FL. This species generally occurs in small populations of widely scattered individuals; populations of more than 50 individuals are rare. [= RAB, GW, K, Z; = *Podostigma pedicellata* (Walter) Vail – S]

Asclepias perennis Walter, Smoothseed Milkweed, Swampforest Milkweed. Cp (GA, SC): swamp forests; rare. June-August; August-September. E. SC south to peninsular FL, west to e. TX, north in the interior to s. IN and s. IL. [= RAB, C, F, G, GW, K, S, Z]

Asclepias purpurascens Linnaeus, Purple Milkweed. Mt, Pd (NC, VA), Cp (VA): openings in moist bottomlands and swamp forests, perhaps mostly on soils derived from mafic soils; rare (GA Special Concern, NC Watch List). June. NH and s. Ontario 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. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): moist to dryish forests and forest margins, most common on mafic and calcareous substrates; common. 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, Red Milkweed. Cp (GA, NC, SC, VA), Pd (GA, VA): pocosin ecotones, wet pine savannas, sandhill seeps, seepage swamps; uncommon (GA Special Concern, VA Rare). June-July; July-September. Se. NY (Long Island), se. PA, and NJ south to wc. GA, west to e. TX. *A. laurifolia* is alleged to differ in sessile, cordate-clasping leaf bases (vs. petioled and rounded), purplish-pink flowers (rather than orange-red), and other characters (see Small 1933); it may warrant recognition and needs additional study. [= RAB, C, F, G, GW, K, Z; > *A. rubra* – S; > *A. laurifolia* Michaux – S; > *A. rubra* var. *rubra*; > *A. rubra* var. *laurifolia* (Michaux) Harper]

Asclepias syriaca Linnaeus, Common Milkweed. Mt, Pd (NC, SC, VA), Cp (NC, VA): pastures, roadsides, disturbed areas; common (rare in Coastal Plain of NC, rare in SC). June-August; July-September. New Brunswick and ME west to s. Manitoba 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. Cp (NC, SC): sandhills; uncommon (NC Watch List). 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.* ***rolfsii*** (Britton ex Vail) Shinners, Sandhills Butterfly-weed. Cp (GA, NC, SC, VA): sandhills; uncommon. May-August; August-September. Se. VA south to s. FL, west to s. MS. 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 Linnaeus *var.* ***tuberosa***, Common Butterfly-weed. Mt, Pd, Cp (GA, NC, SC, VA): woodland margins, roadsides, pastures; common. 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, W; < *Asclepias tuberosa* – S; > *Asclepias decumbens* Linnaeus - S]

Asclepias variegata Linnaeus, White Milkweed. Cp, Pd, Mt (GA, NC, SC, VA): upland forests and woodlands; common (uncommon in VA Mountains). 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, Z; = *Biventraria variegata* (Linnaeus) Small – S]

Asclepias verticillata Linnaeus, Whorled Milkweed. Mt, Pd, Cp (GA, NC, SC, VA): barrens, thin soils of rock outcrops (especially mafic rocks), thin woodlands, sandhills; uncommon. June-September; September-October. E. MA west to ND and Manitoba, south to s. FL, TX, NM, and AZ. [= RAB, C, F, G, K, S, W, Z]

Asclepias viridiflora Rafinesque, Green Milkweed. Pd, Cp (GA, NC, SC, VA), Mt (GA, VA): open woodlands, woodland edges, barrens, glades, especially over mafic or calcareous rocks, and also in disturbed areas; uncommon. June-August; August-September. CT west to s. Ontario, Manitoba, ND, and MT, south to NC, SC, GA, AL, LA, TX, n. Mexico, NM, and AZ. [= RAB, C, K, W, Z; > *Asclepias viridiflora* var. *viridiflora* – F; > *Asclepias viridiflora* var. *lanceolata* (Ives) Torrey – F; = *Acerates viridiflora* (Rafinesque) Pursh ex Eaton – G, S]

Asclepias viridis Walter. Cp (GA, SC), Mt (GA): prairies, dry woodlands; rare. 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, Z; = *Asclepiodora viridis* (Walter) A. Gray – S]

* *Asclepias curassavica* Linnaeus is cultivated as an ornamental and is sometimes slightly persistent. Kartesz (1999) reports it for TN. [= K, Z] {not keyed at this time; synonymy incomplete}

Asclepias tuberosa Linnaeus var. *interior* (Woodson) Shinners, Midwestern Butterfly-weed. East to MS, TN, KY, WV (Kartesz 1999). [= C; < *A. tuberosa* – F, S; = *A. tuberosa* Linnaeus ssp. *interior* Woodson – G, K, Z] {not keyed at this time}

Asclepias viridula Chapman, Southern Milkweed. Cp (GA): wet longleaf pine savannas and flatwoods, seepage slopes, pitcherplant bogs; rare. April-July. GA and AL south to FL. See Chafin (2000) for additional information. [= GW, K, S, Z] {not keyed at this time; synonymy incomplete}

Catharanthus G. Don (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. Cp (GA, NC, SC): disturbed areas, persistent after cultivation or as a waif or "throwout" after cultivation; rare, introduced from Madagascar, now a pantropical weed. May-October. *C. roseus* is the source of a powerful anti-leukemia drug. [= K, S, Z; = *Vinca rosea* Linnaeus – RAB]

Cynanchum Linnaeus (Swallow-wort)
(also see ***Seutera***)

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 cordate ..... ***C. laeve***
1 Leaves linear.
  2 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]***
  2 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. Cp (GA, NC, SC), Pd (SC, VA), Mt (GA, VA): bottomlands and disturbed areas; uncommon. July-August; October. Widespread (but rather scattered and irregular) in e. North America, from se. PA and KS south to sw. GA, w. FL, and c. TX. [= RAB, GW, K, W; = *Ampelamus laevis* (Michaux) Krings – Z; = *Ampelamus albidus* (Nuttall) Britton – C, F, G; = *Gonolobus laevis* Michaux – S]

Cynanchum scoparium Nuttall, Leafless Swallow-wort. Cp (GA, SC): coastal hammocks; rare (SC Rare). Se. SC south to 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; = *Amphistelma scoparia* (Nuttall) Small – S; ***Orthosia sp.***]

Funastrum
(see ***Seutera***)

Gonolobus Michaux (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, Eastern Anglepod. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC): mesic to wet forests and thickets; uncommon. 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 can 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; < *Vincetoxicum gonocarpos* Walter – S; > *Vincetoxicum suberosum* (Linnaeus) Britton – S; = *Matelea gonocarpa* – X; = *Gonolobus gonocarpus* – Z]

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]

Matelea Aublet (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 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.

4 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***

4 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***

3 Corolla lobes ascending; flower buds conical, > 2× as long as wide; corolla lobes 2.4-6.2× as long as wide.

5 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***

5 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].

6 Corolla lobes 2.4-3.6 (-4.0)× as long as wide, the widest part above the sinus; corolla dark maroon ..... ***M. decipiens***

6 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. Cp (GA): open forests on river bluffs, mesic margins of sandridges; rare (GA Threatened). April-June. Sw. and apparently se. GA, Panhandle FL, and s. AL. [= K, Z; *Cyclodon alabamense* (Vail) Small – S]

Matelea baldwyniana (Sweet) Woodson, White Spinypod. Cp (GA): dry to mesic bluffs over calcareous rocks; rare? 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, Z; = *Odontostephana baldwiniana* (Sweet) Alexander – S]

Matelea carolinensis (Jacquin) Woodson, Carolina Spinypod. Pd, Cp (GA, NC, VA), Mt (GA, VA): moist to dry, nutrient-rich forests; common (uncommon in VA Piedmont, rare in VA Mountains). 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. Pd (GA, NC, VA), Cp (NC): woodlands and thickets, generally over mafic (in the Piedmont) or calcareous rocks (in the Coastal Plain); rare (NC Rare, VA Rare). 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. Cp (GA, SC), Pd? (NC?): moist, nutrient-rich forests; rare (NC Watch List). May-June; August-October. E. NC (?) and e. SC south to panhandle FL, apparently rare throughout its range. [= RAB, K; = *Odontostephana flavidula* (Chapman) Alexander – S]

Matelea obliqua (Jacquin) Woodson, Northern Spinypod, Limerock Milkvine. Mt (GA, NC, VA), Pd (VA): in forests, woodlands, or thickets over calcareous rocks; uncommon (GA Special Concern, NC Watch List). June; 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 pubiflora (Dcne.) Woodson, Trailing Milkvine. Cp (GA): sand ridges, sandhills; rare (GA Rare). Late May-early August; mid-June-late September. E. GA (Jones & Coile 1988) south to ne. FL (Wunderlin 1998). [= K, Z; = *Edisonia pubiflora* (Dcne.) Small – S]

Nerium Linnaeus (Oleander)

A monotypic genus, a shrub, of Mediterranean Europe.

* ***Nerium oleander*** Linnaeus, Oleander. Cp (GA, NC, SC): frequently cultivated, especially on barrier islands (because of its salt resistance), sometimes persistent; rare, introduced from Mediterranean Europe. [= K, S]

Periploca Linnaeus (Silkvine)

* *Periploca graeca* Linnaeus, Silkvine, is sometimes cultivated and escaped or persistent; it is reported for various states adjacent to our area, as in Knox County, TN (Chester, Wofford, & Kral 1997). [= K]

Seutera E. Fournier 1882 (Swallow-wort)

A genus of 2-3 species (as newly circumscribed by Fishbein & Stevens), 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. Cp (GA, NC, SC): coastal hammocks, edges of marshes, generally or always on barrier islands; uncommon. 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; = *C. palustre* (Pursh) Heller – RAB; = *Lyonia palustris* (Pursh) Small – S; = *Funastrum angustifolium* (Persoon) Liede & Meve – Z]

Trachelospermum Lemaire (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: Sometimes mistaken at a glance for *Gelsemium* (both woody vines with opposite lanceolate leaves), but the milky sap of *Trachelospermum* provides an immediate identifying characteristic.

Trachelospermum difforme (Walter) A. Gray, Climbing Dogbane. Cp, Pd (GA, NC, SC, VA): bottomlands, swamp forests, marshes; common (uncommon in VA Piedmont). May-July; July-September. DE south to n. 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]

Vinca Linnaeus (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; 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; leaf margins not ciliate; flowers 2-3 cm across ..... ***V. minor***

* ***Vinca major*** Linnaeus, Greater Periwinkle. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas, suburban woodlands, around old house sites, persistent and spreading from cultivation; uncommon, introduced from Europe. Late February-May; June-July. [= RAB, C, F, G, K, S, W]
* ***Vinca minor*** Linnaeus, Common Periwinkle. Pd, Cp, Mt (GA, NC, SC, VA): disturbed areas, around old house sites and especially old cemeteries, persistent and spreading from cultivation; common, introduced from Europe. April-May; June-July. [= RAB, C, F, G, K, S, W]

AQUIFOLIACEAE Bartling 1830 (Holly Family)

A monogeneric family of about 500 species, nearly cosmopolitan.

Ilex Linnaeus 1753 (Holly, Winterberry, Gallberry)

A genus of about 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 well-developed apical (and usually also) marginal spines 2-6 mm long.
  - 3 Flowers in 1-few-flowered axillary cymes, on growth of the same year; [native tree of a wide variety of habitats] ..... ***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).
  - 4 Leaves crenate from base to apex, 0.5-4.5 cm long; calyx and corolla 4-lobed.
    - 5 Fruits black; [alien shrub, rarely naturalized, especially in suburban areas] ..... ***I. crenata***
    - 5 Fruits red or yellow; [native shrub of the Coastal Plain, sometimes planted and naturalized elsewhere]..... ***I. vomitoria***
  - 4 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.
    - 6 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.
      - 7 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***
      - 7 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***
    - 6 Fruits red or yellow; calyx and corolla 4-lobed; leaves entire (or with spinose serrations), lacking dark punctate dots beneath.
      - 8 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*** *var*. ***cassine***
      - 8 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.
- 9 Leaves entire, or nearly so; [of moist to wet sites, from WV northward] ..... ***[I. mucronata]***
- 9 Leaves toothed; [collectively widespread in our area].
  - 10 Leaves oblanceolate or obovate, broadest above the middle, 8-30 (-45) mm wide, narrowly cuneate basally, mostly 2-3× as long as wide.
    - 11 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.
      - 12 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***
      - 12 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***
    - 11 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.
      - 13 Upper leaf surface with trichomes throughout; sepals ciliate; leaf blades entire to shallowly crenate ..... ***I. cuthbertii***
      - 13 Upper leaf surface glabrous, or with trichomes confined to the veins or their vicinity; sepals eciliate; leaf blades crenate to distinctly serrate..... ***I. longipes***
  - 10 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.
    - 14 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***

14 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].
15 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***
15 Fruiting pedicels 2-9 mm long; fruit 5-9 (-12) mm in diameter, red to orange; [collectively of various habitats, widespread in our area].
16 Nutlets (5-) 6-8 per fruit, smooth on the 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.
17 Sepals glabrous (in flower or fruit), acute ..... ***I. laevigata***
17 Sepals ciliate (in flower or fruit), obtuse ..... ***I. verticillata***
16 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.
18 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***
18 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. Cp, Pd, Mt (GA, NC, SC): sandy upland forests, dry slope forests, rarely in pocosin ecotones in the fall-line sandhills region; uncommon (NC Watch List). 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 more Coastal Plain 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. Cp (GA, NC, SC): banks of blackwater creeks and rivers, clay-based Carolina bays; rare (GA Special Concern, NC Rare, SC Rare). 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 *var. **cassine***, Dahoon, Cassena. Cp (GA, NC, SC): blackwater stream swamps, pocosins, nearly always in very acid peaty or sandy sites; rare (NC Watch List). May-June; October-November. Primarily a Southeastern Coastal

Plain endemic: se. NC south to FL and west to se. TX; also in Cuba and Mexico. *I. cassine* var. *cassine* in our area is uniformly rather narrow-leaved, in contrast to further south. Some populations in our area show intergradation with or poor differentiation from *I. myrtifolia*, lending some credibility to their treatment as varieties. Var. *latifolia* Aiton occurs in FL. [= K; < *I. cassine* var. *cassine* – RAB; < *I. cassine* – GW, S, Y]

Ilex collina Alexander, Long-stalked Holly. Mt (NC, VA): 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); rare (NC Threatened, VA Endangered). 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; = *Nemopanthus collinus* (Alexander) R.C. Clark – C, W; < *I. longipes* – F, G]

Ilex coriacea (Pursh) Chapman, Big Gallberry, Sweet Gallberry. Cp (GA, NC, SC, VA), Pd (GA): pocosins, more restricted to wet, peaty sites than *I. glabra*; common (VA Rare). April-May; September-October. A Southeastern Coastal Plain endemic: se. VA south to FL and west to e. TX. [= RAB, C, F, G, GW, K, S, Y]

***** ***Ilex cornuta*** Lindley, Chinese Holly, Burford Holly. Pd (NC): escaped into forests in suburban areas; rare, native of China. Escaped from suburban plantings in AL, NC, and KY (Clark et al. 2005). [= K]

***** ***Ilex crenata*** Thunberg, Japanese Holly. Mt, Pd (NC): planted as a landscaping shrub, rarely escaped into forests in suburban areas; rare, native of Japan. First reported for NC by Pittillo & Brown (1988). [= K]

Ilex cuthbertii Small, Cuthbert Holly. Cp, Pd (GA, SC): upland circumneutral woodlands and forests; rare (GA Special Concern). 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. Cp (GA): floodplains and moist forests in the Suwanee River drainage; rare. 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. Pd, Cp (GA, NC, SC, VA), Mt (GA): floodplain forests, less commonly on mesic (or even dry), upland slopes; common. 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 Leon, 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. Cp (GA, NC, SC, VA), Pd (GA, NC): savannas, pine flatwoods, pocosin margins, swamps, primarily in wetlands, but extending upslope even into sandhills; common (rare in lower Piedmont). May-June; September-November. Nova Scotia and ME south to FL, west to TX. [= RAB, C, F, G, GW, K, S, Y]

Ilex laevigata (Pursh) A. Gray, Smooth Winterberry. Cp (NC, SC, VA): pocosins, other wet, acidic sites, such as in small blackwater stream swamps; uncommon. 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. Pd (GA, NC, SC), Mt (GA): upland forests; rare (NC Rare). 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. Mt (GA, NC, SC, VA), Pd (NC, VA): mesic forests, rarely bogs or bog edges; common (uncommon in upper Piedmont). 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, 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 myrtifolia Walter, Myrtle Holly. Cp (GA, NC, SC): limesink (doline) ponds, wet savannas; uncommon. May-June; October-November. A Southeastern Coastal Plain endemic: se. NC south to 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. ***opaca***, American Holly, Christmas Holly. Cp, Pd, Mt (GA, NC, SC, VA): in a wide variety of forests, ranging from xeric to wetland; common. April-June; September-October. Var. *opaca* is widespread in the southeastern United States, ranging north (mostly near the coast from MD north) to MA. This is our only species that becomes a medium to large tree. Var. *arenicola* (Ashe) Ashe is endemic to xeric sands of sand pine scrub in c. peninsular FL. [= GW, K, Y; < *I. opaca* – RAB, C, F, G, W; = *I. opaca* – S]

Ilex verticillata (Linnaeus) A. Gray, Winterberry. Mt, Pd, Cp (GA, NC, SC, VA): bogs, pocosins, swampy forests; common. April-May; September-November. Widespread in e. North America. [= RAB, GW, K, S, W, 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. Cp (GA, NC, SC, VA), Pd (GA, *NC): maritime forests, other dry sandy forests; common in the outer Coastal Plain, uncommon in VA, rare elsewhere, where probably introduced (VA Watch List). March-May;

October-November. Widespread in the Southeastern United States, primarily on the Coastal Plain, from e. VA (from Northampton County south) south to 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]

Ilex mucronata (Linnaeus) M. Powell, V. Savolainen, & S. Andrews, Nemopanthus. Bogs and moist, high-elevation forests. Newfoundland west to Ontario 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. Doubts as to the distinctiveness of *Nemopanthus* from *Ilex* have now been unequivocally answered (Powell et al. 2000; Manen, Boulter, & Naciri-Graven 2002). [= X; = *Nemopanthus mucronatus* (Linnaeus) Trelease – C, F, G, K]

Nemopanthus Rafinesque
(see *Ilex*)

ARALIACEAE A.L. de Jussieu 1789 (Ginseng Family)

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 compound with 3-many leaflets (or simple and then with 5-7 pointed lobes in *Kalopanax*), > 10 cm wide; herbs, shrubs, or trees; [tribe *Aralieae*].
    3 Leaves simple, palmately lobed ..... ***[Kalopanax]***
    3 Leaves compound
      4 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***
      4 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*).
        5 Plant a shrub, with prickles; fruit black..... ***[Eleutherococcus]***
        5 Plant an herb, lacking prickles; fruit red or yellow..... ***Panax***

Aralia Linnaeus (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; 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*] ..... ***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.
  2 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***
  2 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.
    3 Stem bristly toward its base; inflorescence a raceme or weak panicle of (2-) 5-25 umbels; [section *Hispidae*] .... ***A. hispida***
    3 Stem unarmed; inflorescence a compound panicle of 15-many umbels; [section *Aralia*]..... ***A. racemosa***

Aralia hispida Ventenat, Bristly Sarsaparilla. Mt (NC?, VA): rocky woodlands, cliffs, and clearings, primarily over acidic rocks (such as quartzite, granite, and sandstone); rare (NC Watch List, VA Rare). June-August. Labrador and Newfoundland west to Manitoba, 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), Pd (NC, VA), Cp (VA): upland forests and woodlands, rocky places, most typically in rather dry places, such as ridgetop forests; common (uncommon in Piedmont, rare in Coastal Plain) (GA Special Concern). May-July. Labrador and Newfoundland west to British Columbia, 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), Pd (NC, VA), Cp (VA): rich woodlands, trail margins and roadsides; uncommon (rare in Coastal Plain, locally common in Mountains of far sw. VA). June-August. New Brunswick and Québec 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, Pd, Mt (GA, NC, SC, VA): 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 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, W, X, Y, Z]

Eleutherococcus Maximowicz (Fiveleaf Aralia)

A genus of about 38 species, shrubs, of e. Asia. References: Frodin & Govaerts (2003)=Z.

* *Eleutherococcus sieboldianus* (Makino) Koidz., Fiveleaf Aralia, native to e. Asia, is 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 (Ivy)

A genus of 5-15 species, vines, distributed from Mediterranean Europe west to e. Asia. References: Graham (1966)=Y; Stace (1997)=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 (uncommonly seen and much less familiar) 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, introduced from the Caucasus. [= K, Q, V, X, Z]

* ***Hedera helix*** Linnaeus *var.* ***helix***, Common Ivy, English Ivy. Cp, Pd, Mt (GA, NC, SC, VA): persistent, established, and spreading around old home sites, in suburban woodlands and waste areas; uncommon, 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; = *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 (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 not peltate, a sinus extending to the attachment of the petiole.
- 2 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***
- 2 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.
  - 3 Fruiting umbels on peduncles 1-3 mm long; leaves 10-50 mm wide; [native of bogs, spray cliffs, and other wetlands] ..... ***H. americana***
  - 3 Fruiting umbels on peduncles 9-24 mm long; leaves 5-30 mm wide; [alien of lawns and other disturbed habitats].
    - 4 Leaves 5-lobed, 15-30 mm wide ..... ***H. bowlesioides***
    - 4 Leaves 7-lobed, 5-13 mm wide ..... ***H. sibthorpioides***

1 Leaves peltate, lacking a sinus extending to the attachment of the petiole.
- 5 Inflorescence umbellate; leaves 1-4 (-7) cm wide ..... ***H. umbellata***
- 5 Inflorescence verticillate or umbellate-verticillate (when first developing sometimes appearing merely umbellate); leaves 1-15 cm wide.
  - 6 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***
  - 6 Inflorescence verticillate, all the flowers borne sessile or on pedicels on the unbranched inflorescence axis; leaves 1-6 cm wide.
    - 7 Flowers and fruits pedicellate, the pedicels 1-10 mm long ..... ***H. prolifera***
    - 7 Flowers and fruits sessile or subsessile ..... ***H. verticillata***

Hydrocotyle americana Linnaeus, American Water-pennywort. Mt (NC, VA), Pd (VA): bogs, marshes, seepages, cliffs and ledges where wet by seepage or spray from waterfalls, sometimes roadside ditches; uncommon, rare south of VA (NC Watch List, SC Rare). June-September. Widespread in ne. North America, south to w. NC, SC, e. and c. TN, and IN. [= RAB, C, G, GW, K, MC, S, W]

Hydrocotyle bonariensis Lamarck, Dune Water-pennywort. Cp (GA, NC, SC, VA): dunes and moist sandy areas; uncommon, rare in VA (VA Rare). April-September. Widespread in South and Central America, north in North America to the Southeastern Coastal Plain, VA to FL and TX. [= RAB, GW, K, MC, S]

* ***Hydrocotyle bowlesioides*** Mathias & Constance. Cp (GA): lawns; rare, introduced from South America. See Anderson (1983) for discussion of the species' occurrence in Thomasville, Thomas Co. GA. [= K, MC; = *H. sibthorpioides* Lamarck var. *oedipoda* O. Degener & Greenwood]

Hydrocotyle prolifera Kellogg. Cp (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; < *H. verticillata* var. *verticillata* – F, more broadly circumscribed; > *H. australis* Coulter & Rose – S; > *H. canbyi* Coulter & Rose – S]

Hydrocotyle ranunculoides Linnaeus f., Swamp Water-pennywort. Cp (GA, NC, SC, VA), Mt, Pd (VA): stagnant to (less commonly) swiftly flowing waters of swamps pools, backwaters, blackwater streams; common. April-July. Widespread in North, Central, and South America. [= RAB, C, F, G, GW, K, MC, S, W]

* ***Hydrocotyle sibthorpioides*** Lamarck, Lawn Water-pennywort. Pd, Cp (GA, NC, VA): lawns; rare, introduced from Asia and Africa. March-September. Apparently becoming more common as a lawn weed. [= RAB, C, F, G, K, MC]

Hydrocotyle umbellata Linnaeus, Marsh Water-pennywort. Cp, 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]

Hydrocotyle verticillata Thunberg. Cp (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; < *H. verticillata* var. *verticillata* – F, more broadly circumscribed]

Kalopanax Miquel 1863

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 (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, Pd (GA, NC, SC, VA), Cp (GA, NC, VA): cove forests, mesic hardwood forests, generally in nutrient-rich forests though tending to avoid the richest coves; uncommon (GA Special Concern, NC Watch List/Special Concern, SC Rare, VA Watch List/Threatened). May-June; August-October. Québec 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 $500 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*. [= RAB, C, F, G, K, S, W, Y, Z]

Panax trifolius Linnaeus, Dwarf Ginseng. Mt (GA, NC, VA), Pd (NC, VA), Cp (VA): cove forests, bottomland forests, other nutrient-rich forests; uncommon, rare south of VA (GA Special Concern, NC Rare). April-June; August-October. Nova Scotia and Québec west to MN, south to PA, e. VA, c. NC, nc. GA, ec. TN, IN, and IA. [= RAB, C, F, G, K, S, W, Y, Z]

ARISTOLOCHIACEAE A. L. de Jussieu 1789 (Birthwort Family)

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 *Aristochieae*].
  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 (Birthwort)
(see *Endodeca* and *Isotrema*)

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).

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

Asarum Linnaeus (Wild Ginger)
(see *Hexastylis*)

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

1 Calyx lobes 10-35 mm long, spreading to ascending from the base, acuminate to caudate, the tubular tips 4-20 mm long ..... ***A. canadense* var. *canadense***

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. canadense* var. *reflexum***

Asarum canadense Linnaeus ***var. canadense***, Common Wild Ginger. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): rich deciduous forests in circumneutral soils; common (uncommon in Piedmont in NC and SC, uncommon in VA Coastal Plain, rare in Coastal Plain in NC and SC). April-May. New Brunswick and Québec west to MN, south to NC, AL, and n. LA. The varieties have often been ignored, but have some merit; they deserve further attention. *A. canadense* Linnaeus var. *acuminatum* Ashe is alleged to differ in having long-caudate calyx lobes 15-35 mm long (vs. 10-25 mm long), the tubular portion 10-20 mm long (vs. 4-10 mm long. [= C, G; < *A. canadense* – RAB, FNA, K, W; > *A. canadense* Linnaeus var. *acuminatum* Ashe – F; > *A. canadense* var. *ambiguum* (Bicknell) Farwell – F; > *A. canadense* var. *canadense* – F; > *A. canadense* – S; > *A. acuminatum* (Ashe) Bicknell – S; > *A. rubrocinctum* Peattie – S]

Asarum canadense Linnaeus ***var. reflexum*** (Bicknell) B.L. Robinson. Mt (NC, VA?): rich deciduous forests in circumneutral soils; rare? April-May. CT west to s. Manitoba, south to w. NC, KY, and MO. [= C, F, G; < *A. canadense* – RAB, FNA, K, W; = *A. reflexum* Bicknell – S]

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. Pd, Cp, Mt (GA, NC, SC, VA): dry to mesic forests, perhaps more restricted to mesic situations over acidic substrate, ranging into drier situations over calcareous or mafic substrates; common. May-June; June-July. CT and NY west to IL, MI, and MO, south to 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; > *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. 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 taxonomy presented, insofar as results are available (R. Wyatt, pers. comm.). 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: 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 readily identifiable. 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.

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 cylindrical to narrowly cylindro-urceolate.

7 Calyx tube cylindrical to narrowly cylindro-urceolate; calyx lobes 2-4 mm long, erect to slightly spreading.... ..... ***H. virginica***

7 Calyx tube cylindrical, calyx lobes 4-15 mm long, moderately spreading to reflexed.

8 Calyx tube longer than wide.

9 Calyx tube orifice 8-12 mm wide; floral opening > 1/2 the lobe length; calyx lobes 6-17 mm wide; ovary superior; leaves typically not variegated ..... ***H. heterophylla***

9 Calyx tube 4-8 mm wide; floral opening < 1/2 the lobe length; calyx lobes 4-7 mm wide; ovary half-inferior; leaves typically variegated..... ***H. naniflora***

8 Calyx tube about as wide as long (at widest point) or wider than long, flared.

10 Tube about as wide as long; opening width < the lobe length..... ***H. heterophylla***

10 Tube wider at flare than long; opening width > the lobe length ..... ***H. minor***

6 Calyx tube broadly urceolate-campanulate or rhombic-ovate (broadest near the middle).

11 Calyx tube urceolate-campanulate; calyx lobes 10-22 mm wide at base.

12 Leaves scattered along the length of the rhizome; [of Coastal Plain and lower Piedmont of GA and AL] . ..... ***H. shuttleworthii* var. *harperi***

12 Leaves clustered at the tip of the rhizome; [of the Mountains and upper Piedmont of VA, NC, SC, and GA] ..... ***H. shuttleworthii* var. *shuttleworthii***

11 Calyx tube rhombic-ovate (broadest near the middle); calyx lobes 3-8 mm wide at base.

13 Internal ridged reticulation an open network raised < 1 mm or absent..... ***H. contracta***

13 Internal ridged reticulation a close network raised 1.5-2 mm..... ***H. rhombiformis***

Hexastylis arifolia (Michaux) Small var. ***arifolia***, Little Brown Jug, Arrowleaf Heartleaf. Pd, Cp, Mt (GA, NC, SC, VA): dry to mesic deciduous forests; common (VA Watch List). March-May. Se. VA, sw. VA, se. TN, and n. AL south to 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* var. *arifolium* – X]

Hexastylis arifolia (Michaux) Small *var. **callifolia*** (Small) Blomquist. Cp (GA): mesic forests; rare. March-May. Sw. GA 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 var. *callifolium* (Small) Barringer – X]

Hexastylis arifolia (Michaux) Small var. ***ruthii*** (Ashe) Blomquist, Appalachian Little Brown Jug. Mt (GA, NC, VA): upland forests, ultramafic outcrop barrens; uncommon (VA Watch List). 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*. [= C, FNA, K, W, Y, Z; < *H. arifolia* – RAB; = *Asarum ruthii* Ashe – F; = *H. ruthii* (Ashe) Small – G, S; = *Asarum arifolium* var. *ruthii* (Ashe) Barringer – X]

Hexastylis contracta Blomquist, Mountain Heartleaf. Mt (NC, VA): on acidic soils in deciduous forests with *Kalmia latifolia* and *Rhododendron maximum*; rare (US Species of Concern, NC Endangered). 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*)]

Hexastylis heterophylla (Ashe) Small, Variable-leaf Heartleaf. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): slopes and bluffs in xeric to mesic forests, usually associated with *Kalmia latifolia*; common. 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]

Hexastylis lewisii (Fernald) Blomquist & Oosting, Lewis's Heartleaf. Pd, Cp (NC, VA): upland forests (pine or oak), pocosin ecotones; rare (NC Rare, VA Watch List). 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. Pd (NC, SC, VA), Mt (VA), Cp (NC): upland or moist forests, pocosin margins; common (VA Watch List). February-May. Endemic to the Piedmont and adjacent Coastal Plain and Mountains of nc. VA, NC, and nc. SC. The pocosin ecotone plants of the Sandhills are under study by Gaddy and may be recognized as a separate taxon. [= RAB, FNA, K, W, Z; < *Asarum virginicum* Linnaeus – F; < *H. virginica* – C, G; = *Asarum minus* Ashe; = *Hexastylis minus* – Y, a grammatical error]

Hexastylis naniflora Blomquist, Dwarf-flower Heartleaf. Pd (NC, SC): acidic, sandy loam on bluffs and ravines in deciduous forests, frequently associated with *Kalmia latifolia*; rare (US Threatened, NC Endangered, SC Rare). March-June. Endemic to the upper Piedmont of s. NC and n. SC. [= RAB, FNA, K, W, Y, Z; < *H. virginica* – C]

Hexastylis rhombiformis Gaddy, French Broad Heartleaf. Mt (NC, SC): in deciduous forests on sandy river bluffs or in ravines with *Kalmia latifolia* and *Rhododendron maximum*; rare (US Species of Concern, NC Rare). 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]

Hexastylis shuttleworthii (Britten & Baker f.) Small *var. **harperi*** Gaddy, Harper's Heartleaf. Cp, Pd (GA): bogs, acid hammocks; rare (GA Special Concern). 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. Mt (GA, NC, SC, VA), Pd (GA, VA): acidic soils in deciduous and deciduous-coniferous forests, often along creeks under *Rhododendron maximum*; uncommon (VA Rare). May-July. Endemic to the Southern Appalachians: w. VA south through w. NC and e. TN to nw. SC, n. GA, and ne. AL. [= FNA, K, Z; < *H. shuttleworthii* – RAB, G, S, W, Y; < *H. shuttleworthii* – C (also see *H. lewisii)*; < *Asarum shuttleworthii* Britten & Baker – F; = *Asarum shuttleworthii* var. *shuttleworthii* – X]

Hexastylis virginica (Linnaeus) Small, Virginia Heartleaf. Cp (NC, SC, VA), Pd (NC, VA), Mt (GA, NC, VA): upland forests; common (uncommon in Mountains). 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 memmingeri* Ashe – F; < *H. virginica* – G; > *H. virginica* – S; > *H. memmingeri* (Ashe) Small – S]

Hexastylis speciosa R.M. Harper. 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]

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] ..... ***A. macrophylla***
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] ..... ***A. tomentosa***

Isotrema macrophylla (Lamarck) C.F. Reed, Pipevine, Dutchman's-pipe. Mt (GA, NC, SC, VA): cove forests and other mesic mountain forests; common. 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 tomentosa (Sims) C.F. Reed, Woolly Dutchman's-pipe, Pipevine. Cp (GA, SC), Mt* (NC*) {VA}: floodplain forests, disturbed areas; uncommon, native in GA and SC, apparently introduced only in NC (SC Rare). 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]

ASCLEPIADACEAE
(see *APOCYNACEAE*)

ASTERACEAE Dumortier 1822 or ***COMPOSITAE*** Giseke 1792 (Aster Family)

A family of about 1500-1600 genera and 20,000-25,000 species, shrubs, herbs, trees, and vines, cosmopolitan. References: Cronquist (1980)=SE throughout family treatment.

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 (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (SC): disturbed areas; common (rare in VA), introduced from South America. May-November. [= RAB, C, F, FNA, G, K, S, SE]

* ***Acanthospermum hispidum*** Augustin de Candolle. Cp (GA, SC): disturbed areas, gardens; uncommon, introduced from n. South America. July-November. First reported from South Carolina by Hill & Horn (1997). [= FNA, K, S, SE]

* ***Acanthospermum humile*** (Sw.) Augustin de Candolle, Low Starbur. Cp (SC): disturbed areas; rare, introduced from the West Indies. Reported for SC by Nelson (2003). [= FNA, K, S, SE; = *Melampodium humile* Swartz]

Achillea Linnaeus (Yarrow)

A genus of about 115 species, herbs, primarily Eurasian. References: Cronquist (1980)=SE; Arriagada & Miller (1997)=Z; Trock in FNA (2006a).

1 Leaves pinnately dissected into linear segments.....***A. millefolium***
1 Leaves serrate to almost entire.....***[A. ptarmica]***

Achillea millefolium Linnaeus, Yarrow, Thousandleaf. Mt, Pd, Cp (GA, NC, SC, VA): grassy balds, roadsides, disturbed areas; common. April-November. Circumboreal (as here broadly treated). A taxonomically very complex entity, with races of different ploidies, 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. [= 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, Z; > *A. millefolium* var. *millefolium* – K; > *A. millefolium* var. *occidentalis* de Candolle – K]

* *Achillea ptarmica* Linnaeus, Sneezeweed, Sneezewort, native of Eurasia, is naturalized south to WV and scattered sites in PA (Rhoads & Klein 1993). [= C, F, FNA, G, K, Z]

Acmella L.C. Richard ex Persoon (Spotflower)

A genus of about 30 species, herbs, primarily of tropical distribution. References: Jansen (1985)=Z; Strother in FNA (2006c); Cronquist (1980)=SE.

1 Heads discoid.....***A. pusilla***
1 Heads radiate.
  2 Leaves linear to lanceolate; petioles 2-4.5 mm long; outer series of phyllaries narrowly to broadly ovate, the apex acute .....***A. pusilla***
  2 Leaves narrowly to broadly ovate; petioles (3-) 5-43 mm long; outer series of phyllaries lanceolate, the apex acuminate .....***A. repens***

* ***Acmella pusilla*** (Hooker & Arnott) R.K. Jansen, Argentine Spotflower. Cp (GA, NC, SC): 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 and Savannah, GA, and perhaps not well-established. [= FNA, K, Z]

Acmella repens (Walter) L.C. Richard in Persoon, Creeping Spotflower. Cp (GA, NC, SC), Pd (NC, SC): floating vegetation mats, roadsides, streambanks, other moist, open, habitats; rare (NC Watch List). 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* (4X, and

the only taxon out of 39 native to North America) separates rather well from *A. oppositifolia* (2X - 6X). 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, Z]

Acroptilon Cassini 1827 (Russian Knapweed)

A monotypic genus, native of Eurasia. References: Keil in FNA (2006a).

* ***Acroptilon repens*** (Linnaeus) de Candolle. (VA). Reported for VA in FNA. [= FNA, K; = *Centaurea repens* Linnaeus – C, F, G]

Ageratina Spach (Milk-poison, White Snakeroot)

A genus of about 250-290 species, American. The separation of *Ageratina* from *Eupatorium* is controversial, but now appears 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, Pd, Cp (GA, NC, SC, VA): moist forests, such as cove forests; common (uncommon in Coastal Plain). Late July-October. *A. altissima* var. *altissima* ranges from Québec west to se. ND, south to Panhandle Florida 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*) – 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. This variety is endemic to moderate to high elevations of the Southern Appalachians, from nw. VA south to w. SC, n. GA, e. TN, e. KY, and probably nw. 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, Pd, Mt (GA, NC, SC, VA): woodlands and forests, usually xeric, and often fire-maintained, also woodland edges; common (uncommon in Piedmont and Mountains). Late August-October. Widespread in e. North America. 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, 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 (GA): sandhills, dry pinelands, and subxeric hardwood hammocks; uncommon. Se. GA south to s. FL. [= FNA, K, Z; = *Eupatorium jucundum* Greene – S, SE]

Ageratina luciae-brauniae (Fernald) King & H.E. Robinson, Rockhouse White Snakeroot, is endemic to the Cumberland Plateau of ne. TN (Chester, Wofford, & Kral 1997) and se. KY, where it occurs at the base of sandstone cliffs (usually overhanging) in seepage or splash. It might conceivably occur at the base of cliffs in sw. VA or nw. NC. 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 (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]
* ***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]

Amblyolepis Augustin de Candolle (Huisache-daisy)

A monotypic genus, an annual herb, native of Texas and n. Mexico. References: Bierner in FNA (2006c).

* ***Amblyolepis setigera*** Augustin de Candolle. Cp (SC): wool-combing mill waif (Nesom 2004d); rare, introduced from TX-Mexico. [= FNA, K]

Ambrosia Linnaeus (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, Pd, Cp (GA, NC, SC, VA): roadsides, gardens, disturbed soils, thin soils on rock outcrops; common. August-November. Widespread in e. North America. [= 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); {SC, VA}: mafic woodlands; uncommon. August-November. 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 Augustin de Candolle, Perennial Ragweed. Cp (NC, SC), Pd (VA), {GA}: loamy sandy soil of flats and slight depressions in periodically burned longleaf pine uplands, also in disturbed areas; uncommon. September-November. Recorded from Anson, Hoke, Jones, Moore, Richmond, and Scotland cos. NC, and Aiken, Georgetown, and Kershaw cos. SC. Primarily western and midwestern, but scattered along eastern seaboard states (ME, NH, NY, NC, SC, GA, FL). Apparently first collected in VA in 2000. [= C, FNA, G, K, SE; > *A. psilostachya* – RAB; > *A. rugelii* Rydberg – RAB, S; > *A. psilostachya* var. *coronopifolia* (Torrey & Gray) Farwell – F]

Ambrosia sp. 1. Under investigation by P. McMillan and colleagues at CLEMS. {not keyed at this time}

Ambrosia trifida Linnaeus *var.* ***trifida***. Mt, Pd, Cp (GA, NC, SC, VA): floodplains, moist pastures; disturbed ground; common (uncommon in VA Coastal Plain, rare in Coastal Plain south of VA). July-November. Widespread in e. North America. [= C, F, G; < *A. trifida* var. *trifida* – K; < *A. trifida* – RAB, FNA, SE; = *A. trifida* – S]

Ampelaster Nesom (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 (GA, NC, SC): swamps, thickets, marshes, streambanks; uncommon (NC Rare). 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]

Amphiachyris (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*** (Augustin 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* (Augustin de Candolle) Blake – F, G, SE; = *Xanthocephalum dracunculoides* (Augustin de Candolle) Shinners]

Anaphalis Augustin de Candolle (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): dry open places, probably persistent from cultivation in NC, seemingly native in VA; rare (VA Rare). July-September. Interruptedly circumboreal, in North America from Labrador and 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, G, K, S, SE, W, Z; > *A. margaritacea* var. *angustior* (Miquel) Nakai – F; > *A. margaritacea* var. *intercedens* Hara – F]

Antennaria Gaertner (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? Newfoundland wet to Yukon, 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, Pd (NC, VA): dry woodlands. 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): dry woodlands; rare (NC Watch List, VA Watch List). March-May. Newfoundland west to British Columbia, 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 (NC, VA), Mt (VA): dry woodlands and fields. Nova Scotia west to North West Territory, south to VA, KY, AR, OK, and CO. [= 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, Cp, Mt (NC, VA), {GA, SC}: dry woodlands; common. Late March-early May. Nova Scotia 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, Pd, Cp? (NC, VA), {GA}: woodlands, roadbanks; common. Late March-early May. Nova Scotia west to Saskatchewan, 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, Mt, Cp (NC, VA), {GA, SC}: dry woodlands; common. Late March-early May. Nova Scotia west to Saskatchewan, south to FL, AL, MS, AR, and OK. [= FNA, K, W, X, Z; = *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. Pd, Mt, Cp (NC, VA), {GA, SC}: forests and woodlands, often mesic; uncommon. Late March-early May. VA, WV, sw. PA, and s. IN south to FL, GA, LA, and OK. [= RAB, C, F, FNA, G, K, S, SE, W, X, Z]

Antennaria virginica Stebbins, Shale-barren Pussytoes. Mt, Pd (VA): shale barrens and other dry, rocky habitats; uncommon. C. PA and w. VA west to OH. [= 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 (Chamomille)

(also see *Chamaemelum, Cota*)

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.

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, Pd, Cp (GA, NC, SC, VA): roadsides, disturbed areas; common. 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, Z; > *A. arvensis* var. *arvensis* – F, K; > *A. arvensis* var. *agrestis* (Wallroth) Augustin de Candolle – F, K]
* ***Anthemis cotula*** Linnaeus, Mayweed, Stinking Chamomille, Mayweed, Dog-fennel. Mt, Pd, Cp (GA, NC, SC, VA): roadsides, disturbed areas; uncommon. May-July. [= RAB, C, F, FNA, G, K, SE, W, Z; = *Maruta cotula* (Linnaeus) Augustin de Candolle – S]
* ***Anthemis secundiramea*** Bivona-Bernardi. Cp (VA): railroad embankment; rare, introduced from Mediterranean Europe, probably not established. [= C, F, FNA, K, SE]

Arctium Linnaeus (Burdock)

A genus of about 11 species (though circumscription remains uncertain), herbs, of the temperate Old World. References: 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. Mt (NC): fields and roadsides; rare, introduced from Eurasia. July-November. [= RAB, C, F, FNA, G, K, SE, Z]
* ***Arctium minus*** Bernhardi, Common Burdock. Mt (GA, NC, SC), Pd (NC, SC, VA), Cp (SC, VA): pastures, barnyards, roadsides, other disturbed areas; common (uncommon in Piedmont and Coastal Plain), introduced from 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 (African-daisy)

References: McKenzie et al. (2006).

* *Arctotis stoechadifolia* Berg., African-daisy, in SC. {specimen at NCU} [= K]

Arnica Linnaeus (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, Pd (GA, NC, SC, VA): pine savannas, sandhills, clayey or sandy woodlands; common (uncommon in sandhills). Late March-early June. DE 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 H.E. Robinson (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 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] ..... ***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 gtreenish 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 atriplicifolium (Linnaeus) H.E. Robinson, Pale Indian-plantain. Mt, Pd, Cp (GA, NC, SC, VA): mesic forests, woodland edges, clearings; common. June-October. The species is widespread in e. North America. [= FNA, K, 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 (GA): calcareous swamps; rare (GA Threatened). Sw. GA and Panhandle FL, west to s. AL; disjunct in nw. peninsular FL. May-August; July-September. [= FNA, GW, K, Y, Z; = *Mesadenia diversifolia* (Torrey & A. Gray) Greene – S; = *Cacalia diversifolia* Torrey & A. Gray – SE, U, X]

Arnoglossum ovatum (Walter) H.E. Robinson *var.* ***lanceolatum*** (Nuttall) D.B. Ward, Savanna Indian-plantain. Cp (GA, NC, SC): wet savannas, especially over coquina limestone ("marl"); rare (NC Rare). Late July-October. Se. NC to FL, west to e. TX. [= Q; < *Arnoglossum ovatum* – FNA, GW, K, 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, 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, Y, Z; < *Cacalia ovata* Walter – SE, U; > *Mesadenia elliottii* 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): cove forests, other mesic forests; common (VA Rare). June-October. The very large, reniform leaves (sometimes up to 80 cm across) are conspicuous in rich cove forests. The species is widespread in e. North America, south to n. GA (Jones & Coile 1988). [= FNA, Y, Z; = *Arnoglossum muehlenbergii* – K; = *Cacalia muhlenbergii* (Schultz-Bipontius) Fernald – RAB, C, F, G, SE, U, V, W; = *Mesadenia reniformis* Rafinesque – S; = *Arnoglossum reniforme* (Hooker) H.E. Robinson – Y, Z]

Arnoglossum sulcatum (Fernald) H.E. Robinson, Grooved-stem Indian-plantain. Cp (GA): bottomland forests; rare (GA Special Concern). Sw. GA and Panhandle FL west to s. AL. [= FNA, GW, K, Y, Z; = *Mesadenia sulcata* (Fernald) Harper – S; = *Cacalia sulcata* Fernald – SE, U, X]

Arnoglossum album L.C. Anderson. FL Panhandle (Bay and Gulf counties). [= FNA, K, Z]

Arnoglossum floridanum (A. Gray) H.E. Robinson. FL Panhandle and Peninsula. [= FNA, K, Z; = *Cacalia floridana* A. Gray – SE, U, X; = *Mesadenia floridana* (A. Gray) Greene – S]

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). [= 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 to include the segregate *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? (NC): disturbed areas; rare, introduced from Eurasia. August-September. [= C, F, FNA, G, K, S, SE, Y, Z]

* ***Artemisia absinthium*** Linnaeus, Common Wormwood, Absinthium, Absinthe. Pd? (NC), {SC}: disturbed areas; rare, introduced from Europe. July-September. [= C, F, FNA, G, K, S, SE, Y, Z; > *A. absinthium* var. *insipida* Stechmann]

* ***Artemisia annua*** Linnaeus, Sweet Wormwood, Annual Mugwort, Sweet Annie. Cp (SC, VA), Pd, Mt (VA), {NC?}: roadsides, disturbed areas, wool-combing waste (Nesom 2004d); uncommon, introduced from Asia and e. Europe. August-November. [= C, F, FNA, G, K, S, SE, Y, Z]

* ***Artemisia biennis*** Willdenow *var. biennis*, Biennial Wormwood. Cp (SC): waste area around wool-combing mills; rare, introduced from the w. United States. Reported 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, 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 (NC, SC, VA), Cp (NC, VA), Mt (VA), {GA}: roadsides, disturbed areas; common, introduced from western North America. Late August-November. [> 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 stelleriana*** Besser, Beach Wormwood, Dusty Miller, Hoary Mugwort. Cp (NC, VA): sandy roadsides, dunes; rare, introduced from 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, Z; = *A. stellerana* – Y, orthographic variant]

* ***Artemisia vulgaris*** Linnaeus, Mugwort, Felon Herb. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, VA): roadsides, pastures, disturbed areas; common, introduced from Eurasia. Late August-November. [= RAB, C, FNA, S, SE, Y, Z; > *A. vulgaris* var. *vulgaris* – F, K]

* *Artemisia pontica* Linnaeus, Roman Wormwood, Green-ginger, native of Europe, is naturalized at least as far south as DE, se. PA (Rhoads & Klein 1993), and KY. [= C, F, FNA, K] {synonymy incomplete}

Aster Linnaeus (Aster)
(also see *Ampelaster, Doellingeria, Eurybia, Ionactis, Oclemena, Sericocarpus, Symphyotrichum*)

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); R. Jones (1983)=Z; Lamboy (1987)=Y; Nesom (1994)=X; Semple, Heard, & Xiang (1996); Cronquist (1980)=SE; R. Jones (1992); Lamboy (1992); Nesom (1997); Xiang & Semple (1996).

* ***Aster tataricus*** Linnaeus f., Tartarian Aster. Pd (NC, VA), Mt (GA, VA), Mt (VA): frequently cultivated, sometimes persisting or weakly spreading; rare, introduced from 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): limestone glades; rare (GA Special Concern). 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 (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 (GA, NC, SC): interdune swales, wet hammocks, marsh edges; rare (NC Watch List). September-October. Ne. NC (Dare County) south to s. FL, west to LA; Bahamas. [= RAB, FNA, GW, K, S, SE]

Baccharis glomeruliflora Persoon. Cp (GA, NC, SC): wet hammocks, marsh edges, interdune swales; rare (NC Rare). October-November. Se. NC (Brunswick County) south to s. FL, west to MS; West Indies. [= RAB, FNA, GW, K, S, SE]

Baccharis halimifolia Linnaeus, Silverling, High-tide Bush, Mullet Bush, Groundsel Tree. Cp, 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. [= RAB, C, F, FNA, G, GW, K, S, SE]

Baccharis dioica Vahl, Broombush False-willow. Dunes and shores. S. AL; s. FL; West Indies. [= FNA, K, S, SE]

Balduina Nuttall (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; leaves primarily cauline, stem much branched ..... ***B. angustifolia***
1 Plant a perennial; leaves primarily basal, stem unbranched or with only a few branches.
  2 Disk corollas purple; basal leaves linear-spatulate, (7-) ca. 14 (-32) cm long, 0.4-1 cm wide; stem base reddish ..... ***B. atropurpurea***
  2 Disk corollas yellow; basal leaves spatulate, (5-) ca. 7.5 (-11) cm long, 0.5-1.3 cm wide; stem base greenish ..... ***B. uniflora***

Balduina angustifolia (Pursh) B.L. Robinson. Cp (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, Z; = *Actinospermum angustifolium* (Pursh) Torrey & A. Gray – S]

Balduina atropurpurea Harper, Bog Honeycomb-head, Purple Honeycomb-head, Purple Balduina. Cp (GA, NC, SC): peaty seepage bogs and wet pine savannas; rare (US Species of Concern, GA Rare, NC Rare, SC 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* (Harper) Small – S]

Balduina uniflora Nuttall, Savanna Honeycomb-head, Yellow Balduina. Cp (GA, NC, SC): wet pine savannas and pine flatwoods; uncommon (SC Rare). Late July-September. A southeastern Coastal Plain endemic: se. NC and immediately adjacent ne. SC, apparently absent from much of SC, 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 (English Daisy)

A genus of about 8 species, herbs, of Europe. References: Nesom (2000b); Cronquist (1980)=SE.

* ***Bellis perennis*** Linnaeus, English Daisy. Mt (NC, VA), Pd, Cp (VA): lawns, grassy roadsides; rare, introduced from Europe. April-May. [= RAB, C, F, G, K, SE]

Berlandiera Augustin de Candolle (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.

Berlandiera pumila (Michaux) Nuttall, Eastern Green-eyes. Cp (GA, SC): sandhills, disturbed sandy areas; common. Late May-November. Nc. SC south to n. FL, west to s. AL; w. LA to c. TX . Plants in w. LA and e. TX termed *B. pumila* var. *scabrella* Nesom & Turner may represent introgression between *B. pumila* and *B. texana* de Candolle (Pinkava in FNA 2006c). [= RAB, FNA, S, SE; = *B. pumila* var. *pumila* – K, Z]

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 6-16 mm long; cypselas 2-awned..... ***B. alba*** *var*. ***radiata***
4 Ray florets 0 (or if a few present, the ligule < 3 mm long); cypselas 3 (-5)-awned..... ***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 **either** 1-pinnately compound, the 3-5 (-7) leaflets petiolulate, or -1-2× pinnately lobed.
6 Ray florets 0, or rays 1-3, the laminae 2-3.5 mm long.
7 Calyculus bractlets (3-) 4 (-5), seldom ciliate; disc florets usually 10-20 ..... ***B. discoidea***
7 Calyculus bractlets 5-21, usually ciliate; disc florets 20-150.
8 Calyculus bractlets (5-) 8 (-10); leaves usually 3 (-5)-foliolate ..... ***B. frondosa***
8 Calyculus bractlets 10-16 (-21); leaves usually laciniate or pinnatisect ..... ***B. vulgata***
6 Ray florets (5-) 8-13, the laminae 10-30 mm long.
9 Cypselas 2.5-4× as long as wide..... ***B. trichosperma***
9 Cypselas 1.5-2 (-2.5)× as long as wide.
10 Cypselas 2.5-5 mm long, the margins not winged, barbed, or ciliate ..... ***B. mitis***
10 Cypselas (4-) 5-8 mm long, the margins usually barbed or ciliate, and often also corky-winged.
11 Calyculus bractlets 8-12 (-16), these (4-) 5-7 (-12) mm long ..... ***B. aristosa***
11 Calyculus bractlets 12-21, these (6-) 8-12 (20) mm long ..... ***B. polylepis***
5 Most leaves simple, the margins dentate to serrate or incised (with 3-7 lobes).

cernua
laevis
tripartita
connata
mitis
[bidentoides]
[eatonii]

Bidens alba (Linnaeus) Augustin de Candolle *var*. ***radiata*** (Schultz Bipontinus) Ballard ex T.E. Melchert. Cp (GA, NC, SC): disturbed areas; uncommon, adventive from the New World tropics. [= K, Y; < *B. pilosa* Linnaeus – RAB, FNA, S, SE; = *B. pilosa* Linnaeus var. *radiata* Schultz Bipontinus – Z]

* ***Bidens aristosa*** (Michaux) Britton, Midwestern Tickseed-sunflower. Cp, Pd (NC, SC, VA), Mt (GA, NC, SC): [= 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 bipinnata Linnaeus, Spanish Needles. Cp, Pd, Mt (GA, NC, SC, VA): [= RAB, C, F, FNA, G, K, S, SE, W; > *B. bipinnata* var. *bipinnata* – Z]

Bidens cernua Linnaeus, Bur-marigold. Mt (GA, NC, VA), Pd (VA), Cp (GA, VA): marshes, ditches; [= 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 connata Muhlenberg, Purplestem Beggar-ticks. Mt (GA), ? (NC?): South to NC according to C and S; included in *B. tripartita* by RAB. [= 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, Pd (GA, NC, SC, VA), Mt (GA, VA): [= RAB, C, F, FNA, G, GW, K, S, SE, W, Z]

Bidens frondosa Linnaeus, Devil's Beggar-ticks. Cp, Pd, Mt (GA, NC, SC, VA): [= RAB, C, FNA, G, GW, K, S, SE, W; > *B. frondosa* var. *frondosa* – F, Z; > *B. frondosa* var. *anomala* Porter – Z]

Bidens laevis (Linnaeus) Britton, Sterns, & Poggenburg, Showy Bur-marigold. Cp (GA, NC, SC, VA), Pd (NC, VA), Mt (VA): marshes, ditches; [= RAB, C, F, FNA, G, GW, K, SE, W, Z; > *B. laevis* – S; > *B. nashii* Small – S]

Bidens mitis (Michaux) Sherff, Coastal Plain Tickseed-sunflower. Cp (GA, NC, SC), Pd (GA), Mt (NC): [= RAB, C, F, FNA, G, GW, K, SE, W, Z; > *B. mitis* var. *leptophylla* (Nuttall) Small – S; > *B. mitis* var. *mitis* – S]

* ***Bidens pilosa*** Linnaeus. Cp (GA?, SC): waste areas near wool-combing mill; rare, introduced from tropical America. Also reported for NC (Kartesz 1999). Known from ballast in se. PA (Rhoads & Klein 1993). [= FNA, K; > *B. pilosa* var. *pilosa* – Z; > *B. pilosa* Linnaeus var. *bimucronata* (Turczaninov) Schultz Bipontinus – Z]

* ***Bidens polylepis*** Blake, Ozark Tickseed-sunflower. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): [= 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 (GA, NC, VA): tidal marshes; [= 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 tripartita*** Linnaeus. {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*)]

Bidens comosa (A. Gray) Wiegand, Strawstem Beggar-ticks. [B. comosa (A. Gray) Wiegand – C, F, G, S; < *B. tripartita* – RAB, FNA, K]

Bidens vulgata Greene, Tall Beggar-ticks. Mt (NC, SC, VA), Pd (NC, VA), Cp (VA): [= 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. 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 bidentoides (Nuttall) Britton occurs on tidal shores and mudflats from NY south to se. PA and e. MD. [= C, FNA, G, K; > *B. bidentoides* – F; > *B. mariana* Blake – F; > *B. bidentoides* var. *bidentoides* – Z; > *B. bidentoides* var. *mariana* – Z]

Bigelowia Augustin de Candolle (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 4-14 mm wide; plants cespitose, or weakly rhizomatous; [of wet pine savannas].....***B. nudata*** *var.* ***nudata***
1 Basal leaves 1-2 mm wide; plants strongly rhizomatous and colonial; [of dry clayey or rocky places] ..... ***[B. nuttallii]***

Bigelowia nudata (Michaux) Augustin de Candolle *var.* ***nudata***, Rayless-goldenrod. Cp (GA, NC, SC): savannas, pine flatwoods, pocosin edges; common. August-October. A Southeastern Coastal Plain species: var. *nudata* ranges from e. NC south to n. FL and west to LA. Var. *australis* (L.C. Anderson) Shinners [= ssp. *australis* L.C. Anderson] occurs in c. and s. peninsular FL; it differs in its narrower leaves (2-4.5 mm wide vs. 4-15 mm) and larger heads (involucre 6-7.5 mm tall vs. 4.5-6 mm). [= FNA, SE; = *Bigelowia nudata* ssp. *nudata* – GW, K, Z; < *Chondrophora nudata* (Michaux) Britton – RAB, S]

Bigelowia nuttallii (Michaux) Augustin de Candolle. Cp, Pd (GA): prairies, sandstone glades, Altamaha Grit glades, and roadbanks; rare. September-October. Ec. GA (Jones & Coile 1988, Bridges & Orzell 1989) and w. FL west to e. TX. [= FNA, GW, K, SE, Z; = *Chondrophora virgata* (Nuttall) Greene – S, misapplied]

Boltonia L'Héritier de Brutelle (Doll's-daisy)
(contributed by John F. Townsend and Alan 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 0.15mm long or with occasional slender awns to 0.6mm; 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.....***B. caroliniana***
  2 Phyllaries 0.4-0.9mm 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.....***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, membranaceous margins broad, (2-) 2.5-6 mm wide ....***B. asteroides*** *var.* ***latisquama***
    4 Phyllaries oblanceolate to linear-oblanceolate, membranaceous margins narrow, 1-2.5 (-3) mm wide..... .....***[B. asteroides*** *var.* ***recognita]***
  3 Phyllaries linear-subulate to lanceolate; inflorescence various.
    5 Inflorescence more or less leafy-bracteate.
      6 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]***
      6 Inflorescence narrow with loosely ascending branches, heads relatively few, phyllaries (0.5) 0.7 to 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 ....***B. asteroides*** *var.* ***asteroides***

5 Inflorescence subulate-bracteate
7 Phyllaries subulate; peduncles filiform ..... ***B. diffusa* var. *diffusa***
7 Phyllaries linear-oblong; peduncles thick..... ***[B. diffusa* var. *interior]***

Boltonia asteroides (Linnaeus) L'Héritier, Eastern Doll's-daisy. Cp (NC, SC, VA), Mt (NC), {GA}: marshes, ditches; common, rare in Mountains (VA Watch List). 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. [= RAB, W, Y; = *B. asteroides* var. *asteroides* – C, G, K, SE, X, Z; > *B. asteroides* var. *asteroides* – F; > *B. asteroides* var. *glastifolia* (Hill) Fernald – F; < *B. asteroides* (Linnaeus) L'Héritier var. *asteroides* – FNA; < *Boltonia* sp. – GW]

Boltonia caroliniana (Walter) Fernald, Carolina Doll's-daisy. Cp (NC, SC, VA), Pd (NC, SC), Mt (VA), {GA}: bottomlands, ditches, roadsides, prairies; common (GA Special Concern, VA Rare). 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 (GA, SC), Pd* (VA*): clay-based Carolina bays, roadsides, powerline rights-of-way, and other artificially open areas; rare. 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). [= FNA, K, Z; < *B. caroliniana* – RAB; < *B. diffusa* – C, G, SE, Y; < *Boltonia* sp. – GW]

* ***Boltonia latisquama*** A. Gray, Midwestern Doll's-daisy. Cp (NC, VA): ditches; rare, introduced from mw. United States. August-October. WI west to ND, south to MS and OK; disjunct in NC and se. VA. [> *B. latisquama* var. *latisquama* – F; > *B. latisquama* var. *recognita* Fernald & Griscom – F; = *B. asteroides* (Linnaeus) L'Héritier de Brutelle var. *latisquama* (A. Gray) Cronquist – FNA, K; > *B. asteroides* (Linnaeus) L'Héritier de Brutelle var. *latisquama* (A. Gray) Cronquist – C, G; > *B. asteroides* var. *recognita* (Fernald & Griscom) Cronquist – C, G; < *Boltonia sp.* – GW; = *B. asteroides* var. *latisquama* – SE, Z]

Boltonia montana J.F. Townsend & V. Karaman-Castro, Valley Doll's-daisy. Mt (VA): sinkhole ponds; rare. This new species is under study, occurring in Augusta Co. VA and Ridge and Valley wetlands in NJ (J. Townsend, pers. comm.). Material from Augusta Co. VA (Maple Flats ponds) has been previously interpreted as *B. asteroides*, but appears to be more similar to *B. caroliniana* , though not matching that taxon either. [= X; < *B. asteroides* (Linnaeus) L'Héritier var. *asteroides* – FNA]

Boltonia apalachicolensis L.C. Anderson, Apalachicola Doll's-daisy. Panhandle FL, s. MS, west to LA. [= FNA, K] {synonymy incomplete}

Boltonia asteroides (Linnaeus) L'Héritier ***var. latisquama*** (A. Gray) Cronquist. Cp (VA): WI west to ND, south to MS and OK; reported for VA. [= FNA, K; = *B. latisquama* A. Gray] {synonymy incomplete}

Boltonia asteroides (Linnaeus) L'Héritier var. *recognita* (Fernald & Griscom) Cronquist. MI, OH, KY, TN west to Saskatchewan and OK. [= FNA, K; = *Boltonia recognita* (Fernald & Griscom) G.N. Jones] {synonymy incomplete}

Boltonia diffusa Elliott var. *interior* Fernald & Griscom. KY and TN west to IL, OK, and LA. [= FNA, K] {synonymy incomplete}

Borrichia Adanson (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) Augustin de Candolle, Seaside Oxeye. Cp (GA, NC, SC, VA): salt and brackish marshes; common. May-September. DC and e. VA south to 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]

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 sahpe 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 (GA): mesic pine-hardwood or oak-hickory woods of upland hammocks; rare (GA Special Concern). Late August-late October. Sw. GA (Jones & Coile 1988) and AL south to n. FL. [= FNA, K, SE; *Coleosanthus cordifolius* (Elliott) Kuntze – S]

Brickellia eupatorioides (Linnaeus) Shinners ***var. eupatorioides***, Eastern False-boneset. Mt, Pd, Cp (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 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 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 eastward to AR and MO. 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). [= FNA, K, X, Z; < *Kuhnia eupatorioides* Linnaeus – RAB, S, W; = *Kuhnia eupatorioides* var. ***eupatorioides*** – C, F, G, SE; = *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 (GA): rich bluff forests; rare (GA Watch List). August-October. A Southeastern Coastal Plain endemic: sw. GA and Panhandle FL west to LA. [= FNA, S, SE; = *Solidago discoidea* Elliott – K]

Cacalia
(see *Arnoglossum, Hasteola, Rugelia*)

Calotis R. Browne

* ***Calotis cuneifolia*** R. Browne. Cp (SC): waste areas near wool-combing mill; rare, introduced from 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 (GA, SC): disturbed areas, lawns; rare, introduced from tropical America. [= FNA, K, S, SE, Z]

Carduus Linnaeus (Plumeless Thistle)
(also see *Cirsium*)

A genus of about 90 species, herbs, of temperate Old World. References: Keil in FNA (2006a); Cronquist (1980)=SE.

1 Phyllaries 2-8 mm wide; heads mostly nodding ..... ***C. nutans ssp. macrolepis***
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), Pd, Cp (VA): disturbed areas, pastures; common (rare in NC), introduced from Eurasia. June-October. [= FNA; > *C. acanthoides* – RAB, C, F, G, K, SE, W]
* ***Carduus crispus*** Linnaeus, Welted Thistle. Cp (VA): disturbed areas, naturalized around large ports; rare, introduced from Eurasia. June-September. [= C, F, FNA, G, K, SE]
* ***Carduus nutans*** Linnaeus *ssp.* ***macrolepis*** (Peterm.) Kazmi, Musk Thistle, Nodding Thistle. Mt (VA), Pd (GA, NC, VA), Cp (SC, VA): disturbed areas; uncommon (rare in NC and SC), introduced from Eurasia. Late May-November. [= K; < *C. nutans* – RAB, C, F, FNA, G, SE, W]

* ***Carduus pycnocephalus*** Linnaeus *ssp.* ***pycnocephalus***, Italian Plumeless-thistle. Cp (SC): waste areas around wool-combing mill; rare, introduced from 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] {not keyed at this time}

* *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

A genus of 7 species, herbs, endemic to the Southeastern Coastal Plain of North America. The merger of *Trilisa* and *Litrisa* into *Carphephorus* has been recently questioned (Schmidt & Schilling 2000). The only species not occurring in our area is *C. carnosus* (Small) James (of c. peninsular FL). No area in the range of the genus has more than five of the seven species, and only se. SC and immeditaely adjacent GA has more than four. References: Nesom in FNA (2006c); Correa & Wilbur (1969)=Z; DeLaney, Bissett, & Weidenhamer (1999)=Y; Orzell & Bridges (2002)=X; Cronquist (1980)=SE.

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 ..... ***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 ..... ***C. odoratissimus* var. *odoratissimus***
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; [of 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 ..... ***C. paniculatus***
    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 (GA Special Concern, VA Rare). August-October. A Southeastern Coastal Plain endemic: se. VA to extreme e. GA. The leaf apices are generally blunt, giving the leaves a nearly spatulate shape. Of our species of *Carphephorus*, *C. bellidifolius* occupies the driest habitats; it often occurs with the other species, however. [= RAB, C, F, FNA, G, K, S, SE, Z]

Carphephorus corymbosus (Nuttall) Torrey & A. Gray. Cp (GA, SC): wet flatwoods; rare. August-October. A southern Atlantic Coastal Plain endemic: se. SC south to FL. This species was reported for 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, Y, Z]

Carphephorus odoratissimus (J.F. Gmelin) Herbert *var.* ***odoratissimus***, Deer's-tongue, Vanilla-leaf. Cp (GA, NC, SC): moist to mesic savannas and flatwoods; uncommon. Late July-October; September-November. A Southeastern Coastal Plain endemic: se. NC south to s. FL and west to e. LA; var. *odoratissimus* extends throught this range escept for southern peninsular FL. *C. odoratissimus* has the largest leaves of our species of *Carphephorus*; 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 *C. odoratissimus*, probably best treated as *C. odoratissimus* var. *subtropicanus* (DeLaney. N. Bissett, & Weidenhamer) Wunderlin & B.F. Hansen. [= FNA, X; < *C. odoratissimus* – GW, K, SE, Z; = *C. odoratissimus* – Y; < *Trilisa odoratissima* (J.F. Gmelin) Cassini – RAB, S]

Carphephorus paniculatus (J.F. Gmelin) Herbert. Cp (GA, NC, SC): savannas and flatwoods; common. August-October; September-November. A Southeastern Coastal Plain endemic: se. NC south to c. peninsular 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. [= FNA, GW, K, SE, Y, Z; = *Trilisa paniculata* (J.F. Gmelin) Cassini – RAB, S]

Carphephorus pseudoliatris Cassini, Lavender Lady. Cp (GA): seepage bogs, savannas, wet to moist pinelands; rare (GA Special Concern). A West Gulf Coastal Plain endemic: sw. GA and FL Panhandle west to e. LA. [= FNA, GW, K, S, SE, Y, Z]

Carphephorus tomentosus (Michaux) Torrey & A. Gray. Cp (GA, NC, SC, VA): savannas, flatwoods, and sandhills; common (VA Rare). August-October. A southern Atlantic Coastal Plain endemic: se. VA south to s. GA, *C. tomentosus* is highly variable in its pubescence, ranging from glabrate to densely hirsute. [= RAB, C, FNA, G, GW, K, S, SE, Z; > *C. tomentosus* var. *tomentosus* – F; > *C. tomentosus* var. *walteri* (Elliott) Fernald – F]

Carthamus Linnaeus (Distaff-thistle)

A genus of 14 specoies, annual and perennial herbs, of the Mediterranean region. References: Keil in FNA (2006a).

* ***Carthamus creticus*** Linnaeus, Smooth Distaff-thistle. Cp (SC): waste area around wool-combing mill; rare, introduced from s. Europe and n. Africa. Reported by Nesom (2004d) as *C. baeticus*. [= FNA; = *C. lanatus* Linnaeus ssp. *baeticus* (Boissier & Reuter) Nyman – K; *Carthamus baeticus* Boissier & Reuter]

Centaurea Linnaeus 1753 (Star-thistle, Knapweed)
(also see *Acroptilon*, *Carthamus*, and *Plectocephalus*)

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.

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, Cp (GA, NC, SC, VA), Mt (VA): fields, roadsides, disturbed areas; uncommon, introduced from Mediterranean Europe. Late March-June. [= RAB, FNA; = *Cnicus benedictus* Linnaeus – C, F, G, K, S, SE, W]

* ***Centaurea calcitrapa*** Linnaeus, Purple Star-thistle, Caltrops. Mt, Cp (VA): roadsides, disturbed areas; rare, introduced from Europe. June-September. [= C, F, FNA, G, K, S, SE]
* ***Centaurea cyanus*** Linnaeus, Cornflower, Batchelor's-buttons. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): roadsides, disturbed areas; common, introduced from Mediterranean Europe. April-June. [= RAB, C, F, FNA, G, K, S, SE, W]
* ***Centaurea jacea*** Linnaeus, Brown Knapweed. Mt (VA): roadsides, disturbed areas; rare (locally common), introduced from Europe. June-September. This species is increasing rapidly in the VA Ridge and Valley. [= 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, introduced from Mediterranean Europe. June-September. [= C, F, FNA, G, K, S, SE]
* ***Centaurea ×moncktonii*** C.E. Britton, Meadow Knapweed. Mt, Pd (VA): roadsides, disturbed areas; rare, introduced from Europe. July-October. [= FNA; = *C.* ×*pratensis* Thuillier – C; *? C. nigra* var. *radiata* Augustin de Candolle – F; *? C. debeauxii* Godron & Grenier ssp. *thuillieri* Dostál]
* ***Centaurea nigra*** Linnaeus, Black Knapweed, Spanish-buttons. Mt (VA): roadsides, disturbed areas; rare, introduced from Europe. July-October. [= C, F, FNA, G, K, SE]
* ***Centaurea nigrescens*** Willdenow, Short-fringed Knapweed. Mt, Pd (VA): roadsides, disturbed areas; rare (locally common), introduced from Europe. July-October. This species is increasing rapidly in the n. VA Piedmont. *Centaurea 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, Pd (VA), Cp (NC, SC): roadsides, disturbed areas; rare, introduced from Mediterranean Europe. June-August. First reported for South Carolina by Hill & Horn (1997). [= RAB, C, F, FNA, G, K, S, SE]
* ***Centaurea stoebe*** Linnaeus *ssp.* ***micranthos*** (S.G. Gmelin ex Gugler) Hayek, Spotted Knapweed, Bushy Knapweed. Mt, Pd (NC, SC, VA), Cp (VA): roadsides, disturbed areas; common (rare in SC), introduced from Europe. Late June-November. [= FNA; = *Centaurea biebersteinii* Augustin 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 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) Augustin de Candolle *var.* ***asteroides***, Tiny Lazy-daisy. Cp (SC): waste areas near wool-combing mills; rare, introduced from sc. United States. Reported by Nesom (2004d). [= FNA, K, SE]

Chamaemelum P. Miller 1754 (Chamomile)
[also see *Cladanthus*]

A genus of 2 species, herbs, of the Medterrannean region. References: Cronquist (1980)=SE.

1 Rays white with a yellow base; plant an annual.....***[see Cladanthus mixtus]***
1 Rays white; plant a perennial..... ***Ch. nobile***

* ***Chamaemelum nobile*** (Linnaeus) Allioni, Garden Chamomile. Pd (NC): persistent from cultivation in gardens; rare, introduced from Europe. [= FNA, K; = *Anthemis nobilis* Linnaeus – C, F, G, S, SE]

Chaptalia Ventenat (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 (1995)=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. Cp (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, Y, Z]

Chevreulia Cassini 1817

* ***Chevreulia sarmentosa*** (Persoon) S.F. Blake. Cp (SC): waste area near wool-combing mill; rare, introduced from s. South America. Reported for SC by Nesom (2004d).

Chondrilla Linnaeus (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 (GA, VA), Cp, Mt (VA): cultivated fields, disturbed areas, roadsides; rare, introduced from Eurasia. June-August. [= C, F, FNA, G, K, SE]

Chondrophora
(see *Bigelowia*)

Chromolaena 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. Prairies and fields. 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). August-November. [= FNA, K; = *Osmia ivaefolia* (Linnaeus) Schultz-Bipontinus – S; = *Eupatorium ivaefolium* – SE, orthographic variant; = *Eupatorium ivifolium* Linnaeus]

Chrysanthemum Linnaeus (Chrysanthemum)
(also see *Glebionis, Leucanthemum,* and *Tanacetum*)

If circumscribed narrowly, a genus of 3 species, herbs, of n. Africa and Europe. References: Cronquist (1980)=SE; Arriagada & Miller (1997)=Z.

* *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] ..... ***Ch. 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, ne. TN. and se. KY south to e. GA, c. GA, and ec. AL.] ..... ***Ch. 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] ..... ***Ch. virginianum*** *var.* ***australe***

Chrysogonum virginianum Linnaeus *var.* ***australe*** (Alexander ex Small) Ahles, Gulf Coast Green-and-gold. Cp (GA): moist to fairly dry woodlands and forests; uncommon. Late March-early June. A Gulf Coastal Plain endemic: sc. and sw. GA west to e. LA. [= FNA, Z; < *Ch. virginianum* var. *australe* – RAB, K, SE, W (also see var. *brevistolon*); < *Ch. 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. Late March-early June. Ne. SC, sc. NC, nw. NC, ne. TN. and se. KY south to e. GA, c. GA, and ec. AL. Tentatively reported for Russell Co. VA (Ludwig, pers. comm. 2005). [= FNA, Z; < *Ch. virginianum* var. *australe* – RAB, K, SE, W; < *Ch. 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): moist to fairly dry woodlands and forests; common. 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; = *Ch. virginianum* – S]

Chrysoma Nuttall (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 (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; rare (NC Endangered, SC Rare). Late July-October. S. NC south to n. FL and west to s. MS (very rare in GA, SC, and NC). *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 snakeskin. 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; = *Solidago pauciflosculosa* Michaux – RAB; = *Chrysoma solidaginoides* Nuttall]

Chrysopsis (Nuttall) Elliott 1823 (Golden-aster)
(also see *Heterotheca* and *Pityopsis*)

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).

1 Stem, leaves, and phyllaries sparsely to densely pubescent with spreading non-glandular hairs as well has having minutely glandular pubescence; plants taprooted annuals; [section *Bradburia*] ..... ***Ch. pilosa***

1 Stems, leaves, and phyllaries various but lacking spreading non-glandular hairs; biennial or perennial, 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..... ..... ***[Ch. 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 ..... ***[Ch. 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 .... ***Ch. trichophylla***

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 VA to FL] ..... ***Ch. 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 western FL Panhandle] ..... ***[Ch. 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 ..... ***Ch. 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 ..... ***[Ch. godfreyi]***

8 Stems erect; leaves linear-elliptic; inflorescence open flat-topped corymbose; involucres 6-9 mm long; phyllaries obtuse; ligules 6-8 mm long..... ***Ch. scabrella***

Chrysopsis gossypina (Michaux) Elliott, Cottonleaf Golden-aster. Cp (GA, NC, SC, VA): sandhills, coastal dunes, other dry sandy places; common (VA Rare). September-October. Se. VA south to c. peninsular FL and sw. GA. [< *Chrysopsis gossypina* ssp. *gossypina* – FNA, K, Z; < *Heterotheca gossypina* (Michaux) Shinners – RAB (also see *Ch. pilosa*); < *Ch. gossypina* – C, G, SE; > *Ch. longii* Fernald – F; >< *Ch. arenicola* Alexander – S; > *Ch. decumbens* Chapman – S; > *Ch. pilosa* – S, misapplied; < *Heterotheca gossypina* (Michaux) Shinners – Y]

Chrysopsis mariana (Linnaeus) Elliott, Maryland Golden-aster. Cp, Pd, Mt (GA, NC, SC, VA): 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, Z; = *Heterotheca mariana* (Linnaeus) Shinners – RAB, Y; > *Chrysopsis mariana* var. *mariana* – F; > *Ch. mariana* var. *macradenia* Fernald – F]

* ***Chrysopsis pilosa*** Nuttall. Cp (GA?, NC, SC, VA): sandy roadsides; rare, introduced from a primary, native range from s. MO and se. KS, south to TX. [= 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, Z; = *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 *Ch. trichophylla* was reduced to a form by Semple (1981), as *Ch. gossypina* ssp. *gossypina* f. *trichophylla* (Nuttall) Semple. He suggests, though, that varietal status may be warranted. Plants in SC previously identified as *Ch. cruiseana* are referrable to *Ch. trichophylla*. [= SE; = *Heterotheca trichophylla* (Nuttall) Shinners – RAB; < *Chrysopsis gossypina* ssp. *gossypina* – FNA, K, Z; < *Ch. gossypina* – C, G; > *Ch. trichophylla* – S; >< *Ch. arenicola* Alexander – S; >< *Ch. pilosa* – S, misapplied; < *Heterotheca gossypina* (Michaux) Shinners – Y]

Chrysopsis cruiseana Dress. Coastal sand dunes. FL panhandle and s. AL. October-December. [= *Chrysopsis gossypina* (Michaux) Elliott ssp. *cruiseana* (Dress) Semple – FNA, K, Z]

Chrysopsis godfreyi Semple. Coastal sand dunes. FL panhandle and s. AL. November-December. Plants with densely stipitate-glandular, non-woolly upper stem leaves have been treated as forma *viridis* (Semple 1981). [= FNA, K, Z]

Chrysopsis hyssopifolia Nuttall. Dry sands. N. FL peninsula west to FL panhandle, s. AL, s. MS, and se. LA. October-December. [= SE; = *Chrysopsis gossypina* (Michaux) Elliott ssp. *hyssopifolia* (Nuttall) Semple – FNA, K, Z; > *Chrysopsis hyssopifolia* – S; > *Chrysopsis gigantea* Small – S; = *Heterotheca hyssopifolia* (Nuttall) Harms – Y]

Chrysopsis lanuginosa Small, Lynn Haven Goldenaster. Dry pinelands. FL Panhandle. [= FNA] {not yet keyed; synonymy incomplete}

Chrysopsis latisquamea Pollard. [= FNA; = *Heterotheca latisquamea* (Pollard) V.L. Harms] {not yet keyed; synonymy incomplete}

Chrysopsis linearifolia Semple. [= *Chrysopsis linearifolia* ssp. *linearifolia* – FNA] {not yet keyed; synonymy incomplete}

Cichorium Linnaeus (Chicory)

A genus of 7 species, herbs, of Europe and n. Africa. References: Strother in FNA (2006a); Cronquist (1980)=SE; Kiers (1999)=Z.

1 Corolla purple; pappus > 0.6 mm long..... ***[C. endivia]***

1 Corolla blue (to white or pink); pappus < 0.2 mm long ..... ***C. intybus***

* ***Cichorium intybus*** Linnaeus, Chicory, Succory, Blue-sailors. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): roadsides, fencerows, vacant lots, disturbed areas; common, introduced from Europe. Late May-November. The dried roasted root is used as a flavoring or substitute for coffee. [= RAB, C, F, FNA, G, K, S, SE, W, Z]

* *Cichorium endivia* Linnaeus, Endive, from Mediterranean Europe, is a fairly familiar cultivated green. Rhoads & Klein (1993) report it as "occasionally escaped to alluvial shores and rubbish dumps" in se. PA. [= FNA, K, Z]

Cirsium P. Miller 1754 (Thistle)

A genus of about 250 species, herbs, north temperate. References: 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].
  2 Leaves shallowly undulate-lobed, with only a few fine marginal prickles.....***C. arvense*** *var.* ***arvense***
  2 Leaves strongly sinuate-pinnatifid, with numerous well-developed marginal prickles..... ***C. arvense*** *var.* ***horridum***
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].
  3 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***
  3 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].
    4 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***
    4 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*).
      5 Heads immediately subtended by several spiny-toothed leaves (appearing as a leafy involucre); flowers yellow, white, or purple.
        6 Involucres more-or-less densely tomentose; stems densely tomentose; [of the Coastal Plain and Piedmont].....***C. horridulum*** *var.* ***horridulum***
        6 Involucres glabrous; stems glabrous or sparsely tomentose; [of the Coastal Plain].
          7 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]***
          7 Leaves spinose-dentate to shallowly pinnatifid; main spines mostly 5-10 mm long; [widespread in the Coastal Plain]..... ***C. horridulum*** *var.* ***vittatum***
      5 Heads pedunculate (rarely with 1 or 2 reduced leaves below); flowers pink, purple, lavender, or white.
        8 Lower surface of the leaves densely white-tomentose beneath, this persistent and entirely obscuring the green surface.
          9 Heads 15-25 mm high; plants 4-15 dm tall; larger leaves < 5 cm wide.
            10 Cauline leaves mostly 10-25; plants flowering April-June; [of dry soils of the Piedmont] ....***C. carolinianum***
            10 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***
          9 Heads 25-35 mm high; plants 10-40 dm tall; larger leaves usually > 5 cm wide.
            11 Leaves toothed or shallowly lobed .....***C. altissimum***
            11 Leaves deeply pinnatifid.....***C. discolor***
        8 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.
          12 Heads 15-25 mm high; plants 5-35 dm tall, usually much branched and with numerous heads..... .....***C. nuttallii***
          12 Heads 25-50 mm high; plants 2-10 dm tall, usually strict or few-branched and with 1 or a few heads.
            13 Heads on well-developed peduncles; [of moist to wet pinelands of the Coastal Plain from NC and SC south] .....***C. lecontei***
            13 Heads on short peduncles; [of various habitats, mostly inland from the Coastal Plain, or of dry pinelands of the Coastal Plain].
              14 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***
              14 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, Pd (GA, NC, SC, VA), Cp (GA): pastures, woodlands, thickets; uncommon (rare in VA) (VA Rare). September-November. MA west to ND, south to FL and TX. [= C, F, FNA, G, K, S, SE, W; = *Carduus altissimus* Linnaeus – RAB]

* ***Cirsium arvense*** (Linnaeus) Scopoli *var.* ***arvense***, Canada Thistle, Field Thistle. Mt (VA): pastures, disturbed areas; uncommon?, introduced from Europe. July-November. [= C, G, SE; < *Carduus arvensis* (Linnaeus) Robson – RAB; = *Cirsium arvense* var. *mite* Wimmer & Gräbner – F; < *Cirsium arvense* – FNA, K, S, W; < *Breea arvense* (Linnaeus) Lessing]

* ***Cirsium arvense*** (Linnaeus) Scopoli *var.* ***horridum*** Wimmer & Grabner, Canada Thistle, Field Thistle. Mt, Cp (NC, VA), Pd (VA): pastures, disturbed areas; common (uncommon in Piedmont, rare in Coastal Plain), introduced from Europe. July-November. [= C, G, SE; < *Carduus arvensis* (Linnaeus) Robson – RAB; = *Cirsium arvense* var. *arvense* – F, misapplied; < *Cirsium arvense* – FNA, K, S, W, < *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 (GA Special Concern, NC Rare, VA Rare). April-June (-July). Sc. 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), Pd (GA, NC, VA), Cp (VA): pastures, woodlands, thickets; common. August-November. Québec west to Manitoba, 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, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): roadsides, woodlands, pine savannas; common (rare in 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; < *Cirsium horridulum* complex – GW; = *Cirsium horridulum* – S]

Cirsium horridulum Michaux *var.* ***vittatum*** (Small) R.W. Long, Southern Yellow Thistle. Cp (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 lecontei Torrey & A. Gray, LeConte's Thistle. Cp (GA, NC, SC): wet pine savannas; uncommon (GA Special Concern, NC Rare List). June-August. E. NC south to FL, west to LA. [= FNA, GW, K, S, SE; = *Carduus lecontei* (Torrey & A. Gray) Pollard – RAB]

Cirsium muticum Michaux, Swamp Thistle. Cp (NC, SC, VA), Mt (GA, NC, VA), Pd (NC, VA): swamps, wet thickets, woodlands, seepage slopes, wet prairies, meadows; uncommon (rare in VA Piedmont and Coastal Plain) (GA Special Concern). August-November. Newfoundland west to Saskatchewan, south to DE, NC, TN, and MO, and less commonly south to FL and TX. [= C, FNA, G, GW, K, S, SE, W; = *Carduus muticus* (Michaux) Persoon – RAB; > *Cirsium muticum* var. *muticum* – F]

Cirsium nuttallii Augustin de Candolle, Coastal Tall Thistle. Cp (GA, NC, SC, VA): pine savannas, roadsides, pastures; uncommon (VA Rare). 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; = *Carduus nuttallii* (Augustin de Candolle) Pollard – RAB]

Cirsium pumilum (Nuttall) Sprengel, Pasture Thistle. Pd (NC, VA), Cp, Mt (VA): pastures, thickets, and woodlands, perhaps especially over mafic rocks; uncommon (rare in Coastal Plain). 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 (VA Rare). 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 (GA, NC, SC, VA), Pd (NC): moist to fairly dry pine savannas; uncommon (VA Rare). August-October. S. NJ south to ne. FL, on the Coastal Plain. [= C, F, FNA, G, GW, K, SE; = *Carduus virginianus* Linnaeus – RAB; = *Cirsium revolutum* (Small) Petrak – S]

* ***Cirsium vulgare*** (Savi) Tenore, Bull Thistle. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): meadows, pastures, and disturbed areas; common, introduced from Europe. Late June-November. [= C, F, FNA, G, K, SE, W; < *Carduus lanceolatus* Linnaeus – RAB; < *Cirsium lanceolatum* (Linnaeus) Scopoli – S, misapplied]

Cirsium horridulum Michaux var. *megacanthum* (Nuttall) D.J. Keil, Bigspine Thistle. Moist ground. AL and Panhandle FL west to TX and OK. [= FNA; < *Cirsium horridulum* complex – GW; < *Cirsium horridulum* var. *vittatum* – K, SE; > *Cirsium vittatum* – S]

Cladanthus Cassini 1816

A genus of about 5 species, herbs, of the Mediterranean region. References: Watson in FNA (2006a).

* ***Cladanthus mixtus*** (Linnaeus) Chevallier. Pd (NC): disturbed areas; rare, introduced from Europe. June. [= FNA; = *Anthemis mixta* Linnaeus – C, F, G, SE; = *Chamaemelum mixtum* (Linnaeus) Allioni – K; = *Ormenis mixta* (Linnaeus) Dumortier – S]

Cnicus Linnaeus (Blessed-thistle)

[see *Centaurea*]

Conoclinium Augustin de Candolle (Mistflower)

A genus of 4 species, of e. and c. North America extending into Mexico. Often included in *Eupatorium*. References: Patterson & Nesom in FNA (2006c); Schmidt & Schilling (2000).

Conoclinium coelestinum (Linnaeus) Augustin de Candolle, Mistflower, Ageratum. Cp, Pd, Mt (GA, NC, SC, VA): moist to wet disturbed areas, especially ditches; common (uncommon in Piedmont of NC and SC, rare in Mountains), 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; = *Eupatorium coelestinum* Linnaeus – RAB, C, F, G, SE, W]

Conyza Lessing (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 (GA, NC, SC, VA), Pd (SC): fields, disturbed areas; uncommon, apparently introduced from South America. April-October. Se. VA south into the tropics. [= C, FNA, K, SE; **= *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. Pd, Cp, Mt (GA, NC, SC, VA): 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; = *Erigeron canadensis* Linnaeus var. *canadensis* – RAB; < *C. canadensis* – FNA; **= *Erigeron canadensis*** – F; = *Leptilon canadense* (Linnaeus) Britton – S]

Conyza canadensis (Linnaeus) Cronquist *var**. pusilla*** (Nuttall) Cronquist, Southern Horseweed. Cp, Pd, Mt (GA, NC, SC, VA): dunes, old fields, disturbed areas; common. (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; = *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)

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.
4 Ray flowers pink (white); plant rhizomatous .....***C. rosea***
4 Ray flowers yellow; plant fibrous-rooted.
5 Leaf blades elliptic to ovate, the margins ciliolate (especially near and on the petiole), the surfaces often pubescent as well.....***C. integrifolia***
5 Leaf blades linear to oblanceolate, the margins glabrous, the surface glabrous .....***C. linifolia***
3 Some (at least) of the major cauline leaves alternate, especially the lowermost several.
6 Ray flowers pink; leaves juncoid (linear-terete)..... ***C. nudata***
6 Ray flowers yellow; leaves with an expanded blade.
7 Lower leaves clearly showing tiny dark dots when backlit (dried material sometimes ambiguous); lowermost stem leaves alternate, the middle and upper leaves of the stem usually opposite; heads (ray tip to ray tip) mostly 2.5-4.0 cm across .....***C. linifolia***
7 Lower leaves lacking numerous tiny dark dots when backlit; stem leaves alternate (upper bracteal leaves in or near the inflorescence sometimes opposite); heads (ray tip to ray tip) mostly 3.5-6.0 cm across.
8 Basal leaves often absent at flowering; stem leaves well-developed, gradually reduced upward, many (10-30 nodes below the inflorescence) .....***C. helianthoides***
8 Basal leaves present at flowering; stem leaves strongly reduced upward, relatively few (3-9 nodes below the inflorescence).
9 Larger stem leaves usually with basal auricles; plant glaucous; flowering late May-July (rarely also September); achene wing on each side 0.75-1.0× as wide as the achene body.....***C. falcata***
9 Larger stem leaves without basal auricles; plant green; flowering August-October; achene wing on each side 1/4 to 1/2 as wide as the achene body .....***C. gladiata***
1 Disk flowers with 5 corolla lobes and 5 anthers; ray flowers apically entire, or with (2-) 4-5 teeth.
10 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.
11 Leaves all simple, 4-12 cm wide, the margins coarsely serrate (some of the lower leaves sometimes pinnately lacerate basally); [section *Silphidium*].....***C. latifolia***
11 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*].
12 Stems with 1-5 (-8) nodes between the first node > 1 cm above the basal leaves and the first head.
13 Plants spreading by elongate stolons; leaf blades (or terminal leaflets) 1-2.2× as long as wide..... .....***C. auriculata***
13 Plants lacking stolons; leaf blades (or terminal leaflets) > 3× as long as wide (basal leaves sometimes broader).....***C. lanceolata***
12 Stems with (5-) 6-12 nodes between the first node > 1 cm above the basal leaves and the first head.
14 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***
14 Leaf blades (or terminal leaflets) narrowly elliptical to oblanceolate, ca. 0.6-2 cm wide, acuminate; stem and leaves glabrous .....***C. pubescens*** *var*. ***robusta***
10 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.
15 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*].
16 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.
17 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***
17 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***
16 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.
18 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***
18 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***
15 Leaves, at least the lower, distinctly petioled on petioles 5-50 mm or more long.

19 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***

19 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*].

20 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***

20 Disk flowers yellow; ray flowers yellow; leaflets of mid-cauline leaves 0.5-6 (-10) mm wide and > 10× as long as wide.

21 Achene wings fimbriate; [of granitic outcrops of the Piedmont of GA and AL]..... ..... ***C. grandiflora*** *var.* ***saxicola***

21 Achene wings entire; [collectively more widespread].

22 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]***

22 Divisions of the midstem and upper cauline leaves with > 5 divisions; plants erect; flowering May-late June; [of granite outcrops and disturbed areas].

23 Larger divisions of midstem and upper stem leaves 2-6 (-10) mm wide .... ***C. grandiflora*** *var.* ***grandiflora***

23 Larger divisions of midstem and upper stem leaves 0.5-1.5 mm wide .... ***C. grandiflora*** *var.* ***harveyana***

Coreopsis auriculata Linnaeus, Lobed Coreopsis. Pd, Cp, Mt (GA, NC, SC, VA): moist slopes and woodlands; common (rare in Coastal Plain and Mountains). April-June. S. VA and KY south to MS, AL, and GA. [= RAB, C, F, FNA, G, K, S, SE, W, Y, Z]

* ***Coreopsis basalis*** (A. Dietrich) Blake, Texas Coreopsis. Cp (GA, NC, SC), Pd (GA): sandy roadsides and fields; common, introduced from 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, 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 se. 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): peat bogs, very wet savannas, ditches and borrow pits in savannas; common (VA Rare). May-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. First reported for VA by Wieboldt et al. (1998). It 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]

Coreopsis gladiata Walter, Swamp Coreopsis. Cp (GA, NC, SC): swamp forests; rare (SC Rare). August-October. Se. NC south to c. FL and west to s. MS. 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 (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, Mt (NC, SC, VA): disturbed areas; rare, introduced from 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; < *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]

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). July-November. Se. SC south to the Panhandle of Florida, 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, Y, Z]

Coreopsis lanceolata Linnaeus, Longstalk Coreopsis. Cp, Pd, Mt (GA, NC, SC, VA)): disturbed areas; common (rare in Mountains). April-June. S. MA, MI and WI south to n. FL, e. TX, and NM. Often spread from cultivation, its original range obscure. [= RAB, C, FNA, K, SE, W, 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 (GA Special Concern, NC Rare, SC Rare). (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 (GA, NC, SC, VA), Mt (NC): savannas, sandhill seeps, sandhill-pocosin ecotones, bogs; common, rare in Mountains (VA Rare). August-October. 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, Mt (GA, NC, SC, VA): woodlands; rare. 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, Z]

Coreopsis major Walter *var. **rigida*** (Nuttall) F.E.Boynton, Stiffleaf Coreopsis. Mt, Pd, Cp (GA, NC, SC, VA?): dry woodlands and forests; common. 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; > *C. major* var. *stellata* – F, G, Y; > *C. major* var. *rigida* – F, Y; < *C. major* – FNA, K, S, Z]

Coreopsis nudata Nuttall. Cp (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 n. FL and west to e. LA. [= FNA, GW, K, S, SE, Y, Z]

Coreopsis pubescens Elliott *var. **pubescens***, Common Hairy Coreopsis. Mt (NC, VA), Pd (GA, NC), Cp (NC): forests, woodlands, and rock outcrops; common, rare in Piedmont and Coastal Plain (VA Watch List). 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. A third variety, var. *debilis* (Sherff) E.B. Smith, ranges from 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. [= F, GW, K, Y, Z; < *C. pubescens* – RAB, C, FNA, G, S, SE, W]

Coreopsis pubescens Elliott *var. **robusta*** Gray ex Eames, Mountain Hairy Coreopsis. Mt (GA, NC, SC, VA), Pd, Cp (NC): rocky slopes, glades, edges of rock outcrops; common, rare in Piedmont and, where probably not native, Coastal Plain, (VA Watch List). 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]

Coreopsis rosea Nuttall. Cp (GA, SC): upland depression ponds in the Inner Coastal Plain, drawdown zones on banks of blackwater rivers in the Outer Coastal Plain; rare (SC Rare). July-September. Coastal Plain of s. Nova Scotia, 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 (vs. yellow, or yellow and red). 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 tinctoria*** Nuttall *var. **tinctoria***, Calliopsis, Plains Coreopsis. Pd, Cp, Mt (GA, NC, SC, VA): roadsides and other disturbed places: uncommon, 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 Leon. [= C, K, Z; < *C. tinctoria* – FNA, G, GW, SE, W; > *C. tinctoria* – RAB, S; > *C. cardaminefolia* (Augustin de Candolle) Torrey & A. Gray – RAB, S, Y; > *C. tinctoria* var. *tinctoria* – Y; > *C. stenophylla* Boynton – Y]

Coreopsis tripteris Linnaeus, Tall Coreopsis. Pd, Mt (GA, NC, SC, VA), Cp (GA, NC, VA): rich, moist woodlands and woodland borders, primarily over calcareous or mafic rocks or on nutrient-rich alluvium; uncommon. July-early September. Widespread in e. North America, from MA, s. Ontario, and WI south to FL and TX. [= RAB, C, FNA, G, GW, K, S, SE, W, 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, Cp, Mt (NC, SC, VA): dry sandy, rocky, or clayey woodlands and woodland borders; common (uncommon in Coastal Plain and 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, 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 keyed at this time; synonymy incomplete}

Coreopsis pubescens Elliott *var. **debilis*** (Sherff) E.B. Smith. GA and FL west to LA. [= GW, K, Z; < *C. pubescens* – FNA, S, SE; > *C. corninsularis* Sherff – Y; > *C. debilis* Sherff – Y] {not keyed at this time}

Coreopsis pulchra F.E. Boynton, Lookout Mountain Coreopsis. Nw. GA and ne. AL. [= FNA, K, S, SE, Y, Z] {not keyed at this time}

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 keyed at this time; synonymy incomplete]

Cosmos Cavanilles (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, Pd (NC, SC, VA), Mt (NC): garden edges, roadsides, disturbed areas; commonly cultivated, rarely escaped, introduced from Mexico. August-November. [= RAB, C, F, FNA, G, K, S, SE; > *C. bipinnatus* var. *bipinnatus* – Z]

* ***Cosmos sulphureus*** Cavanilles, Orange Cosmos. Cp (GA, NC, SC, VA): garden edges, roadsides, disturbed areas; commonly cultivated, rarely escaped, introduced from tropical America. August-November. [= C, F, FNA, G, K, S, SE; > *C. sulphureus* var. *sulphureus* – Z]

Cota J. Gay ex Gussone (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. Pd (VA): disturbed areas, roadsides; rare, introduced from Europe. June-September. [= FNA; = *Anthemis tinctoria* Linnaeus – C, F, G, K, Z]

Cotula Linnaeus (Brassbuttons)

* ***Cotula australis*** (Sieber) Hooker f. Cp (SC): waste area around wool-combing mill; rare, introduced from Australia and New Zealand. Reported for SC by Nesom (2004d). [= K]

Crepis Linnaeus (Hawksbeard)
(also see *Youngia*)

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.

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, Pd (NC, VA): pastures, roadsides, disturbed areas; common in Mountains, rare in Piedmont, introduced from Eurasia. May-November. [= RAB, C, F, FNA, G, K, SE, W]
* ***Crepis pulchra*** Linnaeus, Smallflower Hawksbeard. Pd (GA, NC, SC, VA), Mt, Cp (NC, SC, VA): roadsides, fields, disturbed areas; common in Piedmont, rare in Mountains and Coastal Plain, introduced from Eurasia. Late April-July. [= RAB, C, F, FNA, G, K, SE, W]
* ***Crepis tectorum*** Linnaeus. Mt (NC), {VA}: disturbed areas; rare, perhaps not established, introduced from Europe. June-July. [= C, F, FNA, G, K, S]
* ***Crepis vesicaria*** Linnaeus ***ssp. taraxacifolia*** (Thuillier) Thellung. Mt (NC): lawns; rare, introduced from Mediterranean and w. Europe. Late May-July. [= RAB, C, FNA, K, SE; *? Crepis vesicaria* Linnaeus ssp. *haenseleri* (Boiss. ex Augustin de Candolle) P.D. Sell]

* ***Crepis biennis*** Linnaeus, Rough Hawkbeard. {VA} [= FNA, K]
* ***Crepis foetida*** Linnaeus, Stinking Hawksbeard. {NC} [= 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 keyed at this time}

Croptilon Rafinesque (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, Pd, Mt (GA, NC, SC, VA): sandy soils of fields, roadsides, and sandhill woodlands; common (VA Watch List). August-November. Se. VA south to 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 (in press).

* ***Cyclachaena xanthiifolia*** (Nuttall) Fresenius, Big Marsh-elder. Mt (VA), Cp (SC): disturbed areas, waste areas near wool-combing mills; rare, introduced from w. North America. August-October. See Nesom (2004d). [= FNA; = *I. xanthifolia* – C, F, G, K, SE, orthographic variant; = *I. xanthiifolia*]

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 Augustin de Candolle) Britton – Y, Z; < *Evax prolifera* Nuttall ex Augustin 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* Augustin 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}

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, Pd (GA, NC, SC, VA), Cp (NC, VA): woodland borders, dry or dry-mesic woodlands; common. Late June-September. MA west to KY, south to SC, GA, Panhandle FL, AL, and wc. TN. [= FNA, K, Z; = *Aster infirmus* Michaux – RAB, C, G, SE, W; > *Doellingeria infirma* – S; >< *Doellingeria humilis* (Willdenow) Britton – S, in part]

Doellingeria sericocarpoides Small, Pocosin Flat-topped Aster. Cp (GA, NC, SC): sandhill ecotones and streamhead pocosins; uncommon. Late July-October. Sc. NC south to Panhandle FL, west to AL; also in AR, OK, and TX. [= FNA, K, S, 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), Pd (GA, NC, VA), Cp (VA): wet meadows, pastures, bogs, marshes, stream floodplains, roadbanks, to at least 1900m; common (rare in Coastal Plain).

August-September. 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; = *A. umbellatus* var. *umbellatus* – RAB, GW; > *Doellingeria umbellata* var. *umbellata* – FNA, K]

Dracopis Cassini (Coneflower)

References: Urbatsch & Cox in FNA (in press).

*? ***Dracopis amplexicaulis*** (Vahl) Cassini. Cp (SC), Pd (GA): 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; = *Rudbeckia amplexicaulis* Vahl – F, FNA]

Dyssodia Cavanilles

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): waste areas near wool-combing mill; rare, introduced from c. and sw. North America. Reported for SC by Nesom (2004d). [= FNA, K, SE; = *Boebera papposa* (Ventenat) Rydberg – S]

Echinacea Moench (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 (1990); 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) 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 (US Endangered, GA Endangered, NC Endangered, SC Rare, VA 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, 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. Some at least of the eastern populations considered to be *E. pallida* are actually the closely related *E. simulata*; additional herbarium work is needed to determine the relative distributions of these two species in our area. [= RAB, F, FNA, G, K, W, Y, Z; < *E. pallida* var. *pallida* – C, SE; = *E. pallida* var. *pallida* – X]

Echinacea purpurea (Linnaeus) Moench, Eastern Purple Coneflower. Mt, Pd (NC): open woodlands, roadsides, perhaps at least some of the occurrences spread from cultivation; rare (NC Rare). [= RAB, C, F, FNA, K, SE, W, 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, apparently introduced from c. US (GA Special Concern, NC Watch List). June-July. Some at least of the eastern populations considered to be *E. pallida* are actually *E. simulata*; additional work is needed to determine 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* (Nuttall) Nuttall var. *simulata* (McGregor) Binns, B.R. Baum, & Arnason – X]

Echinacea tennesseensis (Beadle) Small, Tennessee Purple Coneflower. Endemic to calcareous glades of 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* (Augustin de Candolle) Cronquist – SE; = *E. pallida* (Nuttall) Nuttall var. *tenneseensis* (Beadle) Binns, B.R. Baum, & Arnason – X; = *E. angustifolia* Augustin de Candolle var. *tennesseensis* (Beadle) 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): roadsides, edges of railroad tracks, disturbed areas; rare, native of Europe and w. Asia. 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]

Eclipta Linnaeus

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, Pd, Mt (GA, NC, SC, VA): moist or wet disturbed areas, ditches, shores, disturbed bottomlands; common (uncommon in Mountains). June-November. MA west to WI, south to FL and TX, and into the tropics. [= C, FNA, K; = *E. alba* (Linnaeus) Hasskarl – RAB, F, G, GW, SE, W; = *Verbesina alba* Linnaeus – S]

Elephantopus Linnaeus (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 bracteal leaves much smaller than the basal, usually < 5 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 Raeuschel, Leafy Elephant's-foot. Cp, Pd, Mt (GA, NC, SC, VA): mesic to dry forests and woodlands; common. August-November. NJ west to KS, south to FL and TX; West Indies. [= RAB, C, F, FNA, G, GW, K, S, SE, Z]

Elephantopus elatus Bertoloni, Southern Elephant's-foot. Cp (GA, SC): pine barrens; rare. Late August-September. E. SC south to FL, west to LA, on the Coastal Plain. [= RAB, FNA, K, S, SE, Z]

Elephantopus nudatus A. Gray. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): woodlands and woodland borders, usually fairly dry; common (rare in Piedmont, lower Piedmont only). Late July-September. DE south to FL, west to TX and AR, primarily on the Coastal Plain; south into n. South America. [= RAB, C, F, FNA, G, GW, K, S, SE, Z]

Elephantopus tomentosus Linnaeus. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): woodlands and woodland borders, usually fairly dry; common (rare in Mountains). August-November. MD south to FL, west to TX, north in the interior to w. NC, KY, and south to Chiapas, Mexico. [= RAB, C, F, FNA, G, K, S, SE, Z]

Emilia Cassini (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; involucre 1-2 (-3)× as high as wide..... ***[E. fosbergii]***

1 Leaves mostly on the lower portion of the stem, the larger lyrate-pinnatifid; involucre 3-4× as high as wide ..... ***E. sonchifolia*** *var.* ***sonchifolia***

* ***Emilia sonchifolia*** (Linnaeus) Augustin de Candolle *var.* ***sonchifolia***, Lilac Tasselflower. Pd (GA), Cp? (SC): disturbed areas, introduced from 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 our area. [= FNA, K; < *E. sonchifolia* – S, SE]

* *Emilia fosbergii* Nicolson. Scattered as an introduction in FL, including the Panhandle. [= FNA, K, SE]

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, Pd, Mt (GA, NC, SC, VA): 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. Newfoundland west to Saskatchewan, 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; > *E. hieracifolia* var. *hieracifolia* – F; > *E. hieracifolia* var. *intermedia* Fernald – F; > *E. hieracifolia* var. *praealta* (Rafinesque) Fernald – F; = *E. hieraciifolius* var. *hieraciifolius* – FNA]

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 (Daisy Fleabane)
(also see *Conyza*)

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.

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; [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 (but ciliate) except along the midvein; [of limestone glades of c. TN, nw. GA, and n. AL]..... ***E. strigosus* var. *calcicola***
5 Rosette leaves linear-oblanceolate, 1-3.5 (-6) mm wide; cauline leaves sparsely to moderately strigillose; [of dolostone glades of Bibb Co. AL] ..... ***[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, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): roadsides, disturbed areas; common (rare in Coastal Plain of SC). May-October. Newfoundland west to Manitoba, south to FL and TX (and beyond). [= RAB, C, F, FNA, S, SE, W; > *E. annuus* var. *annuus* – G]

Erigeron philadelphicus Linnaeus ***var. philadelphicus***, Philadelphia-daisy. Mt, Pd, Cp (GA, NC, SC, VA): roadsides, meadows, disturbed areas; common (uncommon in NC, SC, and VA Coastal Plain). April-June. Newfoundland west to British Columbia, south to 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; > *E. philadelphicus* var. *philadelphicus* – F; > *E. philadelphicus* var. *scaturicola* Fernald – F]

Erigeron pulchellus Michaux ***var. pulchellus***, Robin's-plantain. Mt, Pd, Cp (GA, NC, SC, VA): moist slopes, coves, limestone bluffs, trail margins, roadbanks; common (uncommon in Coastal Plain). April-early June. ME west to MN, south to GA and TX. In addition to the widespread var. *pulchellus*, *E. pulchellus* has two additional local varieties, var. *brauniae* Fernald, of ne. KY and s. OH, and var. *tolsteadii* Cronquist, of se. MN. [= C, F, FNA, G, K, SE; < *E. pulchellus* – RAB, GW, S, W]

Erigeron quercifolius Lamarck, Oak-leaved Fleabane. Cp (GA, NC, SC, VA): sandy roadsides, disturbed areas; common, rare in VA (VA Watch List). April-June. Se. VA south to FL, west to TX, north in the interior to TN; Bahamas. [= RAB, C, F, FNA, G, K, S, SE]

Erigeron strigosus Muhlenberg ex Willdenow ***var. calcicola*** J. Allison, Cedar Glade Daisy Fleabane. Mt (GA): limestone glades; rare (GA Special Concern). (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, Pd, Cp (GA, NC, SC, VA): roadsides, disturbed areas; open woodlands; common. Late April-October. Nova Scotia west to WA, south to GA and MO. [= FNA; < *E. strigosus* – RAB, W; > *E. strigosus* var. *strigosus* – C, F, G, K, SE, Z; > *E. strigosus* var. *beyrichii* – C, F, G, K, SE, Z; < *E. strigosus* – RAB, W; < *E. ramosus* (Walter) Britton, Sterns, & Poggenburg – S]

Erigeron vernus (Linnaeus) Torrey & A. Gray, Whitetop Fleabane. Cp (GA, NC, SC, VA): wet savannas, seepages, interdunal swales; common (rare in Virginia) (VA Rare). Late March-June. E. VA south to s. FL, west to LA. [= RAB, C, F, FNA, G, GW, K, S, SE]

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 pulchellus Michaux var. *brauniae* Fernald. Sandy woodlands and forests. WV, KY, MD, and OH (FNA, K). April-June. [= C, F, FNA, G, K]

Erigeron strigosus Muhlenberg ex Willdenow var. *dolomiticola* J. Allison, Cahaba Daisy Fleabane. Calcareous Ketona glades in 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]

Erigeron tenuis Torrey & A. Gray, Midwestern Fleabane. Forests and woodlands. FL and AL west to KS, OK, and TX. Reported for our area by Nesom (1980); but discounted in by Nesom in FNA (2006b). Mid March-May (sporadically later). [= FNA, K, SE]

Eupatoriadelphus King & H.E. Robinson (Joe-pye-weed)

(see ***Eutrochium***)

Eupatorium Linnaeus 1753 (Eupatorium, Thoroughwort, Dog-fennel)

(also see *Ageratina, Chromolaena, Conoclinium, Eutrochium, Fleischmannia*)

A genus of about 40 species, herbs, of e. North America and Eurasia (after the exclusion of *Ageratina, Chromolaena, Conoclinium, Eupatoriadelphus, 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.

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. species 1***
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. species 1 × mohrii***

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 long-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, Pd, Mt (GA, NC, SC, VA): dry woodlands; common (rare in Mountains, uncommon in Piedmont). Late June-September. CT, NY, OH, and TN, south to FLA 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; < *E. album* var. *album* – C, K, SE, W (also see *E. petaloideum*); > *E. album* var. *album* – F, G; > *E. album* var. *glandulosum* (Michaux) Augustin de Candolle – F, G]

Eupatorium altissimum Linnaeus, Tall Thoroughwort. Pd (GA, NC, VA), Mt (GA, VA): woodlands, old fields, woodland borders, and openings over mafic rocks (such as diabase) or calcareous rocks (such as limestone and calcareous sandstone); rare south of VA (NC Watch List). Late August-October. CT, NY, Québec, MN, and NE, south to FL and TX, primarily in the

midwest, especially on limestone substrates, and uncommon east of the mountains. [= RAB, F, G, S, W; < *E. altissimum* – C, FNA, K, SE (also see *E. saltuense*)]

Eupatorium anomalum Nash, Anomalous Eupatorium. Cp (GA, NC): moist savannas; rare (NC Watch List). August-October. *E. anomalum* is believed to be a triploid and tetraploid, apomictic derivative of the hybrid *E. mohrii* × *serotinum*. Se. NC south to 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*)]

* ***Eupatorium cannabinum*** Linnaeus, Hemp-agrimony. Cp (VA): disturbed areas; rare, perhaps merely a waif or garden remnant, native of Europe. July-September. The only documentation for VA is an 1899 specimen from Fairfax County. [= FNA, K]

Eupatorium capillifolium (Lamarck) Small, Common Dog-fennel. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): disturbed soils; common (uncommon in Mountains). September-November. CT, PA, KY, MO, and OK south to FL and TX. This species, like *E. compositifolium*, is an excellent indicator of soil disturbance. [= C, F, FNA, G, GW, K, S, SE, W; = *E. capillifolium* var. *capillifolium* – RAB]

Eupatorium compositifolium Walter, Coastal Dog-fennel, Yankee-weed. Cp, Pd (GA, NC, SC, VA): sandy disturbed areas; common. September-December. S. VA, KY, and OK south to 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 (as species), Clasping Roundleaf Eupatorium. Cp (NC, SC, VA): woodlands; rare? (VA Watch List). 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 (VA Rare). 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* – RAB, C, G, SE (also see *E. linearifolium*); *E. cuneifolium* var. *cuneifolium* – F; = *E. cuneifolium* Willdenow – S; < *E. linearifolium* Walter – FNA]

Eupatorium godfreyanum Cronquist, Godfrey's Eupatorium. Pd (GA, NC, VA), Mt (NC, VA), Cp (VA): dry woodlands; common (uncommon in VA Coastal Plain, rare south of VA) (GA Special Concern, NC Rare). 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, Pd, Mt (GA, NC, SC, VA): 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 (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 Augustin de Candolle, Limesink Dog-fennel. Cp (GA, NC, SC): limesink depression ponds (dolines) in the outer Coastal Plain and clay-based Carolina bays in the inner Coastal Plain; rare (NC Rare). 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; = *E. capillifolium* var. *leptophyllum* (Augustin de Candolle) Ahles – RAB]

Eupatorium leucolepis (Augustin de Candolle) Torrey & Gray, Savanna Eupatorium. Cp (GA, NC, SC, VA), Pd, Mt (VA): savannas, seepage bogs, depression ponds; common, uncommon in VA, rare in Piedmont and Mountains. August-October. Primarily of the Southeastern Coastal Plain, ranging from NY south to 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 (primarily consisting of *E. mohrii* in our area). 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; < *E. leucolepis* var. *leucolepis* – FNA, K]

Eupatorium linearifolium Walter, Narrowleaf Bushy Eupatorium. Cp (GA, NC, SC, VA): sandhills; uncommon (VA Watch List). Late July-October. A Southeastern Coastal Plain species, ranging from 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]

Eupatorium mohrii Greene, Mohr's Eupatorium. Cp (GA, NC, SC, VA), Mt, Pd (VA): moist savannas, other wet habitats; common (rare in Mountains). August-October. Se. VA south to 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 (also see *E. recurvans*); < *E. anomalum* – S (also see *E. anomalum*)]

Eupatorium perfoliatum Linnaeus, Boneset. Mt, Pd, Cp (GA, NC, SC, VA): marshes, swamps, bogs, wet pastures, and other wet habitats; common. August-October. Nova Scotia west to Manitoba, south to FL and TX. [= RAB, FNA, GW, W; *E. perfoliatum* var. *perfoliatum* –C, F, G, K, S, SE; *? E. cuneatum* Engelmann – S (actually a hybrid)]

Eupatorium pilosum Walter, Ragged Eupatorium. Cp, Pd, Mt (GA, NC, SC, VA): savannas, seepage bogs in the Sandhills, bogs, other moist areas; common (uncommon in Piedmont, rare in Mountains). August-October. MA south to 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; = *E. verbenifolium* 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), Pd, Cp (NC, SC, VA): forests and woodlands, woodland edges, roadbanks; common (uncommon in Mountains and Coastal Plain). 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; < *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 (GA, NC, SC): moist savannas; rare (NC Watch List). August-October. A Southeastern Coastal Plain endemic: se. NC south to GA and 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 (also see *E. anomalum* and *E. mohrii*); < *E. mohrii* – C, FNA, K, SE]

Eupatorium resinosum Torrey ex Augustin de Candolle, Resinous Boneset, Pinebarren Eupatorium. Cp (NC, SC): seepage bogs, beaver ponds, frequently burned streamhead pocosins, in the Sandhills and inner Coastal Plain of sc. NC; rare (US Species of Concern, NC Endangered, SC Rare). August-October. A "bimodal endemic," known from the NJ, DE, and (formerly) NY, thence disjunct to the Sandhills and upper Coastal Plain of NC. [= RAB, C, FNA, G, GW, K, SE; > *E. resinosum* var. *resinosum* – F]

Eupatorium rotundifolium Linnaeus, Common Roundleaf Eupatorium. Cp, Pd, Mt (GA, NC, SC, VA): savannas, seepage bogs, woodlands; common (uncommon in Piedmont, rare in Mountains). August-October. Widespread in e. North America. [= F, S; = *E. rotundifolium* var. *rotundifolium* – RAB, C, FNA, G, K, SE, W; < *E. rotundifolium* – GW (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 (NC Watch List). August-October. Known from e. VA and NC. Considered by some to be a hybrid of *E. album* and *E. altissimum*. [= RAB, F, G; < *E. altissimum* – C, FNA, K]

Eupatorium scabridum Elliott, Roughleaf Eupatorium. Cp (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]

Eupatorium semiserratum Augustin de Candolle. Cp (GA, NC, SC, VA): swamp forests, seepage bogs, savannas, clay-based Carolina bays, other wetlands; uncommon. Late July-October. NC south to 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; = *E. cuneifolium* var. *semiserratum* (Augustin de Candolle) Fernald & Griscom – F]

Eupatorium serotinum Michaux, Late Eupatorium. Cp, Pd, Mt (GA, NC, SC, VA): interdune swales, fields, open forests, powerline rights-of-way, tidal marshes; common. Late August-October. MA, NY, MI, WI, MN, and NE south to 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]

Eupatorium sessilifolium Linnaeus *var.* ***brittonianum*** Porter, Britton's Eupatorium. Mt (NC): circumneutral soils of woodlands at moderate elevation; rare (NC Watch List). August; September. Fairly widespread in ne. North America, south to NJ, PA, MD, NC, KY, and MO. The only collection from NC known to me is from Cedar Cliff, Buncombe County, in 1897. I provisionally disagree with Cronquist's equation of this taxon with *E. godfreyanum*. [= F, K; < *E. sessilifolium* var. *sessilifolium* – RAB; < *E. sessilifolium* – C, FNA, G, S, SE, W]

Eupatorium sessilifolium Linnaeus *var.* ***sessilifolium***, Sessile-leaf Eupatorium. Pd, Mt (GA, NC, VA), Cp (VA): open upland woodlands and woodland borders; common (uncommon in VA Piedmont, rare in VA Coastal Plain). July-October. NH west to MN, south to GA, AL, MS, AR, and KS. [= F, K; < *E. sessilifolium* var. *sessilifolium* – RAB (also see var. *brittonianum*); < *E. sessilifolium* – C, FNA, G, S, SE, W]

Eupatorium species 1. Cp (NC, SC): cypress savannas, clay-based bays, and small depressions ponds; rare (NC Rare list). A Cape Fear Arch endemic, ranging from the se. Coastal Plain and Sandhills of NC, to ne. Coastal Plain of SC. [included in concept of *E. leucolepis* by earlier authors; < *E. leucolepis* – RAB, GW, S, SE; < *E. leucolepis* var. *leucolepis* – FNA, K]

Eupatorium torreyanum Short & Peter, Torrey's Eupatorium. Pd, Mt, Cp (GA, NC, SC, VA): dry woodlands, marshes; common (rare in Mountains). Late July-October. NY south to n. 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; < *E. hyssopifolium* – RAB]

Eupatorium vaseyi T.C. Porter, Vasey's Eupatorium. Mt (GA, NC, VA), Pd (NC, VA): moist to dry woodlands and openings; uncommon, rare in upper Piedmont (VA Watch List). July-October. VA and MD 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; *E. fernaldii* Godfrey]

Eupatorium album Linnaeus var. *subvenosum* A. Gray. Pine barrens, open woodlands. 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* Augustin de Candolle var. *lancifolium* Torrey & A. Gray]

Eupatorium mikanioides Chapman, Semaphore Thoroughwort. Endemic to FL, primarily in the peninsulabut also along the coast of the eastern Panhandle (Bay, Franklin, Gulf, Taylor, and Wakulla counties). July-September. [= FNA, GW, K, S, SE]

Eupatorium petaloideum Britton, Showy White Thoroughwort. Cp (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* var. *petaloideum* (Britton) Godfrey ex D.B. Ward]

Eupatorium ×*pinnatifidum* Elliott, ranges north to VA. 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; = *E. pinnatifidum* Elliott – GW, 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 (1992, 1988). Key based in part on SE.

1 Basal and lower cauline leaves both distinctly petioled and with a cordate or subcordate blade; ["*Aster* section *Biotia*"].
- 2 Outer phyllaries squarrose-reflexed; rhizomes short or absent, the plants not forming extensive clonal colonies; [of rich slopes and bottomlands of the lower Piedmont of NC, SC, GA, and AL].
  - 3 Involucre >11 mm tall; phyllaries acute to acuminate at the apex; phyllaries squarrose in life, often only the innermost squarrose in dried specimens, the reflexed portion with a distinct hyaline margin; [of the lower Piedmont of GA and AL] ..... ***E. jonesiae***
  - 3 Involucre <10 mm high; phyllaries acute, obtuse, or rounded at the apex; phyllaries squarrose in life, generally remaining so in dried specimens, the reflexed portion herbaceous with a narrow hyaline margin or none at all; [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..... ***E. schreberi***
    - 5 Plants without basal leaves on well-developed shoots separate from the flowering shoots.
      - 6 Longest peduncle in inflorescence > 1.5 cm long; involucre > 6.5 mm tall; rays mostly > 13 mm long; [mostly of high mountain forests, primarily over 1200m in elevation] ..... ***E. chlorolepis***
      - 6 Longest peduncle in inflorescence < 1.5 cm long; involucre < 6.5 mm tall; rays mostly < 14 mm long; [mostly of lower elevation forests, primarily below 1200m 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).
    - 9 Pappus fine, the bristles not thickened above; ray florets often 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] ..... ***E. eryngiifolia***
10 Lower stem glabrous, upper stem variously hairy; ray florets 8-35, deep lavender or purple; [collectively widespread]
11 Upper stem strigillose; phyllaries 48-64; disc florets (40-) 52-80+; [widespread] ..... ***E. hemisphaerica***
11 Upper stem villous to glabrescent; phyllaries 20-40; disc florets 18-30; [endemic of FL Panhandle] .... ***[E. spinulosa]***

7 Leaves broader, the largest on a plant over 15 mm wide; leaves somewhat basally disposed, the lowermost sometimes withering before flowering.
12 Leaves obviously veined beneath, usually toothed, hairy on the undersurface.
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.
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 mot 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 (GA Special Concern, NC Rare, SC Rare). Upper Piedmont endemic: w. SC (or sw NC?) to wc. GA. [= FNA, K, X; = *Aster avitus* Alexander – SE, W]

Eurybia chlorolepis (Burgess) Nesom, Blue Ridge White Heart-leaved Aster. Mt (GA, NC, SC, VA): northern hardwood forests, spruce-fir forests; common (VA Watch List). August-October. A Southern Appalachian endemic: sw. VA south through w. NC and e. TN to nw. SC and n. GA (Lamboy 1992). Lamboy (1992) has shown that *Eurybia chlorolepis* is a species distinct from *Eurybia divaricata*. *E. chlorolepis* is tetraploid (2n=36); *E. divaricatus* is diploid. [= FNA, K, X; = *Aster chlorolepis* Burgess – G, S; = *A. divaricatus* Linnaeus var. *chlorolepis* (Burgess) Ahles – RAB, C, SE, W; < *A. divaricatus* – F]

Eurybia compacta Nesom, Slender Aster. Cp (GA, NC, SC, VA): pine savannas: common (rare in GA). Late July-October. An Atlantic Coastal Plain endemic: NJ to e. GA. [= FNA, K, X; = *Aster gracilis* Nuttall – RAB, C, F, G, S, SE]

Eurybia divaricata (Linnaeus) Nesom, Common White Heart-leaved Aster. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): moist to fairly dry forests and woodlands; common. August-October. N. NH west to s. Ontario, sw. Québec, 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. *E. divaricata* is diploid (2n=18). [= FNA, K, X; = *Aster divaricatus* Linnaeus – G, Y; = *A. divaricatus* var. *divaricatus* – RAB, C, SE, W; < *A. divaricatus* – F (also see *Eurybia chlorolepis*); > *A. boykinii* Burgess - S; > *A. castaneus* Burgess – S; > *A. divaricatus* – S; > *A. excavatus* Burgess – S; > *A. flexilis* Burgess – S; > *A. stillettiformis* Burgess – S; > *A. tenebrosus* Burgess – S]

Eurybia eryngiifolia (Torrey & A. Gray) Nesom, Eryngo-leaved Aster. Cp (GA): pine savannas; rare (GA Special Concern). East Gulf Coastal Plain endemic: sw. GA and Panhandle FL west to AL. [= FNA, K, X; = *Aster eryngiifolius* Torrey & A. Gray – S, SE]

Eurybia hemispherica (Alexander) Nesom, Prairie Grass-leaved Aster. Mt, Cp? (GA): glades, barrens, rocky woodlands; uncommon. E. TN west to MO, south to nw. GA, se. GA, and FL Panhandle. [= FNA, K, 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 (GA Watch List). August-October. Endemic to the Piedmont: e. GA west to e. AL (Lee Co.). [= 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), Pd (VA): moist to dryish forests, in NC mostly at moderate to high elevations, particularly in red oak forests on ridgetops; common (rare in Piedmont). Late July-September. New Brunswick and Québec 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), with ranges apparently north of our area; 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; > *A. macrophyllus* var. *ianthinus* (Burgess) Fernald – F; > *A. macrophyllus* var. *pinguifolius* Burgess – F; > *A. macrophyllus* var. *excelsior* Burgess – F; > *A. macrophyllus* var. *velutinus* Burgess – F; > *A. macrophyllus* var. *sejunctus* Burgess – F; > *A. macrophyllus* var. *apricensis* Burgess – F; > *A. macrophyllus* – S; > *A. multiformis* Burgess – S; > *A. riciniatus* Burgess – S]

Eurybia mirabilis (Torrey & A. Gray) Nesom, Piedmont Aster. Pd (NC, SC): nutrient-rich bottomlands and moist slopes in the lower Piedmont; rare (US Species of Concern, NC Rare). July-September. Endemic to the lower Piedmont of NC and SC. The related *E. jonesiae* Lamboy is endemic to GA and AL. [= 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 (GA, NC, SC): wet savannas, sandhill / pocosin ectones; common. July-October. An Atlantic Coastal Plain endemic: ne. NC south to se. GA and ne. FL (Nassau County). [= FNA, K, X; = *Aster paludosus* Aiton – RAB, C, GW, SE; = *A. paludosus* ssp. *paludosus* – G]

Eurybia radula (Aiton) Nesom, Low Rough Aster. Mt (VA): circumneutral to calcareous wet meadows, possibly streeam banks; rare (VA Rare). Newfoundland and Labrador south to DE, MD, WV, and w. VA. [= FNA, K, X; = *Aster radula* Aiton – C, G, SE, W; > *A. radula* var. *radula* – F]

Eurybia schreberi (Nees) Nees, Schreber's Aster. Mt, Pd (VA): mesic forests and seepage slopes; uncommon. August-October. NH west to WI, south to DE, MD, c. 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) Burgess – F]

Eurybia spectabilis (Aiton) Nesom, Low Showy Aster. Cp (NC, SC, VA), Pd (NC): pine barrens, dry road banks; rare (NC Watch List, SC Rare, VA Watch List). August-October. Coastal Plain (and rarely adjacent provinces) from MA south to SC; disjunct in AL. [= 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 surculosa (Michaux) Nesom, Creeping Aster. Mt (NC, SC, VA): rock outcrops, glades, rocky woodlands; uncommon (VA Rare). 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*. [= FNA, K, X; = *Aster surculosus* Michaux – RAB, C, F, G, S, SE, W]

Eurybia saxicastellii (J.J.N. Campbell & Medley) Nesom, Rockcastle Wood-aster. Boulder/cobble bars along the Rockcastle River. Endemic to the Cumberland Plateau region of KY and n. TN (Scott County, TN) (Chester, Wofford, & Kral 1997). [= K, X; = *Aster saxicastellii* J.J.N. Campbell & Medley – C; = *E. saxicastelli* – FNA, orthographic variant]

Eurybia spinulosa (Chapman) Nesom, Apalachicola Aster. Longleaf pine savannas. Panhandle FL (Bay, Calhoun, Gulf, and Franklin counties). May-July. [= FNA, K, X; = *Aster spinulosus* Chapman – GW, S, SE]

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: Haines in FNA (2006b); Sieren (1981)=Z; Taylor & Taylor (1983)=Y; Johnson (1995)=X; Cronquist (1980)=SE.

1 Involucres (4-) 4.5-6.3 mm; disc flowers 3.3-4.8 mm long.
  2 Leaf blades linear to lanceolate, 12-49× as long as wide, gradually smaller at the tip; array heights (25-) 35-60 % of total plant heights ..... ***[E. gymnospermoides]***
  2 Leaf blades lanceolate to lanceolate, 8-18× as long as wide, abruptly smaller at the tip; array heights 6-35 % of total plant heights ..... ***[E. leptocephala]***
1 Involucres 3-4.7 (-5.3) mm; disc flowers 2.5-3.3 (-3.4) mm.
  3 Larger leaves 3-7 cm long, 1-3 (-4) mm wide, 1-3-nerved, 8-45× as long as wide, the faces glabrous or nearly so; axillary leaf fascicles usually many; punctae on leaves many, conspicuous ..... ***E. caroliniana***
  3 Larger leaves 4-13 cm long, 3-10 (-12) mm wide, 3-5-nerved, 7-20× as long as wide, the faces glabrous or ± pubescent; axillary leaf fascicles absent to few; punctae on leaves few and inconspicuous to many and conspicuous.
    4 Heads mostly sessile or subsessile; larger leaves 4-13 cm long, 3-12 mm wide; leaf surfaces moderately to densely hirtellous; disc flowers (4-) 5-7 (-13) per head; ray flowers (11-) 17-22 (-35) per head; [of various, often weedy habitats] ..... ***E. graminifolia***
    4 Heads mostly pedunculate; larger leaves 4-8 cm long, 3-5 mm wide; leaf surfaces moderately hirtellous; disc flowers 3-5 per head; ray flowers 7-12 per head; [of tidewater habitats in the outer Coastal Plain of se. VA southward] ..... ***E. hirtipes***

Euthamia caroliniana (Linnaeus) Greene ex Porter & Britton. Cp (GA, NC, SC, VA): pine savannas, moist forests, ditches, pastures, disturbed areas; common. September-December. Nova Scotia west to MI, south to FL and LA. [= FNA, K, 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. Mt (NC, VA), Pd (VA), Cp (SC, VA): moist to dry weedy situations, riverbanks, bottomlands, bog margins; common (rare south of VA) (NC Watch List). August-September. Newfoundland west to MN, south to e. VA, w. NC, KY, TN, and MO; a SC Coastal Plain report (Hill & Horn 1997) is probably an introduction. [= S, SE, W; = *Solidago graminifolia* (Linnaeus) Salisbury – RAB; < *Euthamia graminifolia* – FNA; > *E. graminifolia* var. *graminifolia* – C, X, Y, Z; > *E. graminifolia* (Linnaeus) Nuttall var. *nuttallii* (Greene) W. Stone – C, X, Y, Z; > *Solidago graminifolia* var. *polycephala* Fernald – F; > *S. graminifolia* var. *graminifolia* – F, G; > *S. graminifolia* var. *nuttallii* (Greene) Fernald – F, G; = *E. graminifolia* var. *graminifolia* – K]

Euthamia hirtipes (Fernald) Sieren, Marsh Flat-topped Goldenrod. Cp (NC, SC, VA): brackish marshes, salt marshes, marsh edges, wet hammocks; uncommon (VA Watch List). September-December. Se. VA south to se. SC (or perhaps west to s. LA). 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-VA, by Taylor and Taylor 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*. [= 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, X, Y]

Euthamia gymnospermoides Greene, Texas Goldentop, east to sc. TN (Chester, Wofford, & Kral 1997). [= FNA, K, SE, Z; < *Solidago gymnospermoides* (Greene) Fernald – F, G]

Euthamia leptocephala (Torrey & A. Gray) Greene, east to sc. TN (Chester, Wofford, & Kral 1997) and MS. [= C, FNA, GW, K, S, SE, Z; = *Solidago leptocephala* Torrey & A. Gray – F, G]

Eutrochium Rafinesque (Joe-pye-weed)

The much debated 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 (NC, SC, VA), Pd (NC, SC), Mt (NC): swamp forests, pocosins, other wet, acidic habitats; common (uncommon in Piedmont). July-October. Nova Scotia, s. ME, and NH south to se. SC, on or near the Coastal Plain. [= 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, Pd, Cp (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 and e. TX. [= FNA, X; = *Eupatoriadelphus fistulosus* (Barratt) King & H.E. Robinson – GW, Y; = *Eupatorium fistulosum* Barratt – RAB, C, F, G, K, SE, W, Z; = *Eupatorium maculatum* – S, misapplied]

Eutrochium maculatum (Linnaeus) E.E. Lamont *var.* ***maculatum***, Spotted Joe-pye-weed. Mt (NC, VA), Pd (VA): marl fens, wet calcareous meadows, cove forests, grassy balds; uncommon, rare in VA (VA Rare). Late July-October. The species is widespread across n. North America. Newfoundland, ME, Québec, Ontario, 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; = *Eupatorium maculatum* ssp. *maculatum* var. *maculatum* – C, Z; < *Eupatoriadelphus maculatus* – Y]

Eutrochium purpureum (Linnaeus) E.E. Lamont *var.* ***purpureum***, Purple-node Joe-pye-weed. Mt, Pd, Cp (GA, NC, SC, VA): upland, usually mesic forests; common (rare in Coastal Plain). 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. [= FNA, X; = *Eupatorium purpureum* Linnaeus var. *purpureum* – K, Z; < *E. purpureum* – RAB, C, F, SE, W; > *Eupatorium purpureum* var. *amoenum* (Pursh) Gray – G; > *Eupatorium purpureum* var. *purpureum* – G; = *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 1600m; uncommon (NC Watch List). 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]

Evax Gaertner

(see *Filago*)

Facelis Cassini

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. Cp, Pd (GA, NC, SC), Mt (SC): fields, roadsides, disturbed areas; common, introduced from s. South America. Late April-June. [= RAB, FNA, K, SE, Y, Z; *? F. apiculata* Cassini – S]

Filago Linnaeus (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, Cp (VA): disturbed areas; uncommon, introduced from Europe. May-September. [= FNA, K, Y; = *F. germanica* – RAB, C, F, G, SE, 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 (GA): disturbed areas; rare, native of tropical America. FL Panhandle, s. FL, AL, GA. [= FNA, K, S, 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, native of introduced from sw. United States (Nesom 2004d). March-December. Also known from ballast at Mobile, AL (Cronquist 1980). [= FNA, K, S, SE]

Flaveria linearis Lagasca y Segura, Narrowleaf Yellowtops. Beaches, marshes, hammocks, pinelands. Native in peninsular and panhandle FL. [= FNA, GW, K, S; < *F. linearis* – SE]

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, Mt, Cp (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 (NC Rare, VA 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, s. TX, and e. Mexico, the distribution rather curiously fragmented. See Wooten & Clewell (1971) for further information about this species. [= FNA, K, Z; = *Eupatorium incarnatum* Walter – RAB, C, F, G, S, SE, W]

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 (GA, NC, SC), Mt? (GA?): sandhills, disturbed sandy soils; rare (NC Rare). July-October. Sc. NC south to 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 (GA, NC, SC): sandy flats behind the dunes; common. April-December. E. 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; = *G. picta* Sweet – S]

* ***Gaillardia pulchella*** Fougeroux *var.* ***pulchella***, Common Blanket-flower. Cp, 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; = *G. drummondii* (Hooker) Augustin de Candolle – S, misapplied]

Galinsoga Ruiz & Pavón (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), Pd, Cp (VA): disturbed areas, roadsides, barnyards; uncommon, introduced from Central and South America. May-October. [= FNA; < C, F, G, K, S, SE, W]

* ***Galinsoga quadriradiata*** Ruiz & Pavón, Common Peruvian-daisy. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): disturbed areas, roadsides, barnyards; uncommon, introduced from Central and South America. May-October. 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 areas. [= C, K, SE, W; > *G. ciliata* (Rafinesque) Blake – RAB, F, G, S; > *G. caracasana* (Augustin de Candolle) Schultz-Bipontinus – F, G; > *G. bicolorata* St. John & White – F, G]

Gamochaeta Weddell (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.
  3 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***
  3 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*).
    4 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***
    4 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.
      5 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***
      5 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.
        6 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***
        6 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. {GA, NC, SC, VA} March-July. [= 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 argentina*** Cabrera. Cp (SC): waste areas near wool-combing mill; rare, perhaps merely a waif, introduced from Argentina and Uruguay. See Nesom (2004d). [= FNA] {not keyed at this time}

Gamochaeta argyrinea Nesom. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): March-July. [= FNA, 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. {GA, NC, SC, VA} March-July. [= 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 (GA, NC, SC), Pd (GA): roadsides, disturbed areas; apparently introduced from South America. March-July. [= FNA, 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(GA, NC, SC, VA), Pd (GA, NC, SC): sandy roadsides, disturbed areas; common. Late June-August. [= FNA, X; < *Gamochaeta americana* (P. Miller) Weddell – K, Y, Z, misapplied; < *Gnaphalium purpureum* Linnaeus var. *americanum* (P. Miller) Klatt – RAB, misapplied]

* ***Gamochaeta pensylvanica*** (Willdenow) Cabrera, Pennsylvanica Everlasting. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA?, NC): fields, roadsides, pastures, disturbed areas; common, apparently introduced. March-July. PA south to FL, west to TX, mostly on the Coastal Plain, and widespread in South America and elsewhere. [= FNA, K, 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, Pd, Mt (NC, SC, VA): fields, roadsides, pastures, disturbed areas; common. Late March-early July. ME west to MI, south to FL and e. TX; apparently disjunct in CA and OR, adventive in w. US, Mexico, South America, and elsewhere. . Mt, Pd, Cp (GA, NC, SC, VA): March-July. [= FNA, X; < *Gamochaeta purpurea* (Linnaeus) Cabrera – K, Y, Z; < *Gnaphalium purpureum* Linnaeus var. *purpureum* – RAB, C, G, SE; < *Gnaphalium purpureum* Linnaeus – F, S, W]

* ***Gamochaeta simplicicaulis*** (Willdenow ex Sprengel) Cabrera. Cp (GA, NC, SC): March-July. Reported for NC, SC, and GA by Nesom (1999, 2000d, 2004b). [= FNA, X]

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 segetum*** (Linnaeus) Fourreau, Corn Marigold, Corn Chrysanthemum. Pd (NC): disturbed areas, trash heaps, field edges; commonly cultivated, rarely escaped, persistent, or as a waif, introduced from Eurasia. April-May. [= FNA; = *Chrysanthemum segetum* Linnaeus – RAB, C, F, G, K, S, SE]

* *Glebionis coronaria* (Linnaeus) Cassini ex Spach, Garland Chrysanthemum, Crown-daisy. {NC, SC} is cultivated and may escape or occur as waifs in our area. [= FNA; = *Chrysanthemum coronarium* Linnaeus – K, Z]

Gnaphalium Linnaeus (Cudweed, Rabbit Tobacco)
(also see *Gamochaeta* and *Pseudognaphalium*)

A genus of about 40 species (as recircumscribed more narrowly), distributed on most continents. References: Nesom in FNA (2006a); Anderberg (1991)=Z.

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): high elevation openings, especially in ruts or mud-puddles, rocky places; rare, possibly introduced in North America (VA Rare). July-October. Newfoundland west to British Columbia, south to VA, WV, OH, IN, MN, CO, UT, and OR. [= C, F, FNA, G, K, S, SE, Z]

Grindelia Willdenow (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): 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, Pd (VA): disturbed areas; rare, introduced from farther west. Other varieties are 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. Cp, Pd (VA): disturbed areas; rare, introduced from 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. Cp (SC): waste areas around wool-combing mill; rare, perhaps merely a waif, introduced from w. North America. See Nesom (2004d). [= FNA, K; = *Xanthocephalum sarothrae* (Pursh) Shinners]
* ***Gutierrezia texana*** (Augustin de Candolle) Torrey & A. Gray *var.* ***texana***. Cp (SC): waste areas around wool-combing mill; rare, perhaps merely a waif, introduced from sc. North America. See Nesom (2004d). [= FNA, K; = *Xanthocephalum texanum* (Augustin de Candolle) Shinners]

Gymnostyles Antoine Laurent de Jussieu

A genus of several species, herbs, of South America. Perhaps better included in *Soliva*. References: Cronquist (1980)=SE; Arriagada & Miller (1997)=Z.

* ***Gymnostyles stolonifera*** (Brotero) Tutin. Cp (GA, SC): lawns, roadsides, moist open areas; uncommon, introduced from South America. March-April. [= K; *? Soliva nasturtiifolia* (Antoine Laurent de Jussieu) Augustin de Candolle – RAB, misapplied; *? Gymnostyles nasturtiifolia* Antoine Laurent de Jussieu – S, misapplied; = *Soliva stolonifera* (Brot.) Loureiro – SE, Z]

Haplopappus
(see ***Croptilon***)

Hartwrightia A. Gray ex S. Watson (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 (GA): seepages and wet pinelands; rare (GA Threatened). July-September. Se. GA south to c. peninsular FL. [= FNA, K, S, SE]

Hasteola Rafinesque 1838 (Sweet Indian-plantain)

A genus of 2 species, perennial herbs, of e. North America. *H. suaveolens* and the FL peninsular endemic, *H. robertiorum* L.C. Anderson, form a genus "not closely related" to our other cacalioids, *Arnoglossum* and *Rugelia* (Anderson 1994). This genus has been known as *Synosma*, but Anderson (1994) demonstrates that *Hasteola* has nomenclatural priority. References: Anderson in FNA (2006b); Anderson (1994)=Z; Cronquist (1980)=SE; Pippen (1978)=Y; Barkley (1999).

Hasteola suaveolens (Linnaeus) Pojarkova, Sweet Indian-plantain. Mt (NC, VA), Pd (VA): sandy bottomlands and riverbanks; rare (NC Rare, VA Rare). CT, 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. [= FNA, K, Z; = *Cacalia suaveolens* Linnaeus – RAB, C, F, G, GW, SE, W, Y; = *Synosma suaveolens* (Linnaeus) Rafinesque ex Britton – S]

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, Pd, Mt (GA, NC, SC, VA): roadsides, overgrazed pastures, urban areas; common, 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]

* ***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, introduced from 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, Pd, Cp (GA, NC, SC, VA): moist pastures, forests, woodlands, forest edges; common. September-October. Québec west to British Columbia, south to FL, TX, and CA. Like *H. amarum*, *H. autumnale* is bitter and unpalatable to grazing animals, becoming more abundant in pastures. [= RAB, FNA; > *H. autumnale* var. *autumnale* – C, F, G, K, SE; > *H. autumnale* var. *parviflorum* (Nuttall) Fernald – F, K; > *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 (GA Special Concern, NC Rare, SC Rare, VA 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, w. GA, c. and w. NC, ec. TN (Chester, Wofford, & Kral 1997), and sw. and se. VA. [= RAB, C, FNA, G, GW, K, SE, W, Z; > *H. brevifolium* – F, S; > *H. curtisii* A. Gray – F, S]

* ***Helenium elegans*** Augustin de Candolle *var. **elegans***. Cp (SC): waste areas around wool-combing mill; rare, perhaps only a waif, introduced from LA, OK, and TX. May. See Nesom (2004d). [= FNA, K, Z]

Helenium flexuosum Rafinesque, Southern Sneezeweed. Cp, Pd, Mt (GA, NC, SC, VA): 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, Z; > *H. nudiflorum* Nuttall – F, S; > *H. polyphyllum* Small – S]

* ***Helenium microcephalum*** Augustin de Candolle *var. **microcephalum***. Cp (SC): waste areas around wool-combing mills; rare, perhaps only a waif, introduced from OK, TX, NM, and CO. May-July. See Nesom (2004d). [= FNA, K, Z]

Helenium pinnatifidum (Nuttall) Rydberg. Cp (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, 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 (GA, NC, SC): wet savannas and adjacent ditches; rare (NC Endangered). April-May. A Southeastern Coastal Plain endemic: se. NC south to panhandle FL and west to e. LA. [= RAB, FNA, GW, K, SE, 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 (US Species of Concern, VA Endangered). 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** var. **dowellianus***

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 ..... ***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 5-10; leaves glabrous or glabrate adaxially, smooth or only slightly rough to the touch; phyllaries 2-3 mm wide..... ***H. laevigatus***
4 Rays 10-14; leaves strumose adaxially, rough to the touch; phyllaries 3.5-4.5 mm wide ..... ***H. eggertii***
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*** *var.* ***dowellianus***
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, 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*** *var.* ***dowellianus***
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, lanceolate to elliptical to ovate and rarely > 5× as long as broad; outer phyllaries often obtuse ..... ***H. floridanus***

22 Leaves not conspicuously undulate, linear to lanceolate and > 5× as long as broad; outer phyllaries acute to slightly acuminate.
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 (GA): mucky areas in pine flatwoods; rare (GA Special Concern). August-December. S. GA and FL peninsula. [= FNA, GW, K, S, SE]

Helianthus angustifolius Linnaeus, Narrowleaf Sunflower. Cp, Mt, Pd (GA, NC, SC, VA): savannas, ditches, marshes, other wet habitats; common (uncommon in Piedmont, rare in Mountains). (July-) September-October (-frost). Primarily Coastal Plain, from Long Island, NY south to 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; > *H. angustifolius* var. *angustifolius* – F; > *H. angustifolius* var. *planifolius* Fernald – F]

* ***Helianthus annuus*** Linnaeus, Common Sunflower. Cp (GA, NC, SC, VA), Pd, Mt (NC, SC, VA): disturbed areas, often cultivated in gardens, sometimes cultivated in fields; uncommon, introduced from the Plains states. June-October. This is the sunflower grown for its seeds. [= RAB, C, F, FNA, G, K, S, SE, W]

* ***Helianthus argophyllus*** Torrey & A. Gray, Silverleaf Sunflower. Cp (NC): disturbed sandy soil on a barrier island and adjacent dunes; rare, introduced from 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]

Helianthus atrorubens Linnaeus, Appalachian Sunflower. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): dry soils of rocky, sandy, or clayey woodlands and roadbanks; common (uncommon in VA Mountains). Late July-October. VA west to w. TN, and south to c. GA, 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 (GA, NC, SC, VA): sandy soils of fields and roadsides; common (rare in VA), introduced from the Gulf Coast states. May-August. [= FNA, K; = *H. debilis* var. *cucumerifolius* (Torrey & A. Gray) A. Gray – RAB, C, F; = *H. cucumerifolius* Torrey & A. Gray – G, S; = *H. debilis* ssp. *cucumerifolius* (Torrey & A. Gray) Heiser var. *cucumerifolius* (Torrey & A. Gray) A. Gray – SE]

Helianthus debilis Nuttall *ssp.* ***tardiflorus*** Heiser. Cp (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]

Helianthus decapetalus Linnaeus, Forest Sunflower. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): mesic woodlands and forests; common (rare in Coastal Plain). July-October. ME and Québec west to WI and IA, and south to GA and MO. [= RAB, C, FNA, G, K, S, SE, W; > *H. decapaetalus* – F; > *H. trachelifolius* P. Miller – F]

Helianthus divaricatus Linnaeus, Spreading Sunflower. Pd, Mt, Cp (GA, NC, SC, VA): mesic to dry woodlands and forests, forest edges; common (rare in Coastal Plain). June-August. Nearly throughout e. United States and adjacent Canada. [= RAB, C, FNA, G, K, S, SE, W; > *H. divaricatus* var. *angustifolius* Kuntze – F; > *H. divaricatus* var. *divaricatus* – F]

Helianthus eggertii Small, Eggert's Sunflower. Pd (SC): diabase barrens; rare. C. TN (Chester, Wofford, & Kral 1997), sc. KY, and n. AL; apparently disjunct in nc. SC (McMillan pers. comm. 2003, specimen at CLEMS), though there is controversy about the identity. [= FNA, K, S, SE]

Helianthus floridanus A. Gray ex Chapman, Florida Sunflower. Cp (GA, NC, SC): wet savannas and pocosin edges; rare (NC Watch List). September-October. A Southeastern Coastal Plain species: se. NC south to FL and west to se LA. [= RAB, FNA, GW, K, S, SE]

Helianthus giganteus Linnaeus, Tuberous Sunflower, Swamp Sunflower. Pd (NC, SC, VA), Mt (GA, NC, VA), Cp (NC, VA): bog edges, moist thickets, ditches; uncommon. Late July-October. New Brunswick 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; > *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 1000-1500m (but sometimes lower), generally flowering only when in a canopy gap (as caused by a tree-fall) or along banks of narrow roads; rare (NC Watch List, SC Rare). July-September. A narrow Southern Appalachian endemic: w. NC, nw. SC, and ne. TN (Chester, Wofford, & Kral 1997). First reported for South Carolina by Hill & Horn (1997). [= RAB, FNA, K, SE, W]

* ***Helianthus grosseserratus*** Martens, Sawtooth Sunflower. Pd (GA, NC, VA), Mt, Cp (VA): disturbed areas; rare, introduced from farther west. The original range of this species was apparently centered in OH, IN, IL, IA, and MO, but it is obscured by its subsequent spread. Reported for NC by Matthews & Mellichamp (1989). [= C, F, FNA, G, K, W; = *H. grosse-serratus* – S, SE, orthographic variant]

Helianthus heterophyllus Nuttall, Savanna Sunflower. Cp (GA, NC, SC): wet savannas, seepage bogs; uncommon (GA Special Concern). August-October. A Southeastern Coastal Plain endemic: se. NC south to n. FL and west to se LA. [= RAB, FNA, GW, K, S, SE]

Helianthus hirsutus Rafinesque, Hairy Sunflower. Mt, Pd (GA, NC, SC, VA), Cp (SC): woodlands and other sunny or semi-sunny habitats; uncommon (VA Watch List). July-October. PA and MN, south to n FL and TX. [= RAB, C, FNA, G, K,

S, SE, W; > *H. hirsutus* var. *hirsutus* – F; > *H. hirsutus* var. *trachyphyllus* Torrey & Gray – F; > *H. hirsutus* var. *stenophyllus* Torrey & Gray – F]

* ***Helianthus laetiflorus*** Persoon. Cp, Pd (NC, SC, VA), Mt (VA): 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; = *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), 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, rare south of VA (NC Rare, SC Rare). September-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 NC and SC, most notably the Carolina Slate Belt in Montgomery and Stanly counties, NC. [= RAB, C, F, FNA, G, K, SE, W; > *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; rare (NC Watch List). 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, Mt (NC, SC, VA), Cp (NC, VA): moist roadsides and disturbed areas; rare (becoming common), introduced from farther west. September-October. Manitoba and MI west to British Columbia 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, Mt (GA, NC, SC, VA), Cp (GA, NC, SC): dry woodlands and roadbanks; common (uncommon in Coastal Plain, rare in much of VA). August-October. NJ west to MN, south to nw. FL and se. LA. [= RAB, F, FNA, G, K, S, W; < *H. microcephalus* – C, SE]]

* ***Helianthus mollis*** Lamarck, Ashy Sunflower. Cp (NC, SC, VA), Pd, Mt (GA, NC, VA): disturbed places; rare, introduced from farther west (VA Watch List). 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. {perhaps 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 *var.* ***dowellianus*** (M.A. Curtis) Torrey & A. Gray, Naked-stem Sunflower. Mt (GA, NC, VA), Pd (VA): rocky or sandy flood-scoured riversides; rare (NC Rare, VA Rare). August-October. MD and DC west to MN, and south to w. NC, n. GA, w. 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. [= C, F, SE; < *H. occidentalis* ssp. *occidentalis* – FNA, K; < *H. occidentalis* – RAB, G, S, W; = *H. dowellianus* M.A. Curtis]

* ***Helianthus pauciflorus*** Nuttall *ssp.* ***pauciflorus***, Stiff Sunflower. Pd (GA), {VA}: disturbed areas; rare, introduced from midwestern United States. 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, introduced from the Great Plains, where it is native. 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 (GA, SC): sandhills, dryish savannas, and dry pine flatwoods; rare. Late August-October. S. SC south to c. 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]

Helianthus resinosus Small, Resinous Sunflower. Pd, Mt, Cp (GA, NC, SC): woodlands, thickets, roadsides; uncommon. June-October. Nc. and w. NC south to w. FL and west to MS. Listed for VA by F; documentation unknown. [= FNA, K, S, SE, W; = *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 (US Endangered, NC Endangered, SC Rare). Late August-October. The range is limited to the Piedmont of NC and 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, Pd (GA, SC): wet soils, ditches, roadsides; rare. October-November. SC west to LA. [= FNA, GW, K, S, SE]

Helianthus smithii Heiser, Smith's Sunflower. Mt (GA): dry forests and woodlands; rare (GA Special Concern). 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, Pd, Cp (GA, NC, SC, VA): woodlands and roadsides; common (rare in Coastal Plain). Late July-September. ME, MN, and KA south to FL and TX. [= RAB, C, F, FNA, G, K, SE, W; > *H. strumosus* – S; > *H. montanus* E.E. Watson – S; > *H. saxicolus* – S]

* ***Helianthus tuberosus*** Linnaeus, Jerusalem Artichoke. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas, cultivated in gardens for the edible tubers; common, introduced from farther west. July-October. [= RAB, C, FNA, K, S, SE, W; > *H. tuberosus* var. *tuberosus* – F, G]

Helianthus verticillatus Small, Whorled Sunflower. Mt (GA): wet calcareous prairies; rare (GA Special Concern). 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 salicifolius* A. Dietr. is reported for MD by Kartesz (1999). Not in our area in FNA. [= C, F, FNA, G, K, SE] {not keyed}

Helianthus silphioides Nuttall, widespread in TN, including east to se. TN (Chester, Wofford, & Kral 1997). [= C, F, FNA, K, SE; = *H. atrorubens* Linnaeus var. *pubescens* Kuntze] {synonymy incomplete}

Heliomeris Nuttall

* ***Heliomeris multiflora*** (Nuttall) Blake *var. **multiflora***. Cp (SC): waste areas around wool-combing mill; rare, perhaps only a waif, introduced from western United States and Mexico. May. [= K; = *Viguiera multiflora* (Nuttall) Blake] {not keyed at this time}

Heliopsis Persoon (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 slightly scabrous above); leaves 4.5-6.0 cm wide; stem glabrous and glaucous below, slightly scabrous above ..... ***H. helianthoides var. helianthoides***
  2 Leaves scabrous on both sides; leaves 3.0-3.5 cm wide; stem generally scabrous..... ***[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 (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 west to LA (Thomas & Allen 1996). [= K; = *H. minor* (Hooker) C. Mohr – S; = *H. gracilis* Nuttall – SE, Z]

Heliopsis helianthoides (Linnaeus) Sweet *var. **helianthoides***, Eastern Sunflower-everlasting, Eastern Oxeye. Mt, Pd (GA, NC, SC, VA), Cp (VA): forests, woodlands, woodland borders; common (rare in Coastal Plain). May-October. VT, Ontario, 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; = *H. helianthoides* ssp. *helianthoides* – Z]

Heliopsis helianthoides (Linnaeus) Sweet var. *scabra* (Dunal) Fernald, Western Sunflower-everlasting, Western Oxeye. Pd (VA): forests, woodlands, woodland borders; rare? May-October. Newfoundland and Saskatchewan south to KY, GA, LA, TX, and NM. This taxon has been ascribed to our area by various authors; its distribution in our area needs confirmation. [= C, F, G, K, SE; = *H. scabra* Dunal – S; = *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, introduced from 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 (Camphorweed, Golden-aster)
(also see *Chrysopsis* and *Pityopsis*)

A genus of about 28 species, herbs, of North America. References: Semple in FNA (2006b); Wagenknecht (1960)=Z; Semple (1996)=Y; Gandhi & Thomas (1980)=X; Semple (2004)= Q; Cronquist (1980)=SE; Semple (1983). Key adapted in part from Z and X.

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 (GA, NC, VA), Pd, (GA, NC), Cp (NC): roadsides, disturbed areas; rare, introduced from 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 (NC, SC, VA), Mt (NC, SC): roadsides, disturbed areas; common, introduced from the sc. United States and adjacent Mexico. [= Y; = *H. subaxillaris* (Lamarck) Britton & Rusby var. *latifolia* (Buckley) Gandhi & Thomas – X; < *H. subaxillaris* – RAB, C, F, G, K, S, SE, W; *H. latifolia* var. *latifolia* – Z; = *H. subaxillaris* (Lamarck) Britton & Rusby ssp. *latifolia* (Buckley) Semple – FNA, Q]

Heterotheca subaxillaris (Lamarck) Britton & Rusby, Dune Camphorweed. Cp (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; < *H. subaxillaris* – RAB, C, F, G, K, S, SE (also see *H. latifolia*); = *H. subaxillaris* ssp. *subaxillaris* – FNA, Q; = {} – Z]

Hieracium Linnaeus (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. megacephalon***
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), Pd (VA): pastures, roadsides; rare, introduced from Europe. May-July. [= RAB, F, FNA, G, K, SE, W; **= *Pilosella aurantiaca*** (Linnaeus) F. Schultz & Schultz-Bipontinus]

* ***Hieracium caespitosum*** Dumortier, Yellow King-devil, Yellow Fox-and-cubs. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): pastures, fields, roadsides; common, introduced from Europe. May-July. [= C, FNA, K, SE, W; *? H. pratense* Tausch – RAB, F, G; **= *Pilosella caespitosa*** (Dumortier) Sell & C. West]

* ***Hieracium flagellare*** Willdenow, Whiplash Hawkweed. Mt? (VA): roadsides; rare, introduced from 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, Pd (VA): roadsides, pastures; rare, introduced from 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, Pd, Mt (GA, NC, SC, VA): sandhills, dry forests, woodland margins, roadsides; common. July-November. MA west to s. Ontario and KS, south to c. peninsular FL and TX. [= RAB, C, F, FNA, G, K, S, SE, W]

Hieracium marianum Willdenow, Maryland Hawkweed. Cp, Pd, Mt (NC, SC, VA): dry forests, woodland margins, roadsides; common. May-November. NH west to OH, south to FL and MS. Considered to derive from hybridization between *H. gronovii* Linnaeus and *H. venosum* Linnaeus. [= F, K, S; = *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, orthographic variant; > *H. megacephalon* – S; > *H. argyraeum* Small – S]

Hieracium paniculatum Linnaeus, Leafy Hawkweed. Mt (GA, NC, SC, VA), Pd (NC, VA): dry to mesic forests, especially along dirt roads; common. July-October. Nova Scotia and Québec 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]

* ***Hieracium pilosella*** Linnaeus, Mouse-ear Hawkweed. Mt (GA, NC, VA), Pd (NC, VA), Cp (VA): pastures, roadsides, disturbed areas; uncommon, introduced from Europe. May-July. [= RAB, C, FNA, G, SE, W; > *H. pilosella* var. *pilosella* – F, K; **= *Pilosella officinarum*** F. Schultz & Schultz-Bipontinus]

* ***Hieracium piloselloides*** Villars, Glaucous King-devil. Mt (GA, NC, SC, VA), Pd, Cp (VA): fields, pastures, roadsides, rare, introduced from Europe. May-September. [= C, FNA, K; *? H. florentinum* Allioni – RAB, F, G, SE, W; **= *Pilosella piloselloides*** (Villars) Soják]

Hieracium scabrum Michaux, Rough Hawkweed. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): dry forests, woodland margins, roadsides; common (GA Special Concern). July-November. Nova Scotia and Québec west to MN, south to VA, n. GA, KY, and MO. [= RAB, C, FNA, G, S, SE, W; > *H. scabrum* var. *scabrum* – F, K]

Hieracium traillii Greene, Shale-barren Hawkweed. Mt, Pd? (VA): shale barrens and dry shaley woodlands, other xeric woodlands; uncommon. Sc. PA south to w. VA and e. WV. [= C, F, FNA, G, SE, W; = *H. greenii* Porter & Britton – K, S, a preoccupied name]

Hieracium venosum Linnaeus, Veiny Hawkweed. Mt, Pd, Cp (GA, NC, SC, VA): dry forests, woodland margins, roadsides; common. April-July. NY west to MI, south to GA, AL, and TN; apparently disjunct in FL. [= RAB, C, FNA, G, S, SE, W; > *H. venosum* var. *venosum* – F, K; > *H. venosum* var. *nudicaule* (Michaux) Farwell – F, K]

Hieracium longipilum Torrey. Ontario, OH, KY, and TN west to MN, NE, KS, OK, and TX. [= C, F, FNA, G, K, SE]

Hieracium umbellatum Linnaeus, Northern Hawkweed. 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]

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 (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 (GA, SC): turkey oak sandhills and adjacent sandy fields; rare. 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]

Hymenoxys Cassini

* ***Hymenoxys odorata*** Augustin 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* (Augustin de Candolle) Britton]

Hypochaeris Linnaeus (Cat's-ear)

A genus of about 60 species, herbs, of South America, Europe, Asia, and n. Africa. The 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.

2 Plants glabrous or apparently so; plants mostly annual.....***H. glabra***
2 Plants conspicuously pubescent, as on the hispid leaves; plants mostly perennial.....***H. radicata***

* ***Hypochaeris chillensis*** (Kunth) Britton, Brazilian Cat's-ear. Cp (GA, NC, SC), Pd (GA, SC), Mt (SC): roadsides, fields, other disturbed places; common, introduced from 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; *? Hypochoeris elata* (Weddell) Grisebach – RAB, misapplied]
* ***Hypochaeris glabra*** Linnaeus, Smooth Cat's-ear. Cp (GA, NC, SC), Pd (NC, SC): roadsides, fields, disturbed areas; common (rare in NC), introduced from Europe. Late March-July. [= FNA, K, S; = *Hypochoeris glabra* – RAB, C, SE, orthographic variant]
* ***Hypochaeris microcephala*** (Schultz-Bipontinus) Cabrera *var.* ***albiflora*** (Kuntze) Cabrera, White-flowered Cat's-ear. Cp (GA): disturbed areas; rare, introduced from South America. This species has been found as a naturalized introduction at Fort Pulaski (Chatham County, GA) (T. Govus, pers. comm.). [= FNA, K, SE]
* ***Hypochaeris radicata*** Linnaeus, Spotted Cat's-ear. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, fields, disturbed areas; common, introduced from Eurasia. April-July (or later). [= FNA, G, K, S; = *Hypochoeris radicata* – RAB, C, F, SE, 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), Pd (VA): disturbed areas; rare, introduced from Europe. May-July. [= RAB, C, F, FNA, G, K, S, SE, W, Z]

Ionactis (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, Pd, Mt (GA, NC, SC, VA): dry savannas, sandhills, pine flatwoods, prairie-like openings, glades, and barrens, high elevation rock outcrops and glades, to at least 1450m, dry roadbanks, woodland edges, rocky woodlands; common. Late September-November. ME and Québec west to WI, south to n. 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, Z; = *I. linariifolius* – K, S, orthographic variant; = *Aster linariifolius* Linnaeus – RAB, C, G, SE, W]

Iva Linnaeus (Marsh-elder)
(also see *Cyclachaena*)

A genus of about 9 species, shrubs and herbs, of North America and West Indies, as circumscribed more narrowly by recent authors. References: Cronquist (1980)=SE; Jackson (1960); Strother in FNA (2006c).

1 Plants annual, not fleshy, more-or-less pubescent (at least in the inflorescence); [of inland wetlands or disturbed areas].
2 Leaves 0.5-3 mm wide, linear; staminate flowers usually 4-6 per head; [mostly of clay-based Carolina bays] .....
.....***I. microcephala***
2 Leaves 20-70 mm wide, ovate; staminate flowers usually 8-16 (-20) per head; [mostly of disturbed ground].
3 Heads subtended by bracts (other than the phyllaries); phyllaries 3-5 ..... ***I. annua***
3 Heads lacking bracts (other than the phyllaries); phyllaries 5.....***[see Cyclachaena xanthiifolia]***
1 Plants perennial, fleshy, glabrous; [of maritime situations, such as brackish marshes, marsh edges, or ocean dunes].
4 Leaves alternate; 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; [mostly of dunes and the upper beach]..... ***I. imbricata***
4 Leaves opposite (alternate above or in the inflorescence); 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; [mostly of marshes, marsh edges, and wet hammocks].
5 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 south throughout our area]..... ***I. frutescens*** *var.* ***frutescens***
5 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***

* ***Iva annua*** Linnaeus, Sumpweed, Rough Marsh-elder. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): fields, disturbed places; rare, introduced (by native Americans) from further west. September-November. This species was apparently an important crop of native Americans. The so-called var. *macrocarpa* (Blake) R.C. Jackson [*I. ciliata* var. *macrocarpa* Blake], 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; = *I. ciliata* Willdenow – F; > *I. ciliata* Willdenow var. *ciliata* – G; > *I. ciliata* var. *macrocarpa* Blake – G; > *I. annua* var. *annua* – K; > *I. annua* var. *caudata* (Small) R.C. Jackson – K; > *I. annua* var. *macrocarpa* (Blake) R.C. Jackson – K; > *I. ciliata* – S; > *I. caudata* Small – S]

Iva frutescens Linnaeus *var. **frutescens***, Southern Maritime Marsh-elder. Cp (GA, NC, SC, VA): brackish marshes and marsh edges, normally on the back side of barrier islands; common. Late August-November. NJ south to 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; < *I. frutescens* – RAB, FNA, S]

Iva frutescens Linnaeus *var. **oraria*** (Bartlett) Fernald & Griscom, Northern Maritime Marsh-elder. Cp (NC, VA): brackish marshes and marsh edges, normally on the back side of barrier islands; uncommon (NC Watch List). Late August-November. Nova Scotia 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; < *I. frutescens* – RAB, FNA, S; = *I. oraria* Bartlett]

Iva imbricata Walter, Dune Marsh-elder. Cp (GA, NC, SC, VA): dunes, upper beach, island-end flats; common (VA Rare). Late August-November. Se. VA south to FL, west to LA; also in the 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 *Chamaesyce polygonifolia*, *Ch. bombensis*, *Cakile edentula*, and *Amaranthus pumilus*. [= RAB, C, F, FNA, G, K, S, SE]

Iva microcephala Nuttall, Small-headed Marsh-elder. Cp (GA, NC, SC): clay-based Carolina bays; rare (NC Rare). September-October. C. NC south to s. peninsular FL, west to se. AL. A seed-banking annual, occurring in extremely variable populations in the variable hydrologic conditions of Carolina bays. [= RAB, FNA, GW, K, S, SE]

* *Iva axillaris* Pursh, Deer-root. Cp (SC): waste areas around wool-combing mill; rare, perhaps only a waif, introduced from w. United States. May-October. See Nesom (2004d). [= FNA, K] {not keyed at this time}

Ixeris (Cassini) Cassini

A genus of ca. 20 species, herbs, of e. and se. Asia. References: Strother in FNA (2006a).

* *Ixeris stolonifera* A. Gray, Creeping Lettuce, is introduced from e. Asia and established as a weed in lawns, gardens, and plant nurseries in se. PA (Rhoads & Klein 1993) and NY (Long Island). June-August. [= C, FNA, K; = *Lactuca stolonifera* (A. Gray) Bentham ex Maximowicz – F]

Jamesianthus Blake & Sherff (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 (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 at maturity, 2-4× as long as wide; pappus absent; plant a leafy-stemmed winter annual..... ***K. cespitosa***
1 Phyllaries reflexed at maturity, 3-8× as long as broad; pappus present, consisting of 5 or more scales and 5 or more bristles; plant a scapose, subscapose, or leafy-stemmed perennial or a scapose or subscapose winter annual.
  2 Pappus of 5 scales and 5 bristles; plant a winter annual; stem leafless or leafy at the base only..... ***K. virginica***
  2 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.
    3 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***

3 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.
4 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***
4 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; rare (NC Watch List). Late May-early July. Var. *biflora* ranges from MA s. Ontario and MN south to GA, AL, MS, AR, and e. OK; the smaller var. *viridis* (Standley) Kim occurs in CO, AZ, and NM. [= K, Z; < *K. biflora* – RAB, C, F, FNA, G, SE, W; = *Cynthia virginica* (Linnaeus) D. Don – S]

Krigia cespitosa (Rafinesque) K.L. Chambers *var.* ***cespitosa***, Opposite-leaf Dwarf-dandelion. Cp, Pd (GA, NC, SC, VA), Mt (GA): fields, roadsides, disturbed places; common (rare in VA) (VA Watch List). Late March-early June. S. VA and NE south to FL and TX. *K. cespitosa* var. *gracilis* (Augustin de Candolle) K.L. Chambers occurs in TX. [= FNA, Y; < *K. cespitosa* – GW, 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, Cp (GA, NC, SC, VA): rocky woodlands, roadsides, disturbed areas; common (rare in Coastal Plain). April-May. NJ, IL, and KA, south to FL and ne. TX. [= RAB, C, F, FNA, G, GW, K, SE, W, Z; = *Cynthia dandelion* (Linnaeus) Augustin de Candolle – S]

Krigia montana (Michaux) Nuttall, Mountain Dwarf-dandelion. Mt (GA, NC, SC): cliffs and rock outcrops at medium to high elevations; uncommon (NC Watch List, SC Rare). May-September. A Southern Appalachian endemic: w. NC, e. TN, nw. SC, and ne. GA. [= RAB, FNA, K, SE, W, Z; = *Cynthia montana* (Michaux) Standley – S]

Krigia virginica (Linnaeus) Willdenow, Virginia Dwarf-dandelion. Cp, Pd, Mt (GA, NC, SC, VA): rocky woodlands, roadsides, disturbed areas; common. Late March-early June. ME west to MN, south to FL and c. TX. [= RAB, C, F, FNA, G, GW, K, S, SE, W, Z]

Krigia occidentalis Nuttall. {GA} MO nad KS south to LA and TX. [= FNA, K] {not yet keyed; synonymy incomplete at this time}

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).

Kuhnia
(see *Brickellia*)

Lactuca Linnaeus (Lettuce)
(also see *Ixeris*)

A genus of about 75 species, herbs, nearly cosmopolitan (especially north temperate). References: Strother in FNA (2006a); Cronquist (1980)=SE; McVaugh (1972).

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, Pd (NC, VA): pastures, roadsides, forest edges; uncommon. August-November. Labrador and AK south to NC, TN, IA, CO, UT, and CA. [= RAB, C, F, FNA, G, K, SE, W; > *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), Pd, Cp (GA, NC, SC, VA): fields, roadsides, disturbed ground; common. June-November. Nova Scotia and British Columbia south to FL, TX, and CA. [= RAB, C, FNA, K, SE, W; > *L. canadensis* var. *canadensis* – F, G; > *L. canadensis* var. *latifolia* Kuntze – F, G; > *L. canadensis* var. *longifolia* (Michaux) Farwell – F, G; > *L. canadensis* var. *obovata* Wiegand – F, G; > *L. canadensis* – S; > *L. sagittifolia* – S]

Lactuca floridana (Linnaeus) Gaertner, Woodland Lettuce. Pd, Cp, Mt (GA, NC, SC, VA): mesic and dry-mesic forests; common (rare in GA Coastal Plain). August-November. NY, Manitoba and MN south to FL and TX. [= RAB, C, FNA, SE, W; > *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): mesic to dry-mesic pine-oak woodlands and forests, longleaf pine sandhills, sandy fields, and sandy roadsides; common (rare in Piedmont). April-July. E. NC south to 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; = *L. graminifolia* – S]

Lactuca hirsuta Muhlenberg ex Nuttall, Downy Lettuce. Cp (GA, NC, SC, VA), Pd, Mt (NC, SC, VA): forests and forest edges; uncommon (rare in Piedmont and Mountains and in GA Coastal Plain). Late May-November. Nova Scotia and Ontario south to n. FL and TX. [= RAB, C, FNA, S, SE, W; > *L. hirsuta* var. *hirsuta* – F, G, K; > *L. hirsuta* var. *sanguinea* (Bigelow) Fernald – F, G, K]

* ***Lactuca saligna*** Linnaeus, Willowleaf Lettuce. Mt (NC, VA), Pd (SC, VA), {GA}: fields, roadsides, disturbed ground, perhaps associated with circumneutral soils; rare, native of Europe. August-November. [= RAB, C, F, FNA, G, K, SE, W]

* ***Lactuca sativa*** Linnaeus, Garden Lettuce. Mt, Pd, Cp (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, Pd, Cp (GA, NC, SC, VA): roadsides, disturbed ground, pastures; common (rare in GA), native of Europe. June-November. [= C, FNA, K, SE; = *L. scariola* Linnaeus – RAB, F; > *L. serriola* var. *integrata* Gren. & Godr. – G, W; > *L. scariola* – S; > *L. virosa* – S, misapplied]

Lactuca ludoviciana (Nuttall) Riddell, Louisiana Lettuce. Manitoba and British Columbia, 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}

Lapsana Linnaeus (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), Pd, Cp (VA): fields, forests, disturbed areas; uncommon (rare in GA, NC, and Coastal Plain of VA), introduced from Europe. June-August. First reported for GA (Rabun County) by Stiles & Howel (1998). See Poindexter (2006). [= RAB, C, F, FNA, G, K, SE, W]

Leontodon Linnaeus 1754 (Hawkbit)

A genus of about 50 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.

1 Heads (solitary-) several; scapes usually scaly-bracted above; pappus of plumose bristles; [genus *Oporinia*] .... ***L. autumnalis***
1 Head solitary; scapes usually naked; pappus type mixed, at least the outer pappus of the outer florets in each head of scales; [genus *Leontodon*].
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 autumnalis*** Linnaeus, Fall-dandelion. Cp (VA): roadsides, fields; rare, introduced from Europe. June-October. [= FNA, SE; > *Leontodon autumnalis* Linnaeus var. *autumnalis* – C, F, G; > *L. autumnalis* ssp. *autumnalis* – K; = ***Oporinia autumnalis*** (Linnaeus) D. Don]
* ***Leontodon saxatilis*** Lamarck *ssp.* ***saxatilis***, Little Hawkbit. Cp (VA), Mt (NC): roadsides, fields; rare, introduced from 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* (Wallr.) G. Beck – F, G]

* *Leontodon hispidus*, 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, introduced from Europe. June-July. [= FNA, K, Z; = *Chrysanthemum lacustre* Brotero – RAB, C, SE]
* ***Leucanthemum vulgare*** Lamarck, Oxeye Daisy, White Daisy, Common Daisy, Marguerite. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): fields, roadsides, pastures, disturbed areas; common, introduced from Eurasia. April-July. [= FNA, K, Z; = *Chrysanthemum leucanthemum* Linnaeus – RAB, C, G, SE, W; > *Ch. leucanthemum* var. *pinnatifidum* Lecoq & Lamotte – F; = *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 glabrous.

11 Phyllaries apically usually rounded-retuse and minutely involute-cuspidate to apiculate; corolla tubes glabrous within.

12 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***

12 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***

11 Phyllaries apically acute; corolla tubes pilose within.

13 Heads often in a secund arrangement; involucres 11-15 mm; phyllaries obovate; florets 3-6.....***L. pauciflora***

13 Heads in a secund arrangement or not; involucres (6-) 7-9 mm; phyllaries ovate-triangular to generally oblong; florets 4-10 (-12).

14 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***

14 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***

10 Stems hirtellous with spreading to slightly deflexed hairs or variously puberulent to hirsute.

15 Stems hirsute to puberulent to pilose-puberulent or strigose-puberulent.....***L. gracilis***

15 Stems hirtellous with spreading to slightly deflexed hairs.

16 Heads sessile, relatively crowded in a cylindric arrangement, rigidly ascending, appressed to the rachis and to each other, densely overlapping.....***L. chapmanii***

16 Heads sessile to short-pedunculate, in a relatively loose, spiciform, racemoid, or paniculate, commonly secund arrangement .....***L. pauciflora***

9 Mid and inner phyllaries apically rounded, not rounded-retuse or cuspidate to apiculate.

17 Stems glabrous (rarely sparsely to moderately pilose in *L. pilosa*).

18 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***

18 Involucres 6-10 mm; florets (6-) 7-13 (-17); corolla tubes internally pilose (glabrous in L. ligulistylis); pappus bristles as long as the corolla tubes (shorter in some populations of *L. helleri*).

19 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***

19 Stems 40-120 cm; leaves and phyllaries distinctly punctate-glandular to weakly punctate; pappus bristles equal the corolla tube length; coastal plain and piedmont.

20 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***

20 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***

17 Stems puberulent to strigose.

21 Involucres 2.5-7 mm wide; florets 3-12.

22 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***

22 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***

21 Involucres 13-22 (-25) mm wide or (6-) 8-15 mm wide (*L. squarrulosa*); florets 11-80.

23 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.

24 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***

24 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]***

23 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.

25 Phyllaries glabrous, bullate, with broad, conspicuous, often erose to lacerate or irregular, hyaline border ..... ***L. aspera***

25 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. Mt (GA, NC, VA), Pd (GA, NC?), Cp (GA), {SC}: prairies, barrens, glades; rare (NC Rare, VA Rare). August-September (-October). Ontario and ND south to FL and TX. [= RAB, C, FNA, G, SE, W; > *Liatris aspera* var. *aspera* – F; > *Liatris aspera* Michaux var. *intermedia* (Lunell) Gaiser – F, K, 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. Cp (GA): xeric sands of scrub; rare (GA Special Concern). August-October. Sw. GA, s. AL, south to FL. [= FNA, K, SE; = *Laciniaria chapmanii* (Torrey & A. Gray) Kuntze – S] {synonymy incomplete}

Liatris cokeri Pyne & Stucky, Sandhills Blazing-star. Cp (NC, SC): sandhills; common. (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. Mt (GA): limestone glades, prairies; rare. July-September. NY, Ontario, 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. Cp (GA, SC): sandhills; common. SC south to FL, west to TX. See Mayfield (2002) for discussion of infraspecific taxa in this species. [= FNA; < *Liatris elegans* – RAB, SE; < *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. Cp (GA, SC): sandhills; rare. 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; < *Liatris elegans* – SE, Z; < *Laciniaria elegans* (Walter) Kuntze – S]

Liatris elegantula (Greene) K. Schumann. Cp (GA): sandhills; rare? August-October (-November). GA south to FL, west to MS. [= FNA; = *Liatris graminifolia* Willdenow var. *elegantula* (Greene) Gaiser – Z; = *Laciniaria elegantula* Greene; < *Laciniaria graminifolia* (Willdenow) Kuntze – S; < *Liatris graminifolia* – SE] {synonymy incomplete}

Liatris gracilis Pursh, Slender Blazing-star. Cp (GA, SC): sandhills, dry pine flatwoods; uncommon. (July-) August-October (-November). SC south to FL, west to MS. [= RAB, FNA, K, SE; > *Laciniaria laxa* Small – S; > *Laciniaria gracilis* (Pursh) Kuntze – S]

Liatris helleri T.C. Porter, Heller's Blazing-star. Mt (NC, VA): high elevation rock outcrops, sometimes on ledges of precipitous cliffs, rocky openings in heath balds, shale barrens; rare (US Threatened, NC Threatened). July-mid September. E. WV and w. VA south to w. NC. [= FNA; > *Liatris helleri* T.C. Porter – RAB, K, SE, W, Y, Z; > *Liatris turgida* Gaiser – RAB, C, F, G, K, SE, W, Y, Z; > *Laciniaria helleri* (Porter) Porter ex Heller – S; > *Laciniaria pilosa* (Aiton) Heller – S, misapplied]

Liatris hirsuta Rydberg. Mt (GA): Coosa prairies; rare. 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. Cp (GA): longleaf pine sandhills, scrub; rare (GA Special Concern). August-October (-November). Se. GA (Charlton County) south to peninsular FL. [= FNA; = *Liatris tenuifolia* Nuttall *var. quadriflora* Chapman – K, SE; < *Laciniaria tenuifolia* (Nuttall) Kuntze – S]

Liatris microcephala (Small) K. Schumann, Small-head Blazing-star. Mt, Pd (GA, NC, SC): outcrops of acidic rocks (sandstone, granite, gneiss); rare (NC Rare). 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 patens Nesom & Kral, Georgia Blazing-star. Cp (GA, SC): longleaf pine sandhills and dry flatwoods; uncommon. Late August-early November. SC south to FL. See Kral & Nesom (2003) for detailed information. [= FNA]

Liatris pauciflora Pursh, Few-flower Blazing-star. Cp (GA): xeric sands of scrub; rare (GA Special Concern). August-October. GA (Tatnall Co.) south to 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]

Liatris pilosa (Aiton) Willdenow. Pd, Cp (NC) {GA, SC, VA}: sandhills, pine barrens, fields, roadbanks; common. (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* (DC.) Venard – F; > *Liatris graminifolia* var. *typica* – Y, Z; > *Liatris graminifolia* var. *dubia* (Barton) A. Gray – Y, Z; = *Laciniaria graminifolia* (Walter) Kuntze – S]

Liatris scariosa (Linnaeus) Willdenow *var.* ***scariosa***, Northern Blazing-star. Mt (NC, VA): shale barrens, dry rock outcrops, roadbanks; rare? (NC Watch List). 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* – Y, Z; > *Liatris scariosa* var. *virginiana* (Lunell) Gaiser – Y, Z]

Liatris secunda Elliott, Sandhill Blazing-star. Cp (GA, NC, SC): sandhills; rare (GA Special Concern, NC Watch List). August-September (-October). s. NC south to FL, west to AL. [= RAB, Y; < *Liatris pauciflora* Pursh – K, SE; = *Laciniaria secunda* (Elliott) Small – S; = *L. pauciflora* Pursh var. *secunda* (Elliott) D.B. Ward – FNA]

Liatris spicata (Linnaeus) Willdenow *var.* ***resinosa*** (Nuttall) Gaiser. Cp (GA, NC, SC, VA), Pd, Mt (NC), {GA, NC, SC, VA}: bogs, wet pine savannas, seepages; common. (July-) August-October (-November). NJ south to FL, west to LA. [= RAB, F, FNA, G, K, Y, Z; < *Liatris spicata* – C, SE, W; < *Laciniaria spicata* (Linnaeus) Kuntze – S]

Liatris spicata (Linnaeus) Willdenow *var.* ***spicata***, Florist's Gayfeather. Mt, Pd (NC) {GA, NC, VA}: prairies, roadsides, seepages, bogs, grassy balds; common. July-September. MA, Ontario, and MI, south to GA, AL, MS, and AR. [= RAB, F, FNA, G, K; = *Liatris spicata* var. *typica* – Y, Z; < *Liatris spicata* – C, SE, W; < *Laciniaria spicata* (Linnaeus) Kuntze – S]

Liatris squarrosa (Linnaeus) Michaux *var.* ***squarrosa***. Pd, Cp, Mt (GA, NC, SC) {VA}: [= C, FNA, G, K, SE; > *Liatris squarrosa* var. *squarrosa* – F; > *L. squarrosa* var. *gracilenta* Gaiser – F, Y, Z; < *L. squarrosa* – RAB, W; < *Laciniaria squarrosa* (Linnaeus) Hill – S; > *Liatris squarrosa* var. *typica* Gaiser – Y, Z]

Liatris squarrulosa Michaux. Mt, Pd, Cp (GA, NC, SC) {VA}: diabase barrens, other glades and barrens, prairies, open woodlands; rare (NC Rare, VA Watch List). August-October (-November). WV, KY, IL, and MO south to GA, AL, and TX. Highly variable and needing additional study to determine if multiple taxa should be recognized. [= C, FNA, K, SE, W; > *Liatris earlei* (Greene) Schumann – RAB, F, 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. Cp (GA, SC): longleaf pine sandhills; common. August-November. SC south to FL, west to AL. [= RAB, FNA; = *Liatris tenuifolia* Nuttall *var. tenuifolia* – K, SE; < *Laciniaria tenuifolia* (Nuttall) Kuntze – S (also see *Liatris laevigata*)]

Liatris virgata Nuttall. Mt (GA, NC, SC, VA), Pd (GA, NC), Cp (NC, SC): open woods, roadbanks; common. (July-) August-October (-November). [= 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 varaint; > *Laciniaria regimontis* Small – S; > *Laciniaria smallii* Britton – S; > *L. graminifolia* var. *virgata* (Nuttall) Fernald – F]

Liatris oligocephala J. Allison, Cahaba Blazing-star, Cahaba Torch. Dolomitic Ketona glades. Bibb County, c. AL (Allison & Stevens 2001). June-July (-August). [= FNA]

Liatris scariosa (Linnaeus) Willdenow var. *nieuwlandii* (Lunell) E.G. Voss. Prairies, glades, woodlands. South to PA, WV. [= FNA, C, G, K, SE; < *Liatris borealis* Nuttall – F; = *Liatris novae-angliae* (Lunell) Shinners var. *nieuwlandii* Lunell] {synonymy incomplete}

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]

Lygodesmia D. Don (Rush Pink, Skeletonplant)

A 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. Cp (GA): xeric sandhills; uncommon. C. GA south to s. FL and west to c. Panhandle FL. [= FNA, K, S, SE, Z]

Madia Molina (Tarweed)

A genus of about 18 species, of w. North America and Chile. References: Cronquist (1980)=SE.

* *Madia sativa* Molina, Tarweed, introduced from Chile, south to se. PA. [= K; *M. capitata* Nuttall; > *M. sativa* var. *sativa* – SE; > *M. sativa* var. *congesta* Torrey & A. Gray – SE]

Marshallia Schreber 1791 (Barbara's-buttons)

Marshallia is endemic to the southeastern United States, the 11 taxa ranging collectively from sc. VA, sw. PA, WV, s. KY, s. MO, and c. OK, south to c. peninsular FL, and sw. TX. Watson, Jansen, & Estes (1991) consider *Marshallia* to be most closely related to predominantly southwestern genera *Palafoxia*, *Bahia*, and *Galinsoga*, in the tribe Heliantheae. 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; receptacular bracts (paleae) 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; [of 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; [of e. GA southward] ..... ***M. tenuifolia***
  2 Phyllaries with rounded to acute apices; receptacular bracts (paleae) 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 rare, 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; [of 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; [of 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. Cp (GA, NC, SC): pine savannas; common. 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 ranges from e. GA south to c. peninsular FL, west to e. TX. *M. tenuifolia* 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). [= RAB, GW, 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. Mt (NC): bog margins, dry slopes over mafic rocks; rare (US Species of Concern, NC Rare). June-July. 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, X, Y, Z; < *M. grandiflora* – RAB (also see *M. species 1*)]

Marshallia mohrii Beadle & F.E. Boynton, Coosa Barbara's-buttons. Mt (GA): sandstone, limestone, and dolostone glades; rare (US threatened, GA Threatened). 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. Pd (GA, NC, SC, VA), Cp (GA): clay flats, woodland borders, dry woodlands; common, rare north of NC (VA Rare). 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. [= RAB, C, G, K, SE, Y, Z; = *M. obovata* var. *platyphylla* (M.A. Curtis) Beadle & F.E. Boynton – F, X; < *M. obovata* – FNA, S, W]

Marshallia obovata (Walter) Beadle & F.W. Boynton *var. **scaposa*** Channell. Cp (GA, NC, SC): pine savannas; common. Late April-May. E. NC south to se. AL, in the Coastal Plain. [= RAB, K, 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. Cp (GA): pinelands, Altamaha Grit outcrops, woodlands over ultramafic rocks; rare (GA Rare). Coastal Plain from e. GA south to 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, X, Y, Z]

Marshallia species 1, Oak Barrens Barbara's-buttons. Pd (NC, VA): diabase barrens and fire-maintained woodlands over greenstone; rare (NC Rare, VA Rare). 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: *Oligoneuron album, O. rigidum* var. *glabratum, 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. Cp (GA): pine savannas; common. E. GA south to c. peninsular FL, west to e. TX. See *M. graminifolia* for additional discussion. [= GW, SE, 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. Mt (GA, NC, VA?), Pd (GA), Cp? (SC?): moist rocky streambanks and in calcareous clays; rare (GA Special Concern, NC Rare, VA Watch List). July. E. SC (?), sw. NC, and sc. TN, south to s. AL and s. MS (Sorrie & Leonard 1999). Reported for VA by C; documentation is unknown. [= RAB, C, F, FNA, G, K, S, SE, W, X, Y, Z]

Matricaria Linnaeus (Mayweed)
(also see *Tripleurospermum*)

A genus of about 7 species, herbs, of Eurasia and n. Africa. References: Brouillet in FNA (2006a); Cronquist (1980)=SE; Arriagada & Miller (1997)=Z.

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. Cp (VA), {NC, SC}: roadsides; rare, introduced from Europe. July-September. [= F, FNA, G, SE; = *Matricaria recutita* Linnaeus – C, K, Z; = *Chamomilla recutita* (Linnaeus) Rauschert]

* ***Matricaria discoidea*** Augustin de Candolle, Pineapple-weed, Rayless Chamomile. Mt (NC, VA): barnyards, pastures, roadsides; uncommon, introduced from w. North America. June-November. [= FNA, K, Z; = *M. matricarioides* (Less.) T.C. Porter – RAB, C, F, G, SE, illegitimate name; *? Lepidotheca suaveolens* (Pursh) Nuttall; *? Chamomilla suaveolens* (Pursh) Rydberg]

Megalodonta Greene
(see *Bidens*)

Melanthera Rohr

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. Cp (GA, SC): calcareous outcrops, sandy woodlands; uncommon. June-October. E. SC south to 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, 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. Cp (GA): bottomland hardwood forests, mesic hammocks near the coast, margins of tidal marshes; rare (GA Special Concern). Se. SC (Beaufort and Colleton counties) (P. McMillan, pers. comm. 2005) south to s. FL, west to s. LA. [= K, S, SE]

Mikania scandens (Linnaeus) Willdenow, Climbing Hempweed. Cp, Pd, Mt (GA, NC, SC, VA): marshes, swamp forests, wet thickets; common (rare in Mountains). July-October. ME to s. Ontario, south to s. FL and e. TX, south into the tropics. [= RAB, C, G, GW, K, S, SE, W; > *M. scandens* var. *pubescens* (Nuttall) Torrey & A. Gray – F; > *M. scandens* var. *scandens* – F]

Oclemena E.L. Greene (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. Mt (GA, NC, VA): spruce-fir forests, northern hardwood forests, mountain seepages and streambanks, other cool, moist situations; common. July-September. Newfoundland and Québec south to w. NC, ne. GA, and e. TN. [= FNA, K, Y, Z; = *Aster acuminatus* – RAB, C, F, G, SE, W]

Oclemena reticulata (Pursh) Nesom, Pine-barren Aster. Cp (GA, SC): wet pine flatwoods; uncommon. Late April-early June. Se. SC south through e. GA to s. FL. [= FNA, K, Z; = *Aster reticulatus* Pursh – RAB, GW, SE; = *Doellingeria reticulata* (Pursh) Greene – S]

Oclemena nemoralis (Aiton) Greene, Bog Nodding-aster, occurs south to PA, MD, DE, and NJ. [= FNA, K, Z; = *Aster nemoralis* Aiton – C, F, G] {not keyed at this time}

Oligoneuron Small 1903 (Prairie-goldenrod)

A genus of 6 species, herbs, of e. and c. North America. There now seems to be a consensus regarding the close affinities of the species here treated as *Oligoneuron album* (formerly *Solidago ptarmicoides*, *Aster ptarmicoides*, or *Unamia alba*) and *Oligoneuron rigidum*. This group of species has been treated as members of *Solidago* section *Ptarmicoidei* (House) Semple & K.N. Gandhi. Nesom's elevation of this section to generic status is not universally accepted and needs further corroboration, but seems provisionally to be well-founded. *O. album* and *O. rigidum* co-occur at a remarkable diabase barren in Granville County, NC, with other disjunct species of midwestern or prairie affinities, such as *Silphium terebinthinaceum*. *O. album* and *O. rigidum* are known to hybridize when growing together in other parts of their range; the hybrid, *Oligoneuron* ×*lutescens* (Lindley ex Augustin de Candolle) Nesom [*Solidago* ×*lutescens* (Lindley ex Augustin de Candolle) Boivin] should be sought. References: Nesom (1993b)=Z; Heard & Semple (1988)=Y; Semple & Cook in FNA (2006b); Brouillet & Semple (1981)=X; Cronquist (1980)=SE; Braun (1942).

1 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.

2 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) ..... ***O. rigidum** var**. glabratum***

2 Outer series of phyllaries pubescent on the back (short-ciliate on the margin); leaf undersurface hispid (7-50 hairs per mm^2); stems glabrous to somewhat hispid (10-70 hairs per mm^2) ..... ***O. rigidum** var**. rigidum***

1 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.

3 Rays white, 10-20; disc florets 30-36; heads 1-25 (-50) per plant, the inflorescence diffuse (most heads not touching another head) and flat-topped; cypselas 1.0-1.5 mm long..... ***O. album***

3 Rays yellow, 1-9; disc florets 6-13; heads 30-200+ per plant, the inflorescence compact (most heads in contact with adjacent heads) and rounded; cypselas 1.5-3.0 mm long.

4 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]..... ***[O. nitidum]***

4 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]..... ***O. riddellii***

Oligoneuron album (Nuttall) Nesom, White Prairie-goldenrod, Upland White Aster. Mt (GA), Pd (NC, SC): prairie-like barrens over mafic, ultramafic, or calcareous rock, serpentine woodlands, prairies; rare (GA Watch List, NC Endangered). August-October. VT and NY west to Saskatchewan, south to e. TN (Rhea and Roane counties in the Ridge and Valley) (Chester, Wofford, & Kral 1997), nw. GA, AR, and CO; disjunct in nc. NC and nc. SC. [= K, Z; **= *Solidago ptarmicoides*** (Nees) Boivin – C, FNA, SE, W, X; = *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]

Oligoneuron riddellii (Frank ex Riddell) Rydberg, Riddell's Goldenrod. Mt (GA, VA?): wet, calcareous prairies; rare (GA Special Concern, VA Watch List). Ontario and Manitoba south to w. VA, GA, AR, and KS. The specimen from Fort Monroe ("Fortress Monroe, Va." – Fernald 1950) is accurately identified. [= K, Z; **= *Solidago riddellii*** Frank ex Riddell – C, F, FNA, G]

Oligoneuron rigidum (Linnaeus) Small *var**. glabratum*** (E.L. Braun) Nesom, Southeastern Bold Goldenrod. Pd (GA, NC, SC, VA), Mt (NC), Cp (GA): 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; rare (NC Rare, SC Rare, VA Rare). 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. *glabratum* is apparently strictly diploid. [= K, Z; < *Solidago rigida* Linnaeus – RAB, W; **= *Solidago rigida* var. *glabrata*** E.L. Braun – C, G, SE; = *Solidago jacksonii* (Kuntze) Fernald – F; = *Solidago rigida* ssp. *glabrata* (E.L. Braun) Heard & Semple – FNA, Y; = *Oligoneuron jacksonii* (Kuntze) Small – S]

Oligoneuron rigidum (Linnaeus) Small *var**. rigidum***, Midwestern Bold Goldenrod. Mt, Pd (NC, VA): glades, barrens, and prairie-like areas, over mafic or calcareous rocks; rare (NC Rare, SC Rare, VA Rare). August-October. RI and MA west to NY, s. Ontario, MI, WI, s. MN and c. NE, south to c. VA, sc. NC, w. NC, sc. TN, c. AR, and se. TX. Var. *rigidum* is generally rare and restricted to relictual prairie-like situations east of MI, IN, IL, MO, and OK. Var. *rigidum* 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 Ontario west to Alberta, south to MI, IN, IL, MO, OK, n. TX, and NM. [= K, Z; < *Solidago rigida* Linnaeus – RAB, W; **= *Solidago rigida* var. *rigida*** – C, G, SE; = *Solidago rigida* – F; = *Solidago rigida* ssp. *rigida* – FNA, Y; = *Oligoneuron grandiflorus* (Rafinesque) Small – S]

Oligoneuron nitidum (Torrey & A. Gray) Small, Shiny Goldenrod. MS west to OK and TX. (July-) August-October. [= K, S, Z; = *Solidago nitida* Torrey & A. Gray – FNA]

Onopordum Linnaeus (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. Mt (VA): disturbed areas; rare, introduced from Europe. July-October. [= FNA; > *O. acanthium* – C, F, G, K, S, SE]

Packera Á. & D. Löve (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, Barkley in press). References: Trock in FNA (2006b); Barkley (1962)=Z; Cronquist (1980)=SE; Barkley (1999)=Y; Barkley (1978)=X; Bremer (1994); Barkley et al. (in press); Mahoney & Kowal (in press).

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; [of the 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; [of the Mountains of NC and VA].
5 Tomentum of leaf blades very fine and tight; [of shale barrens and woodlands] ..... ***P. antennariifolia***
5 Tomentum of leaf blades coarser, looser; [of calcareous, mafic, or ultramafic cliffs, barrens, and woodlands] ..... ***P. plattensis***
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 in *P. schweinitziana*); plants usually not forming clonal patches by stolons or widely creeping rhizomes.
8 Basal leaves with truncate bases (typically oblique truncate); [of 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 vars.*** *and* ***P. crawfordii***

Packera anonyma (Wood) W.A. Weber & Á. Löve, Appalachian Ragwort, Small's Ragwort. Mt, Pd, Cp (GA, NC, SC, VA): rock outcrops, roadsides, woodlands; disturbed areas; common. May-early June. S. PA and KY, south to n. FL and c. MS. [= FNA, K, Y; = *Senecio anonymus* Wood – C, SE, X; = *Senecio smallii* Britton – RAB, F, G, S]

Packera antennariifolia (Britton) W.A. Weber & Á. Löve, Shalebarren Ragwort. Mt (VA): 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]

Packera aurea (Linnaeus) Á. & D. Löve, Golden Ragwort, Heartleaf Ragwort. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): moist forests, bottomlands, bogs, stream banks; common. Late March-June. 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, Y; *Senecio aureus* Linnaeus – RAB, C, G, GW, SE, X; > *Senecio aureus* var. *aureus* – F; > *Senecio aureus* var. *intercursus* Fernald – F; > *Senecio aureus* var. *gracilis* (Pursh) Hooker – F; > *S. 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 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 (GA, NC, SC), Pd (GA, SC), Mt (GA): swamp forests, bottomland forests, cleared areas in bottomlands, often in mucky soils; common. March-early June. E. NC south to s. FL, west to e. TX, north in the interior to OH, MO, and SD. [= FNA, K, Y; = *Senecio glabellus* Poiret – RAB, C, F, G, GW, S, SE, 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 (GA Threatened, NC Threatened, SC Rare, VA Rare). Late April-early June. Endemic to sw. NC, nw. SC, and ne. GA; disjunct in sw. VA. 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 for *Achillea* of *Millefolium*. [*Senecio millefolium* Torrey & A. Gray – RAB, C, F, S, SE, X; = *Packera millefolia* – FNA, K, Y, orthographic variant]

Packera obovata (Muhlenberg ex Willdenow) W.A. Weber & Á. Löve, Roundleaf Ragwort, Running Ragwort. Mt, Pd (GA, NC, SC, VA), Cp (GA, VA): nutrient rich forests and woodlands (dry or moist), usually over calcareous or mafic rocks; common, uncommon in NC and SC (NC Watch List). April-June. VT west to KS, south to n. FL and TX. [= FNA, K, Y; =

Senecio obovatus Muhlenberg ex Willdenow – RAB, C, S, SE, X; > *Senecio obovatus* var. *obovatus* – F, G; > *Senecio obovatus* var. *elliottii* (Torrey & A. Gray) Fernald – F, G; > *Senecio obovatus* var. *rotundus* Britton – F; > *Senecio obovatus* – S; > *Senecio rotundus* (Britton) Small – S]

Packera paupercula (Michaux) Á. & D. Löve, Balsam Ragwort, Northern Meadow Groundsel. Mt (GA, NC, VA), Pd, Cp (NC, VA): thickets, meadows, glades, generally over circumneutral soils derived from calcareous or mafic rocks; rare (GA Special Concern, NC Rare, VA Rare). April-May. Labrador west to AK, south to GA, AL, and OR. Mahoney (1998) suggests that this species, as broadly defined, is a complex set of populations, many apparently warranting taxonomic recognition. [< *Packera paupercula* (Michaux) Á. & D. Löve – FNA, K, X, Y; < *Senecio pauperculus* Michaux – RAB, C, G, GW, S, SE; > *Senecio pauperculus* var. *pauperculus* – F; > *Senecio pauperculus* var. *balsamitae* (Muhlenberg ex Willdenow) Fernald – F; > *Senecio pauperculus* var. *praelongus* (Greenman) House – F]

Packera plattensis (Nuttall) W.A. Weber & Á. Löve, Prairie Ragwort. Mt (NC, VA): glades, cliffs, barrens, over mafic, ultramafic, or calcareous rocks; uncommon, rare in NC (NC Rare). VT west to Saskatchewan, south to w. VA, w. NC, e. TN, nc. TN, OH, IN, LA, and TX. [< *Packera plattensis* – 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. appalachiana*** A.M. Mahoney & R.R. Kowal in ed.]

Packera schweinitziana (Nuttall) W.A. Weber & Á. Löve, New England Ragwort. Mt (NC): grassy balds (in deep soil), at high elevations, in our area generally over metagabbro or amphibolite; rare (NC Endangered). May-July. Nova Scotia and Québec 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 – RAB, F, G, S; = *Packera schweinitzianus* – Y, orthographic variant]

Packera tomentosa (Michaux) C. Jeffrey, Woolly Ragwort. Cp, Pd (GA, NC, SC, VA), Mt (SC): sandy roadsides, sandy woodlands and forests, granitic flatrocks, granitic domes; common. April-early June. S. NJ south to FL, 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 – RAB, C, F, G, GW, SE, X; > *Senecio tomentosus* – S; > *Senecio alabamensis* Britton – S]

Palafoxia Lagasca y Segura (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 Annual herb, 2-6 dm tall; phyllaries equal, 3-5 mm long; [of calcareous prairies and glades, of MS westward] ..... ***[P. callosa]***
1 Perennial suffrutescent herb or shrub, 3-15 dm tall; phyllaries unequal, the longer 8-11 mm long; [longleaf pine sandhills and sandy scrub, of sc. GA and FL]..... ***P. integrifolia***

Palafoxia integrifolia (Nuttall) Torrey & A. Gray, Coastal Plain Palafoxia. Cp (GA): sandhills; rare (GA Special Concern). Sc. GA south to FL. [= K, SE, Z; = *Polypteris integrifolia* Nuttall – S]

Palafoxia callosa (Nuttall) Torrey & A. Gray. Prairies. MS west to OK and TX. [= K, SE, Z]

Panphalea Lagasca y Segura

A genus of 9 species, herbs, of South America. References: Pruski (2004).

* ***Panphalea heterophylla*** Lessing. Cp (SC): waste areas around wool-combing mill; rare, perhaps merely a waif. April. See Pruski (2004) and Nesom (2004d).

Parthenium Linnaeus (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. *P. radfordii*, the only taxon in the complex recognized at species level by Mears, is striking in its vegetative characters, but it is almost certainly nothing but a form of *P. integrifolium* var. *mabryanum*; its consistent occurrence in mixed populations makes one wonder if it could be a single-gene character. It is here treated as a form. 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 0-1 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 Most inflorescences with > 100 heads; basal leaf petioles winged to the base or not ....***P. integrifolium** var. **integrifolium***
  - 3 Most inflorescences with < 100 heads; basal leaf petioles not winged to the base, or the wings very narrow (< 1 mm wide).
    - 4 Blades of basal leaves ovate-lanceolate, (4-) 6-12 (-20) cm long, (3-) 4-8 (-9.5) cm wide; heads (18-) 90-180 (-400) per inflorescence .....***P. integrifolium** var. **integrifolium***
    - 4 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. Pd, Mt (NC, VA): in shallow, xeric, circumneutral soil of glades, barrens, and woodlands, over calcareous rocks (such as dolostone) or mafic rocks (such as diabase); uncommon, rare in NC (NC Rare). 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; < *P. integrifolium* – FNA, S; < *P. hispidum* Rafinesque – W; < *P. integrifolium* – S]

* ***Parthenium hysterophorus*** Linnaeus, Santa Maria, Feverfew. Pd (VA): disturbed areas; rare, introduced from tropical America, including the West Indies. July-November. [= C, F, FNA, G, K, S, SE]

Parthenium integrifolium Linnaeus *var.* ***integrifolium***, Common Wild Quinine. Pd, Mt (GA, NC, SC, VA), Cp (NC, SC, VA): various dryish habitats, mainly open or sparsely wooded; common. 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; > *P. integrifolium* var. *integrifolium* – Z; > *P. integrifolium* var. *henryanum* Mears – Z]

Parthenium integrifolium Linnaeus *var.* ***mabryanum*** Mears, Mabry's Wild Quinine. Cp, Pd (NC, SC, VA): sandhills and other dry soils, in forest openings or woodlands; uncommon (VA Watch List). 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. Sinuate-lobed plants are best considered a form of var. *mabryanum*. [= K; < *P. integrifolium* var. *integrifolium* – RAB; < *P. integrifolium* – RAB, C, F, G, S, SE, W; < *P. integrifolium* – FNA; > *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. Cp (GA): disturbed areas; rare, native of South America, perhaps only a waif. Reported for FL, GA, and AL. [= FNA, K, S; = *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. Reported for NC (Basinger, pers. comm.. 2006). Spreading northward along roadsides and other disturbed areas from a native range in tropical America (probably including s. FL). July-November. [= FNA]

Peripleura (N.T. Burbidge) Nesom

* ***Peripleura arida*** (N.T. Burbidge) Nesom. Cp (SC): waste areas around wool-combing mill; rare, 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, native of Europe, is introduced and naturalizing south to DE, WV, and se. PA. [= C, F, FNA, G, K]

Phoebanthus Blake

A genus of 2 species, perennial herbs, of the Southeastern United States (FL and AL). References: Schilling in FNA (2006c).

Phoebanthus tenuifolius (Torrey & A. Gray) Blake. S. AL and Panhandle FL. [= FNA, K, SE; = *Ph. tenuifolia* – S, orthographic variant]

Picris Linnaeus (Bitterweed, Oxtongue)
[also see *Helminthotheca*]

A genus of about 40 species, of the Old World, particularly the Mediterranean region. References: Cronquist (1980)=SE.

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. Mt (NC), Cp (VA): disturbed areas; rare, introduced from 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, 0.8-1.5 mm wide; [of the fall line Sandhills, from sc. NC southward] ..... ***P. pinifolia***
  2 Leaves and stems silky pubescent, 2-5 mm wide; [of se. TN, or of s. NJ northward].
    3 [plants of sandy places, from s. NJ northward] ..... ***[P. falcata]***
    3 [plants of river-scoured rocky riverbanks in se. TN] ..... ***[P. ruthii]***
1 Basal leaves much longer than the stem leaves; stem leaves strongly reduced upward, the upper stem leaves much smaller than middle stem leaves.
  4 Heads < 10; cauline leaves few, generally 2-7; [of sw. GA westward and southward] ..... ***P. oligantha***
  4 Heads > 10; cauline leaves many; [collectively widespread in our area].
    5 Peduncles and upper stem densely glandular-hairy (stipitate-glandular); phyllaries densely glandular-hairy; involucres 4.5-8 mm high; lower leaves < 10 mm wide.
      6 All stem leaves silky pubescent; [widespread in our area] ..... ***P. aspera*** *var.* ***adenolepis***
      6 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***
    5 Peduncles and upper stem eglandular to sparsely glandular; phyllaries eglandular, or the inner phyllaries sparsely to densely glandular, at least distally; involucres 5-12 mm high; lower leaves up to 20 mm wide.
      7 Involucres 8-12 mm high, with > 30 disk flowers ..... ***P. graminifolia*** *var.* ***latifolia***

7 Involucres 5-8 mm high, with < 30 disk flowers.
8 Inner phyllaries densely stipitate-glandular, at least distally ..... ***P. graminifolia*** *var.* ***graminifolia***
8 Inner phyllaries eglandular to sparsely glandular ..... ***P. graminifolia*** *var.* ***tenuifolia***

Pityopsis aspera (Shuttleworth ex Small) Small *var.* ***adenolepis*** (Fernald) Semple & Bowers. Pd, Cp (GA, NC, SC, VA), Mt (GA, NC, SC): dry woodlands, forests, and disturbed places, apparently in the Mountains only in the Escarpment; common. 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; < *Heterotheca aspera* (Shuttleworth ex Small) Shinners]

Pityopsis aspera (Shuttleworth ex Small) Small *var.* ***aspera***. Cp (GA): sandhills, dry flatwoods; common. Sc. GA south to n. (panhandle) FL. [= FNA, K, Z; < *Pityopsis aspera* – S; < *Chrysopsis graminifolia* (Michaux) Elliott var. *aspera* (Shuttleworth ex Small) A. Gray – SE]

Pityopsis graminifolia (Michaux) Nuttall *var.* ***graminifolia***. Cp (GA, NC, SC): sandhills; uncommon. July-October. As interpreted here, *P. graminifolia* includes 5 varieties "that intergrade and hybridize, when the ploidy level is the same" (Semple & Bowers 1985). Two do not reach our area, being restricted to peninsular FL: var. *aequilifolia* Bowers & Semple and the hexaploid (2n = 54) var. *tracyi* (Small) Semple. 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. [= 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 (Michaux) Nuttall *var.* ***latifolia*** Fernald. Cp, Mt, Pd (GA, NC, SC, VA): sandhills, dry woodlands and forests (such as ridgetop pine/heath communities in the Mountains), roadbanks; common (rare in VA Piedmont and Mountains). June-October. Var. *latifolia* is the most widely distributed variety of *P. graminifolia*, ranging from DE, 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 (Michaux) Nuttall *var.* ***tenuifolia*** (Torrey) Semple & Bowers. Cp (GA, NC, SC, VA): sandhills, sandy woodlands, savannas, pine flatwoods; common. 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*); ? *P. nervosa* var. *nervosa* – Y]

Pityopsis oligantha (Chapman ex Torrey & A. Gray) Small, Narrow-leaved Goldenaster. Cp (GA): wet flatwoods and pitcherplant bogs; rare (GA Special Concern). GA and FL west to LA. In sw. GA (GANHP, Jones & Coile 1988). [= FNA, K, S, Z; = *Chrysopsis oligantha* Chapman ex Torrey & A. Gray – SE; = *Heterotheca oligantha* (Chapman ex Torrey & A. Gray) Harms]

Pityopsis pinifolia (Elliott) Nuttall, Sandhill Goldenaster. Cp (GA, NC, SC): sandhills, sandy roadsides; locally common (GA Threatened). 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 falcata (Pursh) Nuttall. Se. MA south through RI, CT, and NY (Long Island) to s. NJ. [= FNA, K, Z; = *Chrysopsis falcata* (Pursh) Elliott – C, F, G]

Pityopsis flexuosa (Nash) Small. E. Panhandle FL. [= FNA] {not yet keyed; synonymy incomplete}

Pityopsis graminifolia (Michaux) Nuttall var. *tracyi* (Small) Semple. AL and FL. [= FNA, K, Z; = *P. tracyi* Small – S; < *Chrysopsis graminifolia* – SE] {not keyed at this time}

Pityopsis ruthii (Small) Small. 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 speciesannual herbs, of mw. North America, Mexico, Soth America, and Africa. References: Keil in FNA (2006a).

* ***Plectocephalus americanus*** (Nuttall) D. Don in R. Sweet, American Basketflower. Cp (SC): waste ground around wool-combing mills; rare, introduced from further west (Nesom 2004d). [= FNA; = *Centaurea americana* Nuttall – C, F, G, K, SE]

Pluchea Cassini (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].
      4 Involucre 4-5.5 (-7) mm high, 4-7 (-9) mm across the disk; plants 4-10 (-15) dm tall; [of VA southward]..... .....***P. odorata* var. *odorata***
      4 Involucre 5.5-7 mm high, 5-9 mm across the disk; plants 3-6 dm tall; [of NC northward]..... .....***P. odorata* var. *succulenta***
  2 Leaves sessile, and either rounded, truncate, or clasping at the base; [section *Amplectifolium*].
    5 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]***
    5 Leaves mostly 3-10 cm long and 1-3 cm wide; involucre 5-10 mm high; middle phyllaries 1-1.5 mm wide.
      6 Stems and leaves glandular, otherwise nearly glabrous; involucre 4-5 mm wide ..... ***[P. yucatanensis]***
      6 Stems and leaves puberulent or arachnose as well as glandular; involucre 5-12 mm wide.
        7 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***
        7 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].
          8 Plants 3-11 dm tall; inner phyllaries 4-6 mm long; [widespread in our area]... ***P. foetida* var. *foetida***
          8 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. Cp (GA, NC, SC): wet savannas, natural ponds, ditches; common. 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 this taxon. Godfrey (1952) recognized 2 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; = *P. rosea* R.K. Godfrey – RAB, K, X, Y; = *P. rosea* var. *rosea* – GW, SE]

Pluchea camphorata (Linnaeus) Augustin de Candolle, Camphorweed, Camphor Pluchea. Cp, Pd (GA, NC, SC, VA), Mt (GA): bottomland sloughs, clay flatwoods, other freshwater wetlands; common. August-October. DE and MD south to n. FL, west to TX and OK, north in the interior to s. OH and e. KS. [= RAB, C, F, FNA, G, GW, K, SE, X, Y; = *P. petiolata* Cassini – S]

Pluchea foetida (Linnaeus) Augustin de Candolle *var. **foetida***, Stinking Fleabane. Cp (GA, NC, SC, VA): seasonally wet areas, ditches, various other freshwater wetlands; common. Late July-October. S. NJ south to peninsular FL, west to e. TX; West Indies (?). [= K; < *P. foetida* – RAB, C, F, FNA, G, GW, SE, X, Y; > *P. foetida* – S; > *P. tenuifolia* Small – S]

Pluchea foetida (Linnaeus) Augustin de Candolle *var. **imbricata*** Kearney. Cp (GA?, SC?): freshwater wetlands; rare. 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, X, Y; = *P. imbricata* (Kearney) Nash – S]

Pluchea odorata (Linnaeus) Cassini *var. **odorata***, Southern Saltmarsh Fleabane. Cp (GA, NC, SC, VA): salt and brackish marshes; common. August-October. VA south to FL, west to TX, also in w. United States, Central America, and South America. [= C, FNA, K, SE; < *P. purpurascens* (Swartz) Augustin de Candolle – RAB; = *P. purpurascens* (Swartz) Augustin de Candolle var. *purpurascens* – F, G; < *P. odorata* – GW, X, Y; = *P. camphorata* – S, misapplied]

Pluchea odorata (Linnaeus) Cassini *var. **succulenta*** (Fernald) Cronquist, Northern Saltmarsh Fleabane. Cp (NC, VA): salt and brackish marshes; common. August-October. MA south to NC, and possibly further south. The validity and distribution of this taxon need additional study. [= C, FNA, K, SE; < *P. purpurascens* (Swartz) Augustin de Candolle – RAB; = *P. purpurascens* (Swartz) Augustin de Candolle var. *succulenta* Fernald – F, G; < *P. odorata* – GW, X, Y]

Pluchea longifolia Nash. FL Peninsula and eastern FL Panhandle (Wakulla and Taylor counties) (Wunderlin & Hansen 2004). [= FNA] {synonymy incomplete}

* *Pluchea sagittalis* (Lamarck) Cabrera, Wing-stem Camphorweed. Probably only a waif, known from old collections (1891-1901) from Pensacola, FL, and Mobile, AL. Native of South America. July-August. [= FNA; ? *P. quitoc* de Candolle – S; ? *P. suaveolens* (Vell.) Kuntze – SE] {synonymy incomplete}

* *Pluchea yucatanensis* Nesom, Yucatan Camphorweed. Introduced in AL and MS from Mexico and Belize. [= FNA]

Polymnia Linnaeus 1754
(also see *Smallanthus*)

A genus of 3 species, herbs, of e. North America. References: Wells (1965)=Z; Strother in FNA (2006c); Cronquist (1980)=SE.

1 Stem obviously and usually densely pubescent; cypselas 3-ribbed..... ***P. canadensis***
1 Stem glabrous or nearly so (except sometimes in the inflorescence); cypselas 4-6-ribbed..... ***P. laevigata***

Polymnia canadensis Linnaeus, White-flowered Leafcup. Mt (GA, NC, VA), Pd (VA): moist forests, particularly over calcareous rocks; common, rare in NC, uncommon in VA Piedmont (NC Watch List). July-October. VT and Ontario west to MN, south to NC, nw. GA, AL, and AR. [= RAB, C, F, FNA, G, K, SE, W, Z; > *P. canadensis* – S; > *P. radiata* (A. Gray) Small – S]

Polymnia laevigata Beadle, Tennessee Leafcup. Mt (GA): bouldery slopes; rare (GA Special Concern). W., c., and se. TN (Chester, Wofford, & Kral 1997), AL, panhandle FL, nw. GA, and MO. [= FNA, K, S, SE, Z]

Prenanthes Linnaeus (Rattlesnake-root)

A genus of about 30 species, herbs, of north temperate parts of the New and Old World. 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; [of north and west of our area]..... ***[P. crepidinea]***
1 Principal phyllaries 4-10; flowers mostly 4-19 per head; [collectively widespread in our area].
  2 Phyllaries glabrous or with few cilia or inconspicuous fine short pubescence at the tip.
    3 Principal phyllaries (4-) 5 (-6); flowers 4-6 per head..... ***P. altissima***
    3 Principal phyllaries 7-10; flowers 8-15 per head.
      4 Inflorescences narrow and elongate (virgate); flowers pink to purple..... ***P. autumnalis***
      4 Inflorescences open, corymbiform to paniculiform, with some elongate branches; flowers white, cream, yellowish, pink, or purple.
        5 Pappus cinnamon-brown; corolla whitish to pinkish..... ***P. alba***
        5 Pappus straw-colored to light brown; corolla pale yellow..... ***P. trifoliolata***
  2 Phyllaries evidently (though sometimes sparsely) pubescent with long coarse hairs (1.5-3 mm long).
    6 Inflorescence corymbiform to paniculiform, many of the branches well-developed.
      7 Phyllaries densely setose; leaves usually merely toothed, or shallowly lobed ..... ***P. barbata***
      7 Phyllaries sparsely setose; principal leaves usually evidently lobed ..... ***P. serpentaria***
    6 Inflorescence cylindric, thyrsoid, the branches very short.
      8 Heads nodding; principal phyllaries 4-7 (-9); flowers 5-8 (-13) per head; [of the Southern Appalachians]..... ***P. roanensis***
      8 Heads ascending or nearly erect; principal phyllaries (6-) 8 (-10); flowers (8-) 11-14 (-19) per head; [west or north of our area].
        9 Stem and leaves rough-hairy; flowers creamy yellow..... ***[P. aspera]***
        9 Stem and leaves glabrous; flowers usually purplish..... ***[P. racemosa var. racemosa]***

Prenanthes alba Linnaeus, Northern Rattlesnake-root. Mt (NC, VA), Pd (VA), Cp? (VA?): forests; uncommon (rare south of VA) (NC Watch List). August-November. ME west to Manitoba, 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 are appear to be attributable 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. Mt, Pd, Cp (GA, NC, SC, VA): forests; common (uncommon in Coastal Plain). August-November. Newfoundland west to MI, south to GA, LA, and AR. [= RAB, FNA, G, K, W, Y, Z; > *P. altissima* var. *altissima* – C, F, SE; = *Nabalus altissimus* (Linnaus) Hooker – S]

Prenanthes autumnalis Walter, Slender Rattlesnake-root. Cp (GA, NC, SC, VA): pocosins, pine savannas, forest edges; common. September-November. NJ south to n. FL, a Southeastern Coastal Plain endemic. [= RAB, C, F, FNA, G, K, SE, Z; = *Nabalus virgatus* (Michaux) Augustin de Candolle – S]

Prenanthes barbata (Torrey & A. Gray) Milstead, Barbed Rattlesnake-root, Flatwoods Rattlesnake-root. Mt (GA): limestone glades and barrens; rare (GA Special Concern). 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; = ***P. serpentaria*** Pursh var. *barbata* Torrey & A. Gray]

Prenanthes roanensis (Chickering) Chickering, Roan Rattlesnake-root, Appalachian Rattlesnake-root. Mt (NC, VA): mountain forests, grassy balds, at high elevations; uncommon (NC Rare, VA Rare). 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). [= RAB, C, FNA, K, 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. Cp, Pd, Mt (GA, NC, SC, VA): forests; common (uncommon in Coastal Plain). August-October. MA south to GA, FL, MS. [= RAB, C, F, FNA, G, K, SE, W, Y, Z; > *Nabalus serpentarius* (Pursh) Hooker – S; >< *Nabalus integrifolius* Cassini – S (also see *Prenanthes barbata*)]

Prenanthes trifoliolata (Cassini) Fernald, Gall-of-the-earth. Mt (GA, NC, VA), Cp (NC, SC, VA), Pd (VA): forests; common (rare in Coastal Plain). August-November. 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]

Prenanthes aspera Michaux, Rough Rattlesnake-root. A midwestern species, east to c. TN, KY, OH, and PA. [= C, F, G, K, SE; = *Nabalus asper* – S, ortographic variant; = *Nabalus asperus* (Michaux) Torrey & A. Gray]

Prenanthes crepidinea Michaux, Midwestern Rattlesnake-root. 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; = *Nabalus crepidineus* (Michaux) Augustin de Candolle – S]

Prenanthes racemosa Michaux var. *racemosa*, Glaucous Rattlesnake-root. Calcareous siltstone/shale glades, other habitats. A northern species, ranging south to NJ, w. PA, and ne. KY (Clark et al. 2005). [= C, K; < ***P. racemosa*** – F, FNA; = ***P. racemosa*** ssp. ***racemosa*** – G]

Pseudognaphalium Kirpichnikov (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 to 2.5 dm tall; inflorescence of many, small, axillary and terminal clusters overtopped by subtending leaves.....***[see Gnaphalium uliginosum]***
1 Involucre 4-7 mm high; plants generally well over 2.5 dm tall; inflorescence terminal, usually elongate.
  2 Leaves distinctly (but shortly) decurrent and adnate-auriculate on the stem.
    3 Upper surface of the leaves coarsely glandular-hairy.....***Ps. macounii***
    3 Upper surface of the leaves loosely tomentose, not glandular.....***Ps. stramineum***
  2 Leaves sessile, not decurrent or adnate-auriculate.
    4 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***
    4 Stem glandular-pubescent or glandular-puberulent, the hairs at right angles to the stem, the stem surface plainly visible.
      5 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***
      5 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. Pd, Cp (NC, SC, VA): dry woodlands and openings (especially over over mafic rocks), sandhills; rare (NC Rare, VA Rare). September-October. Sc. VA south to s. AL, west to AR, LA, and ne. TX. [= FNA, X; = *Gnaphalium helleri* Britton var. *helleri* – Z; < *Gnaphalium helleri* – RAB, C, G, S, SE, W (also see ***Ps. micradenium***); = *Gnaphalium obtusifolium* var. *helleri* (Britton) Blake – F, Y; = *Pseudognaphalium helleri* (Britton) A. Anderberg ssp. *helleri* – K]

Pseudognaphalium macounii (Greene) Kartesz, Clammy Cudweed, Winged Cudweed. Mt (VA): dry fields, pastures, and woodland edges at high elevations; rare (VA Rare). July-September. Québec west to British Columbia, south to w. VA, WV,

TN, and Mexico. [= FNA, K; = *Gnaphalium macounii* Greene – C, F, S; < *Gnaphalium viscosum* – SE, Y, misapplied; < *Pseudognaphalium viscosum* (Kunth) W.A. Weber, misapplied]

Pseudognaphalium micradenium (Weatherby) Nesom, Small Rabbit Tobacco. Pd, Cp, Mt (NC, SC, VA), {GA}: dry woodlands and openings; rare (NC Rare, VA Rare). 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* – RAB, C, G, 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. Mt, Pd, Cp (GA, NC, SC, VA): openings, woodlands, coastal dunes, sandy pinelands. disturbed areas; common. August-October. Newfoundland west to Ontario, south to FL and TX. [= FNA, X; = *Gnaphalium obtusifolium* Linnaeus – RAB, S, SE, W; > *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. Cp (NC, SC, VA), Pd (NC, SC): sandy fields, roadsides, disturbed places; uncommon, introduced from 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 (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. Cp (GA, NC, SC): sandhills, dry pinelands, pine flatwoods; common. May-June. Se. NC south to s. FL and west to s. AL. [= RAB, FNA, GW, K, SE, Z; = *P. undulatum* (Walter) C. Mohr – S]

Pyrrhopappus Augustin de Candolle (False-dandelion)

A genus of about 3 species, herbs, of sw. and se. North America. References: Strother in FNA (2006a); Cronquist (1980)=SE.

Pyrrhopappus carolinianus (Walter) Augustin de Candolle, False-dandelion. Cp, Pd, Mt (GA, NC, SC, VA): dry and moist forests, roadsides, meadows, fields; common (uncommon in NC and SC Mountains, rare in VA Mountains). March-June (and sometimes later). DE, se. PA, and MD south to FL, west to IL, MO, and TX. [= C, F, FNA, G, K, W; > *P. carolinianus* var. *carolinianus* – RAB, SE; > *P. carolinianus* var. *georgianus* (Shinners) Ahles – RAB, SE; = *Sitilias caroliniana* (Walter) Rafinesque – S; > *Pyrrhopappus georgianus* Shinners]

Ratibida Rafinesque (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. Cp (NC, SC): established around nurseries or plantings, waste areas near wool-combing mills; rare, introduced from further west. May-August. Ontario west to Alberta, 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, Z; = *R. columnaris* (Sims) D. Don – S]

Ratibida pinnata (Ventenat) Barnhart, Globular Prairie Coneflower, Grey-headed Coneflower. Mt (GA), Pd (SC): prairie-like glades and oak savannas over gabbro (usually in Iredell soils) or calcareous rocks; rare (SC Rare). June-August. S. Ontario west to MN and SD, south to w. PA, e. TN, nw. GA, w. FL, MS, and OK; 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, 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 Blue Ridge 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 spreading-villous, sometimes very sparsely so; 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 (GA): pitcherplant bogs, wet roadsides and powerline rights-of-way, seepages; rare (GA Special Concern). Sw. GA and Panhandle FL west to c. and s. AL. See Diamond & Boyd (2004) for detailed information. [= FNA, K, SE; = *R. fulgida* Aiton var. *auriculata* Perdue]

Rudbeckia fulgida Aiton *var.* ***fulgida***, Common Eastern Coneflower. {GA, NC, VA} August-October. [= C, FNA, G, K, SE; < *R. fulgida* – RAB, GW, W; = *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]

Rudbeckia fulgida Aiton *var.* ***spathulata*** (Michaux) Perdue. {GA, NC, SC, VA} August-October. [= FNA; < *R. fulgida* – RAB; = *R. spathulata* Michaux – F, S; < *R. fulgida* var. *fulgida* – K]

Rudbeckia fulgida Aiton *var.* ***speciosa*** (Wendroth) Perdue. {GA, VA} (GA Special Concern). August-October. [=? C, FNA, K, Z; < *R. fulgida* – RAB, GW, W; = *R. speciosa* Wenderoth var. *speciosa* – F]

Rudbeckia fulgida Aiton *var.* ***umbrosa*** (C.L. Boynton & Beadle) Cronquist, Appalachian Coneflower. {GA, NC, SC, VA} August-October. [= 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 grandiflora (Sweet) Augustin de Candolle *var.* ***grandiflora***, Largeflower Coneflower. Mt (GA): limestone glades and barrens; rare (GA Special Concern). Nw. GA (Jones & Coile 1988). [= 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 (US Species of Concern, GA Special Concern, NC Endangered, VA Rare). July-September. In nw. GA (Jones & Coile 1988). [= 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 (GA, NC, SC): May-July. [= FNA, K, SE, Z; >< *R. hirta* – RAB; *? R. divergens* T.V Moore – S]

Rudbeckia hirta Linnaeus *var.* ***hirta***, Woodland Black-eyed Susan. {GA, NC, SC, VA} May-July. [= C, FNA, K, SE, 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. {GA, NC, SC, VA} May-July. [= C, FNA, K, SE; < *R. hirta* – RAB, G, W; > *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 (GA, NC, SC, VA): bottomlands, streamsides; common. July-October. [= C, F, FNA, K, SE; < *R. laciniata* – RAB, GW, S, W; < *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 (VA Watch List). July-October. [= C, F, G, K, SE; < *R. laciniata* – RAB, GW, S, W]

Rudbeckia laciniata Linnaeus *var.* ***laciniata***, Common Cutleaf Coneflower, Goldenglow. Cp, Pd, Mt (GA, NC, SC, VA): moist forests, bottomlands, streambanks; comm on. July-October. [= FNA, K, SE; < *R. laciniata* – RAB, GW, S, W; < *R. laciniata* var. *laciniata* – C, F, G; > *R. laciniata* var. *hortensia* Bailey – F]

* ***Rudbeckia maxima*** Nuttall, Giant Coneflower. Cp (SC): disturbed ground; rare, cultivated and rarely persistent, native of sc. United States. [= F, FNA, K, S, SE]

Rudbeckia mohrii A. Gray, Mohr's Coneflower. Cp (GA): wet pine savannas; common. Ec. GA to panhandle FL. [= FNA, K, S, SE]

Rudbeckia mollis Elliott, Woolly Coneflower. Cp (GA, SC): longleaf pine / turkey oak sandhills; uncommon (rare in SC). Late August-October. [= RAB, FNA, K, S, SE, Z]

Rudbeckia nitida Nuttall, St. John's Black-eyed Susan. Cp (GA): wet pine savannas; uncommon. E. GA and ne. FL west to s. AL. [= FNA, K; > *R. nitida* – S; > *R. glabra* Augustin de Candolle – S; = *R. nitida* var. *nitida* – SE]

*? ***Rudbeckia subtomentosa*** Pursh. Pd (NC): habitat in our area unknown; rare. Nc. TN (Chester, Wofford, & Kral 1997). 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 cliffs; rare (US Species of Concern, VA Rare). july-October. 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.* ***rupestris*** (Chickering) A. Gray, Blue Ridge Three-lobed Coneflower. Mt (NC): July-October. [= F, FNA, K, SE, Z; < *R. triloba* – RAB, W; = *R. rupestris* Chickering – S]

Rudbeckia triloba Linnaeus *var.* ***triloba***, Common Three-lobed Coneflower. Mt, Pd (GA), {NC, VA} July-October. [= C, F, FNA, G, K, SE; < *R. triloba* – RAB, W; = *R. triloba* – S]

Rudbeckia fulgida Aiton var. *sullivantii* (C.L. Boynton & Beadle) Cronquist. August-October. East to PA and WV. [= 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 graminifolia (Torrey & A. Gray) C.L. Boynton & Beadle. Wet savannas, and "wet prairies," endemic to the Apalachicola region, FL. [= FNA, K, S, SE]

Rudbeckia grandiflora (Sweet) Augustin de Candolle var. *alismifolia* (Torrey & A. Gray) Cronquist. East to KY and MS. [= K; = *R. grandiflora* var. *alismaefolia* – FNA, SE, orthographic variant; = *R. alismaefolia* Torrey & A. Gray – S]

Rudbeckia laciniata Linnaeus var. *bipinnata* Perdue, 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. East to KY. [= FNA, C, F, K, S, SE; = *R. fulgida* var. *missouriensis* (Engelmann) Cronquist – G]

Rudbeckia triloba Linnaeus var. *pinnatiloba* Torrey & A. Gray, Pinnate-leaf Coneflower. 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] {synonymy incomplete, etc.}

Rugelia Rafinesque (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. Mt (NC): high elevation forests and openings, primarily in spruce-fir forests, but extending in places downslope into northern hardwood forests; rare (US Species of Concern, NC Threatened). 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. Cp, Mt (NC) {GA, SC}: disturbed areas; rare, introduced from 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 (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. Cp (GA, NC, SC, VA): 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; uncommon (VA Rare). May-August; July-October. NH south to c. FL, west to sw. AL (very rare north of NC); disjunct in se. LA (L. Smith, pers. comm.). Vegetatively, *Sclerolepis* is reminiscent of an underwater *Ionactis linariifolius*! [= RAB, C, F, FNA, G, GW, K, SE]

Scolymus Linnaeus (Golden Thistle)

A genus of 3 species, herbs, of the Mediterranean region. References: Strother in FNA (2006a).

* ***Scolymus maculatus*** Linnaeus, Golden Thistle. Cp (NC): on ballast at seaports (formerly); rare, introduced from Europe. Small 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)
(also see *Ligularia, Packera, Rugelia*)

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*. References: Barkley in FNA (2006b); Bremer (1994); Cronquist (1980)=SE; Barkley (1999)=Z; Barkley (1978)=Y.

1 Perennial from a well-developed caudex.
  2 Leaves pinnatifid to pinnatisect..... ***[S. erucifolius]***
  2 Leaves (1-) 2-3-pinnatifid ..... ***[S. jacobaea]***
1 Annual from fibrous roots [section *Annui*].
  3 Herbage densely and stickily glandular-pubescent ..... ***[S. viscosus]***
  3 Herbage glabrous or hairy (not glandular-viscid).
    4 Calyculate bracts 0-5, if present, green-tipped; leaves densely puberulent ..... ***[S. sylvaticus]***
    4 Calyculate bracts 2-6, conspicuous and black-tipped; leaves glabrous or somewhat tomentose only when young .... ***S. vulgaris***

* ***Senecio vulgaris*** Linnaeus, Common Groundsel. Pd (GA, NC, SC, VA), Cp, Mt (NC, SC, VA): roadsides, fields, disturbed areas; uncommon, introduced from Eurasia. March-June. [= RAB, C, F, FNA, G, K, S, SE, W, Y, Z]

* *Senecio erucifolius* Linnaeus. Introduced south to se. PA. [= FNA, K, Y]
* *Senecio jacobaea* Linnaeus, Stinking Willie, Tansy Ragwort. Introduced south to se. PA. [= C, FNA, K, Y]
* *Senecio sylvaticus* Linnaeus, Woodland Groundsel. Introduced south to se. PA and OH. [= C, FNA, K, Y]
* *Senecio viscosus* Linnaeus, Sticky Groundsel. Introduced south to se. and sc. PA. [= C, FNA, K, Y]

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. Cp, Pd, Mt (GA, NC, SC, VA): dry woodlands, thin soils around rock outcrops, sandhills, dry pinelands; common. June-July. S. ME and s. VT west to c. OH, south to e. SC, c. GA, w. 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, Y, Z; = *Aster paternus* Cronquist – RAB, C, G, SE, W]

Sericocarpus linifolius (Linnaeus) Britton, Sterns, & Poggenburg, Narrow-leaf White-topped Aster. Cp, Pd, Mt (GA, NC, SC, VA): dry woodlands, sandhills; common, rare in VA Mountains. 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, Y, Z; = *Aster solidagineus* Michaux – RAB, C, G, SE, W]

Sericocarpus tortifolius (Michaux) Nees, Twisted-leaf White-topped Aster. Cp (GA, NC, SC), Pd (GA): dry to mesic sandhills; common. 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, 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 (in prep.); 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 var. robinsonii]***

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 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* var. *integrifolium]***

17 Ray flowers 20-36 (or more) per head; phyllary surfaces glabrous.....***[S. integrifolium* var. *laeve]***

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 eglanduar, scabrous to puberulent .....***S. asteriscus* var. *asteriscus***

Silphium asteriscus Linnaeus *var. **asteriscus***. {Mt, Pd, Cp (GA, NC, SC, VA)} [= C, FNA, K; > *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. gatesii* C. Mohr – Y]

Silphium asteriscus Linnaeus *var. **dentatum*** (Elliott) Chapman. Cp, Pd (GA, SC), Mt (GA) {NC}: [= FNA; = *S. dentatum* var. *dentatum* – RAB; = *S. dentatum* – F, W; > *Silphium asteriscus* Linnaeus var. *angustatum* A. Gray – K, SE; > *S. asteriscus* Linnaeus var. *laevicaule* DC – K; > *S. dentatum* Elliott – SE; > *S. elliottii* Small – S; > *S. incisum* Greene – S; > *S. nodum* Small – S; > *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}: [= FNA; = *Silphium trifoliatum* Linnaus var. *latifolium* A. Gray – C, F, G, K; > *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 (GA, SC): [= FNA, X; = *S. simpsonii* Greene – K; = *S. gracile* A. Gray – S, SE; = *S. simpsonii* var. *simpsonii* – Y]

Silphium asteriscus Linnaeus *var. **trifoliatum*** (Linnaeus) J.A. Clevinger. Pd (NC, SC, VA), Mt, Cp (NC, VA): [= FNA; = *Silphium trifoliatum* Linnaeus var. *trifoliatum* – C, G, K, SE; = *S. trifoliatum* – RAB; > *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. 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. [= K, Y; = *C. compositum* – F; < *S. compositum* var. *compositum* – RAB; > *C. compositum* – S; > *S. orae* Small – S; < *S. compositum* – C, FNA, G, SE, W; = *S. compositum* ssp. *compositum* – Z; > *S. collinum* Greene]

Silphium compositum Michaux ***var. ovatifolium*** Torrey & A. Gray. Cp (GA, SC): sandhills; rare. May-September. Distributed from se. SC south to c. peninsular FL and FL Panhandle. [= K; = *Silphium ovatifolium* (Torrey & A. Gray) Small – S, Y; < *S. compositum* – FNA, SE; = *S. compositum* ssp. *ovatifolium* (Torrey & A. Gray) Sweeney & Fisher – Z]

Silphium compositum Michaux ***var. venosum*** (Small) Kartesz & Gandhi. Cp (NC, SC), Pd (SC): sandhills, xeric forests. May-September. Se. NC south to se. GA and FL Panhandle. [= K; = *Silphium venosum* Small – Y; < *S. compositum* var. *compositum* – RAB; > *S. lapsuum* Small – S; > *S. venosum* Small – S; < *S. compositum* – FNA, SE; = *S. compositum* ssp. *venosum* (Small) Sweeney & Fisher – Z]

Silphium connatum Linnaeus, Virginia Cup-plant. Mt, Pd (NC, VA): floodplain forests and openings; uncommon. une-August. [= RAB, F, Y; = *S. perfoliatum* var. *connatum* (Linnaeus) Cronquist – C, FNA, K, SE; < *S. perfoliatum* – G, W]

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, K, Y]

Silphium perfoliatum Linnaeus, Common Cup-plant. Mt (NC, VA), Pd (NC): June-August. [= RAB, F, S, Y; = *S. perfoliatum* var. *perfoliatum* – C, FNA, K, SE; < *S. perfoliatum* – G, W]

Silphium pinnatifidum Elliott. Mt (GA): limestone glades and woodlands; rare. C. and se. TN south to nw. GA and AL. [= K, S, SE; = *S. terebinthinaceum* Jacquin var. *pinnatifidum* (Elliott) A. Gray – F, FNA, Y; < *S. terebinthinaceum* – G; > *S. chickamaugense* Canby]

Silphium radula Nuttall. Mt (GA): rocky hardwood forests; rare (GA Rare). East to nw. GA (Jones & Coile 1988). [= K, SE; *? S. asperrimum* Hooker – Y, misapplied; *? S. gatesii* Mohr – Y?]

Silphium reniforme Rafinesque ex Nuttall. Mt, Pd (NC, SC, VA): dry forests; uncommon. This species ranges from w. and sc. VA 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, K, Y; < *S. compositum* – C, FNA, G, SE, W; = *S. compositum* ssp. *reniforme* (Rafinesque ex Nuttall) Sweeney & Fisher – Z]

Silphium terebinthinaceum Jacquin, Prairie-dock. Mt (VA), Pd (NC, SC): mafic glades, barrens, woodlands, and roadsides (NC, SC), calcareous glades, barrens, and woodlands (VA); rare. *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; < *S. terebinthinaceum* – G; > *S. terebinthinaceum* var. *terebinthinaceum* – K, Y; > *S. terebinthinaceum* var. *luciae-brauniae* Steyermark – K; > *S. terebinthinaceum* – S; > *S. rumicifolium* Small – S, Y]

Silphium brachiatum Gattinger, Cumberland Rosinweed. Endemic to sc. and se. TN (Chester, Wofford, & Kral 1997) and n. AL. And GA? [= F, FNA, G, K, S, SE, Y]

Silphium glutinosum J. Allison, Sticky Rosinweed, is known from calcareous Ketona glades in Bibb County, c. AL (Allison & Stevens 2001). [= FNA]

Silphium integrifolium Michaux var. *integrifolium*, Prairie Rosinweed, east to c. TN. [= C, FNA, G, SE; > *S. integrifolium* var. *integrifolium* – F, K, Y; > *S. integrifolium* var. *deamii* L.M. Perry – F, K; > *S. integrifolium* var. *gattingeri* L.M. Perry – K, Y]

Silphium integrifolium Michaux var. *laeve* Torrey & A. Gray. MO west to NE, south to OK; disjunct in c. TN. [= C, FNA, G, K, SE; = *S. speciosum* Nuttall – F, Y]

Silphium laciniatum Linnaeus var. *robinsonii* L.M. Perry, Compass-plant, east to c. AL, wc. TN (Chester, Wofford, & Kral 1997), and c. KY. [= F, K, Y; < *S. laciniatum* – C, FNA, G, SE]

Silphium perplexum J. Allison, Old Cahaba Rosinweed, is known from c. AL (Allison & Stevens 2001). [= FNA]

Silphium wasiotense M. Medley, Appalachian Rosinweed. E. KY and ne. TN (Risk & Wyrick 1996, Chester, Wofford, & Kral 1997). [= C, FNA, K; = *S. wasiotensis*, orthographic variant]

Silybum Adanson (Milk-thistle)

A genus of 2 species, herbs, of the Mediterranean region. References: Kein in FNA (2006a); Cronquist (1980)=SE.

* ***Silybum marianum*** (Linnaeus) Gaertner, Milk-thistle, Blessed-thistle. Pd (VA): disturbed areas; rare, introduced from 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 (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; Cronquist (1980)=SE.

Smallanthus uvedalius (Linnaeus) Mackenzie ex Small, Bearsfoot, Leafcup. Mt, Pd, Cp (GA, NC, SC, VA): moist forests, bottomland forests, and disturbed places; common. July-October. NY and IL south to FL and TX; possibly extending through e. Mexico and Central America to Panama, depending on circumscription. [= FNA, K, S, Z; = *Polymnia uvedalia* Linnaeus – RAB, C, SE, W; > *Polymnia uvedalia* var. *uvedalia* – G; > *Polymnia uvedalia* var. *densipilis* Blake – F, G; > *Polymnia uvedalia* var. *floridana* Blake – F]

Solidago Linnaeus 1753 (Goldenrod)

(also see *Brintonia, Chrysoma*, *Euthamia*, and *Oligoneuron*)

A genus of 80-100 species, herbs, primarily North American, but with a few species in South America, Macaronesia, and Eurasia. References: Semple & Cook in FNA (2006b); Nesom (1990); Cronquist (1980)=SE; Morton (1973, 1974); Zhang (1996); Cook & Semple (2004). Portions of the key adapted (in part) from various sources, especially FNA and SE.

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 ..... **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.
  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). ..... **Key B**
    3 Inflorescence paniculiform, the major branches at least recurved with the heads borne secundly ..... **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..... ..... **Key D**
    4 Inflorescence a well-developed panicle..... **Key E**

Key A – goldenrods with corymbiform inflorescences

1 Plant a woody shrub; leaves with a markedly pebbled surface ..... ***[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 ..... ***[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 bristle slightly to strongly clavellate-thickened..... ***[Oligoneuron]***
    3 Rays yellow; leaves oblong, elliptic, obovate, or spatulate, 2-8× as long as wide; pappus bristle not clavellate thickened.
      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]..... ***[Oligoneuron]***
      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]..... ***Solidago spithamaea***

Key B – goldenrods with basally disposed leaves and elongate, non-secund inflorescences

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 and perhaps also 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 tending to become smooth on the upper stem; panicle branches usually stiffly erect; pappus 4.0-4.5 (-5.0) mm long ..... ***S. stricta***

12 Leaf margins scabrous (or at least tuberculate) throughout; panicle branches often spreading-erect with recurved-secund tips; pappus < 4.0 mm long.

13 Pappus 2.2-2.8 mm long; ray flowers 2-4; disk flowers 6-8; [of the inner Coastal Plain and lower Piedmont] ..... ***S. austrina***

13 Pappus (3.0-) 3.5-4.0 mm long; ray flowers 3-7; disk flowers 9-13; [of the Coastal Plain] ..... ***S. gracillima***

7 Petioles of lower stem leaves not sheathing the stems; [of mesic or drier habitats]; [subsect. *Squarrosae*].

14 Phyllaries spreading or with squarrose tips ..... ***S. squarrosa***

14 Phyllaries appressed.

15 Phyllaries sparsely to moderately finely stipitate-glandular; [endemic to outer Coastal plain of se. NC] ... ***S. villosicarpa***

15 Phyllaries and peduncular bracts not glandular.

16 Phyllaries linear-lanceolate, attenuate, tapering to pointed or minutely rounded tip.

17 Proximal to mid stem glabrous; rays mostly 6-9; inner phyllaries usually striate with 2 prominent secondary veins ..... ***S. roanensis***

17 Stems and leaves finely hairy throughout with minute strigillose hairs; rays mostly 9-16; inner phyllaries not striate.

18 Leaves 20-50 (-60) per stem; midstem leaves usually 4-5 cm long; phyllaries attenuate; [of the Mountains and Piedmopnt (rarely Coastal Plain), of GA northward] ..... ***S. puberula** var. **puberula***

18 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***

16 Phyllaries ovate to lanceolate, acute to obtuse or rounded.

19 Rays white ..... ***S. bicolor***

19 Rays yellow (may turn pale yellow with age).

20 Leaves and stems sparsely to densely hairy with spreading to appressed hairs ..... ***S. hispida***

20 Leaves and upper stems glabrous.

21 Inflorescence either very narrowly thyrsiform and often interrupted or branches well spaced; mid cauline leaves 0.5-2.0 cm wide; [MA to se. IN, south to GA and MI, mostly avoiding the Coastal Plain southward] ..... ***S. erecta***

21 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; MA to GA, west to SD and scattered south in CO to ne. NM.
22 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***
22 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

{key pending}

Key D – goldenrods with cauline leaves and axillary inflorescences

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***
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) ....***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)..... .....***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) per head; [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 per head; [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

{key pending}

Solidago altissima Linnaeus *var.* ***altissima***, Tall Goldenrod. Mt, Pd, Cp (GA, NC, SC, VA): fields, roadsides, disturbed areas; common. August-October. Nova Scotia, Québec, and Saskatchewan south to 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; = *S. canadensis* Linnaeus var. *scabra* Torrey & Gray – C, G, SE; < *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 arguta Aiton *var.* ***arguta***, Forest Goldenrod. Cp, Pd, Mt (NC, VA): woodlands, woodland borders, road margins; uncommon (NC Watch List). August-October. ME and s. Ontario 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. Cp (GA, SC): dry open woodlands, dry slopes, often in sandy or rocky soils; rare (VA Watch List). September-October. C. SC south to s. AL, west to LA, AR, and s. MO, most common in the Ozarks. [= K, SE; < *S. arguta* – RAB (also see *S. tarda* and *S. vaseyi*); > *S. boottii* – F, S; > *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. Cp, Mt, Pd (GA, NC, SC, VA): forests, woodlands, grassy balds; common. September-October. WV west to c. TN and s. MO, south to ne. FL, panhandle FL, s. MS, and c. AR. The distinction between *ssp. caroliniana* and *ssp. pseudoyadkinensis* seems problematic. [= C, K, SE, W; < *S. arguta* – RAB; = *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. 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. Pd (GA, SC), Cp, Mt (GA): rocky forests over circumneutral rocks, bottomland forests; rare (SC Rare). August-September. Wc. SC, sc. TN (Chester, Wofford, & Kral 1997), AR, and OK south to panhandle FL, AL, MS, LA, and TX. [= FNA, K, SE; = *S. notabilis* Mackenzie – RAB, S]

Solidago bicolor Linnaeus, Silverrod, White Goldenrod. Mt (GA, NC, SC, VA), Pd, Cp (NC, VA): woodlands, roadbanks, pastures; common (rare in SC) (SC Rare). August-October. Nova Scotia and Manitoba south to GA and LA. [= RAB, C, FNA, G, K, S, SE, W; > *S. bicolor* var. *bicolor* – F; > *S. bicolor* var. *ovalis* – F]

Solidago brachyphylla Chapman, Dixie Goldenrod. Cp (GA, NC?, SC), Pd (GA): open woodlands; rare. September-November. SC (NC?) south to ne. and panhandle FL, west to s. AL (s. MS?). [= FNA, K, S, SE]

Solidago caesia Linnaeus var. ***caesia***, Axillary Goldenrod. Pd, Cp (GA, NC, SC, VA), Mt (VA): moist forested slopes; common. August-October. ME and Ontario south to FL and LA. [= FNA; < *S. caesia* – RAB, C, F, G, K, S, SE, W]

Solidago caesia Linnaeus *var.* ***zedia*** R.E. Cook & Semple, Gulf Coast Axillary Goldenrod. Cp (GA): moist forests; uncommon. September-October. GA and panhandle FL west to LA and AR. [= FNA; < *S. caesia* – K, S, SE]

Solidago canadensis Linnaeus *var.* ***canadensis***, Northern Common Goldenrod. {VA}: old fields, pastures, roadesides; uncommon? August-October. 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]

Solidago canadensis Linnaeus *var.* ***hargeri*** Fernald, Harger's Common Goldenrod. Mt (VA): {NC?}: old fields, pastures, roadsides; uncommon?. August-October. VT and NH west to MN, south to VA, NC?, KY, OH, IL, and IA. [= C, F, FNA, K, SE; < *S. canadensis* var. *canadensis* – G; < *S. canadensis* – S, W]

Solidago curtisii Torrey & A. Gray, Curtis's Goldenrod. Mt (GA, NC, SC, VA), Pd (VA): moist forested slopes, and rarely in mafic woodlands in the Piedmont of VA; common. September-October. A Centrala nd 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. The reduction of *S. curtisii* to a variety of *S. caesia* is clearly not warranted. [= C, SE, W; < *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 erecta Pursh. Mt, Pd, Cp (GA, NC, SC, VA): woodlands, old fields, woodland borders, grassy balds; common (rare in Coastal Plain of NC, SC, and GA). August-October. NY and CT south to GA, AL, and MS. [= RAB, C, F, FNA, G, K, S, SE, W; < *S. erecta* – FNA (also see *S. porteri*); = *S. speciosa* Nuttall var. *erecta* (Pursh) MacMillan]

Solidago faucibus Wieboldt, Gorge Goldenrod. Mt (SC, VA): 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. Cp (GA, NC, SC, VA): pocosins, swamp forests, wet savannas, wet pine flatwoods, maritime forests; common. August-November. Nova Scotia south to FL, west to LA. [= RAB, C, F, FNA, G, GW, K, S, SE]

Solidago flaccidifolia Small, Appalachian Goldenrod. Mt (GA, NC, SC, VA), Pd (GA), Cp? (GA): mountain slopes; uncommon (VA Watch List). 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. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): moist wooded slopes, especially over calcareous or mafic rocks; common (rare in VA Coastal Plain, uncommon south of VA). August-October. Nova Scotia, Ontario and ND south to GA, AL, MS, and KS. [= RAB, C, F, FNA, G, K, S, SE, W]

Solidago gigantea Aiton, Smooth Goldenrod. Mt, Pd, Cp (GA, NC, SC, VA): old fields, roadsides, streamside meadows, bottomlands; common. August-September (-October). Nova Scotia west to Saskatchewan and MT, south to panhandle FL, TX, and CO. [= RAB, C, GW, K, W; > *S. gigantea* var. *gigantea* – F, G, SE; > *S. gigantea* Aiton var. *serotina* (Kuntze) Cronquist – G, SE; > *S. gigantea* var. *leiophylla* Fernald – F; = *S. serotina* – S]

Solidago glomerata Michaux, Skunk Goldenrod. Mt (NC): restricted to high elevation situations, including grassy balds, rock outcrops, heath balds, northern hardwood forests, and spruce-fir forests; common. September-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. Cp (GA, NC, SC, VA), Pd (GA): wet pine savannas, seepage bogs; rare (NC Rare, VA Rare). August-October. E. VA south to n. 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. Much further research is needed. [= RAB, K, W; < *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. Mt, Pd (VA): limestone, dolostone, greenstone, shale, and calcareous siltstone woodlands, barrens, and cliffs; uncommon (rare in Piedmont). August-September. A Central Appalachian endemic: w. MD south to e. WV and w. VA. [= F, S, W; = *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. Mt (GA, VA), Pd (VA), {NC, SC}: dry rocky forests and woodland edges; rare (VA Watch List). August-October. Labrador west to Saskatchewan, 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; > *S. hispida* var. *hispida* – F, G, K]

Solidago juncea Aiton, Early Goldenrod. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): meadows, pastures, roadbanks, woodland borders; common. July-September. Nova Scotia west to MN, south to GA, AL, MS, and LA. [= RAB, C, FNA, S, SE, W; > *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. Cp (GA, SC): longleaf pine sandhills; rare. August-September. SC south to GA. See Semple (2003) for additional information. [= FNA]

Solidago lancifolia (Torrey & A. Gray) Chapman, Lanceleaf Goldenrod. Mt (NC, VA): mountain slopes, mostly at high elevations; rare (NC Watch List, VA Rare). 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. Cp (GA, NC, SC, VA): pocosins, swamp forests, sandhill seepages, sandhill-pocosin ecotones; uncommon (VA Rare). August-October. Nova Scotia south to AL. [= FNA, K; = *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. Cp (GA, NC, SC): wet pine savannas, wet pine flatwoods, marshes; uncommon (NC Rare). August-November. Se. NC south to s. FL, west to s. AL. [= RAB, FNA, GW, K, S, SE]

Solidago nemoralis Aiton *var.* ***nemoralis***, Eastern Gray Goldenrod. Mt, Pd, Cp (GA, NC, SC, VA): woodlands, glades, barrens, roadbanks; common. Nova Scotia west to ND, south to 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; > *S. nemoralis* var. *haleana* Fernald – C, F, G, SE; < *S. nemoralis* – RAB, S, W; = *S. nemoralis* ssp. *nemoralis* – FNA]

Solidago odora Aiton *var.* ***chapmanii*** (A. Gray) Chapman, Chapman's Goldenrod. Cp (GA): sandhills; rare. September-October. GA and FL. [= K, SE; = *S. chapmanii* A. Gray – S; = *S. odora* ssp. *chapmanii* (A. Gray) Semple – FNA]

Solidago odora Aiton *var.* ***odora***, Licorice Goldenrod. Cp, Pd, Mt (GA, NC, SC, VA): 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; common (uncommon in Mountains). July-October. NH, VT, NY, OH, and MO south to FL and TX. [= C, K, SE; = *S. odora* – RAB, F, G, S, W; = *S. odora* ssp. *odora* – FNA]

Solidago patula Muhlenberg ex Willdenow *var.* ***patula***, Northern Roughleaf Goldenrod. Mt (GA, NC, SC, VA), Pd (GA, NC, VA): bogs, seepages over mafic rocks, grassy balds (as Whitetop Mountain); uncommon. 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; = *S. rigida* – S, misapplied]

Solidago patula Muhlenberg ex Willdenow *var.* ***strictula*** Torrey & A. Gray, Southern Roughleaf Goldenrod. Cp (GA, NC, SC), Pd (VA): streamhead pocosins, sandhill seepages, swamp edges; uncommon (NC Watch List, VA Rare). September-October. Se. VA south to FL, west to MO, OK, and TX. Perhaps better treated as *S. salicina*. [= RAB, C, G, K, SE; > *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.*** Cp, Pd (GA, NC, SC), Mt (GA, NC): upland forests and woodlands; uncommon (rare in Mountains). Late August-November. The distribution of *S. petiolaris* (in the broad sense) is peculiar, with an eastern component (NC south to 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 is Ozarkian and more western. [= C, F, K, SE; < *S. petiolaris* – RAB, W (and also see *S. buckleyi*); *S. petiolaris* var. *petiolaris* – C, F, K, SE; = *S. petiolaris* – G, narrow sense; = *S. milleriana* Mackenzie – S]

Solidago pinetorum Small, Pineywoods Goldenrod. Cp, Pd (NC, SC, VA), Mt (NC, VA): dry woodlands, woodland borders, roadbanks, dry pinelands; common (rare in VA Mountains). 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. Pd (NC): in crevices of outcrops in rocky, flood-scoured riverbanks; rare (US Species of Concern, NC Rare). September. Known only from the type locality, the gorge of the Yadkin River in c. NC. Most of the population was probably 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 *S. arenicola*. [= FNA, K, S, SE]

Solidago porteri Small, Porter's Goldenrod. Pd (GA): upland forests; rare (GA Rare). 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]

Solidago puberula Nuttall *var. **puberula***. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp? (NC): bogs, wet meadows, and wet pastures, in dry acid soils in VA; uncommon (NC Watch List). August-October. Nova Scotia west to Ontario, south to GA and TN. [= RAB, C, F, G, K, SE; = *S. puberula* ssp. *puberula* – FNA; = *S. puberula* – S; < *S. puberula* – W]

Solidago puberula Nuttall *var. **pulverulenta*** (Nuttall) Chapman. Cp (GA, NC, SC, VA): savannas, streamhead pocosins, swamps, seepages in pinelands, and disturbed areas; common. September-October. Se. VA south to FL, west to LA. [= RAB, C, F, G, K, SE; = *S. puberula* ssp. *pulverulenta* (Nuttall) Semple – FNA; = *S. pulverulenta* Nuttall – S]

Solidago pulchra Small, Carolina Goldenrod. Cp (NC): wet pine savannas, seepage bogs; rare (US Species of Concern, NC Endangered). 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. Pd (VA): rocky, flood-scoured riversides; rare (VA Rare). ME and Québec 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. [= *S. simplex* Kunth ssp. *randii* (Porter) Ringius var. *racemosa* (Greene) Ringius – C, FNA, K; = *S. racemosa* Greene var. *racemosa* – F; = *S. spathulata* Augustin de Candolle ssp. *randii* (Porter) Cronquist var. *racemosa* (Greene) Cronquist – G, SE]

Solidago radula Nuttall, Rough Goldenrod. Pd (NC, SC), Mt (GA): dry woodlands over mafic rocks; rare (NC Rare). 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. Mt (VA): cliffs and barrens, primarily over mafic rocks (such as greenstone and hornblende); rare (VA Watch List). Nova Scotia west to Ontario and MI, south to w. VA and WV. [= F; < *S. simplex* ssp. *randii* (Porter) Ringius var. *monticola* (Porter) Ringius – C, FNA; > *S. randii* – F; > *S. maxonii* Pollard – F; = *S. spathulata* Augustin de Candolle ssp. *randii* (Porter) Cronquist var. *randii* – G; = *S. simplex* Kunth ssp. *randii* (Porter) Ringius var. *randii* – K]

Solidago roanensis Porter, Roan Mountain Goldenrod. Mt (GA, NC, SC, VA), 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]

Solidago rugosa P. Miller *var. **aspera*** (Aiton) Fernald. {GA, NC, SC, VA}: fields, forests, roadsides; common. August-November. ME west to MI, south to FL and TX. [= F; < *S. rugosa* var. *rugosa* – RAB; < *S. rugosa* ssp. *aspera* – C, G, K, SE, W; = *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. {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; *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. {GA, NC, SC, VA}: fields, forests, wetlands; common. August-October. Nova Scotia west to Ontario, 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; > *S. rugosa* var. *villosa* – F; < *S. rugosa* – GW; < *S. rugosa* ssp. *rugosa* – W]

Solidago rugosa P. Miller *var. **sphagnophila*** Graves, Peat-loving Goldenrod. {NC, SC, VA}: boggy habitats; uncommon? August-October. Nova Scotia 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, Mt (VA): crevices in rocky, flood-scoured riversides; rare (VA Rare). July-September. PA, OH, and IL south to 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 (GA, NC, SC, VA): coastal dunes, dune slacks, maritime wet grasslands, marsh edges; common, rare in VA (VA Watch List). Late August-

November (and sporadically until at least January in mild winters). VA (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; = *S. mexicana* Linnaeus – S; = *S. sempervirens* ssp. *mexicana* (Linnaeus) Semple – FNA]

Solidago sempervirens Linnaeus *var.* ***sempervirens***, Northern Seaside Goldenrod. Cp (VA): coastal dunes, dune slacks, maritime wet grasslands, marsh edges; common. Late August-November. Newfoundland south to VA nalong 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 simulans Fernald, Granite Dome Goldenrod, Cliffside Goldenrod. Mt (GA, NC, SC): in thin soil mats wetted by periodic seepage on granitic domes in the vicinity of Highlands, NC (Jackson and Macon counties, NC; Rabun County, GA) and in Hickory Nut Gorge (Rutherford County, NC); rare (GA Rare, NC Watch List). 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 (GA Special Concern). (August-) September-October. Ontario 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, 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; > *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), Pd (NC, VA): rock outcrops and dry rocky forests, usually over calcareous or mafic rocks; uncommon (rare in Virginia Piedmont). (July-) August-September (-October). WV, OH, IN, and IL south to GA, AL, and MS. [= RAB, C, F, G, K, SE, W; = *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 (US Threatened, NC Endangered). September-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 Québec, 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 cespitosum, Sibbaldiopsis tridentata, Polypodium appalachianum, Paronychia argyrocoma, Kalmia buxifolia, Stenanthium leimanthoides, Heuchera villosa* var. *villosa, Saxifraga michauxii, 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), Pd (VA): upland forests; uncommon (rare south of VA and in VA Piedmont) (NC Rare). August-September. New Brunswick and Ontario south to DE, w. NC, and OH. [= RAB, C, F, FNA, G, K, S, SE, W]

Solidago stricta Aiton, Wand Goldenrod. Cp (GA, NC, SC, VA?): pine savannas, Coastal Plain bogs, pocosins; common. Late August-October. NJ south to FL, west to TX; West Indies and s. Mexico. [= C, F, G, K, SE; < *S. stricta* – RAB, GW (also see *S. pulchra*); = *S. petiolata* P. Miller – S, misapplied; = *S. stricta* Aiton ssp. *stricta* – FNA]

Solidago tarda Mackenzie. Cp (GA, VA), Pd (GA): sandhills, other dry pinelands, and xeric fluvial sand ridges; rare (VA Watch List). 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]

Solidago tortifolia Elliott, Leafy Pineywoods Goldenrod. Cp (GA, NC, SC, VA): sandhills and dry pinelands; uncommon (NC Rare, VA Rare). August-November. Se. VA south to FL, west to AR and TX. [= RAB, C, F, FNA, G, K, S, SE]

Solidago uliginosa Nuttall *var.* ***uliginosa***, Northern Bog Goldenrod. Mt (GA?, NC, VA), Cp (VA): bogs; rare (GA Rare), NC Rare, VA Rare). Labrador west to Keewatin, south to w. NC, ne. TN, IL, and IA (reports from further south needs additional evaluation; some material formerly identified as *S. uliginosa* is actually *S. simulans* or *S. gracillima*). [= F, G, K; < *S. uliginosa* – RAB, C, FNA, SE, W; < *S. uniligulata* (Augustin de Candolle) Porter – S]

Solidago ulmifolia Muhlenberg ex Willdenow *var.* ***ulmifolia***, Elmleaf Goldenrod. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): rocky forests and woodlands, especially on mafic and calcareous substrates; common (rare south of VA and in VA Coastal Plain, where usually confined to coquina limestone) (NC Watch List). August-October. Nova Scotia, ME, Ontario, and MN, south to FL and TX. [= C, FNA, G, K, SE; < *S. ulmifolia* – RAB, F, S, W]

Solidago verna M.A. Curtis, Spring-flowering Goldenrod. Cp (NC, SC): moist pine savannas, lower slopes of sandhills, pineland roadbanks; rare (US Species of Concern, NC Endangered, SC 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 (NC Rare). September. Endemic to se. NC (Onslow, Pender, and Brunswick counties). See LeBlond (2000). [= FNA]

Solidago albopilosa E.L. Braun, Rockhouse Goldenrod, Cave Goldenrod. In 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. *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]

Solidago arenicola B.R. Keener & Kral, Black Warrior Goldenrod, is known from Blount County, AL (Black Warrior River) and perhaps 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 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 delicatula Small. Possibly east to AL, FL. August-October. [= FNA, SE; = *S. ulmifolia* Muhlenberg ex Willdenow var. *microphylla* A. Gray – K; < *S. ulmifolia* – S]

Solidago gattingeri Chapman, Gattinger's Goldenrod. Cedar glades. AR, MO, c. TN (Chester, Wofford, & Kral 1997). [= F, FNA, G, K, S, SE]

Solidago missouriensis Nuttall var. *fasciculata* Holzinger. C. TN (Chester, Wofford, & Kral 1997). [= C, F, G, K, SE; < *S. missouriensis* – FNA; = *S. glaberrima* Martens – S]

Solidago shortii Torrey & A. Gray. Endemic to nc. KY (Fleming, Jefferson, Nicholas, Robertson counties) and s. IN. August-October. See Smith et al. (2004) for detailed information. [= C, F, FNA, G, K, SE]

Solidago uliginosa Nuttall var. *linoides* (Torrey & A. Gray) Fernald. South to s. PA and WV. [= K; < *S. uliginosa* – C, FNA; > *S. uliginosa* var. *linoides* – F; > *S. purshii* Porter – F; > *S. uliginosa* var. *peracuta* (Fernald) Friesner – G]

Solidago ulmifolia Muhlenberg ex Willdenow var. *palmeri* Cronquist. East to MS (AL?). [= FNA, G, K, SE; < *S. ulmifolia* – S]

Soliva Ruiz & Pavón 1794 (Burweed)
(also see *Gymnostyles*)

A genus of about 8 species, herbs, of South America. References: Watson in FNA (2006a); Cronquist (1980)=SE; Arriagada & Miller (1997)=Z.

1 Achenes (1.5-) 2.5-3.0 mm long, usually winged, the wings not transversely ribbed.....***S. sessilis***
1 Achenes 1.8-2.2 mm long, winged, transversely ribbed .....***S. stolonifera***

* ***Soliva sessilis*** Ruiz & Pavón, Field Burweed. Cp (GA, NC, SC, VA), Pd (GA, NC): lawns, roadsides; rare, introduced from South America. April-May. [= FNA, K, S, Z; = *S. pterosperma* (Antoine Laurent de Jussieu) Lessing – RAB, SE]

* ***Soliva stolonifera*** (Brotero) Loureiro, Carpet Burweed. Cp (GA, SC): lawns, roadsides, moist open areas; uncommon, introduced from South America. March-April. [= FNA, SE, Z; = *Gymnostyles stolonifera* (Brotero) Tutin – K; *? Soliva nasturtiifolia* (Antoine Laurent de Jussieu) Augustin de Candolle – RAB, misapplied; *? Gymnostyles nasturtiifolia* Antoine Laurent de Jussieu – S, misapplied]

Sonchus Linnaeus (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.* ***glabrescens*** (Günther) Grabowski & Wimmer, Perennial Sow-thistle. Mt (NC, VA), Pd (VA): disturbed areas; uncommon (rare in NC), native of Europe. June-November. [= C, SE; < *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, Pd, Mt (GA, NC, SC, VA): roadsides, fields, pastures, disturbed areas; common, native of Europe. Late March-July. [= RAB, C, F, FNA, G, K, S, SE, W]

* ***Sonchus oleraceus*** Linnaeus, Common Sow-thistle. Cp, Pd (GA, NC, SC, VA), Mt (GA, VA): roadsides, fields, pastures, disturbed areas; common, native of Europe. Late March-July. [= RAB, C, F, FNA, G, K, S, SE, W]

* *Sonchus arvensis* Linnaeus var. *arvensis*, Perennial Sow-thistle. Disturbed areas. Introduced from Europe, south to MD, PA, TN, KY, and MS (Kartesz 1999). [= C, F, SE; = *S. arvensis* ssp. *arvensis* – FNA, K; = *S. arvensis* – G]

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. Naturalized in FL (including several counties in the panhandle adjacent to GA) (Wunderlin & Hansen 2003). Native of tropical America. [= FNA; = *Wedelia trilobata* (Linnaeus) A.S. Hitchcock – S, SE]

Stokesia L'Héritier de Brutelle (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 (GA, SC), Pd* (NC*): native in pitcherplant bogs and moist pinelands of GA and SC, rather frequently grown as a garden plant and naturalized from cultivation at least in NC; rare (GA Rare). Late June-August. Native from e. SC south to 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, Z]

Stuartina Sonderegger

A genus of 2 species, endemic to Australia.

* ***Stuartina hamata*** Philipson. Cp (SC): waste area near wool-combing mill; rare, introduced from Australia. See Nesom (2004d).

Symphyotrichum Nees 1833 (American Aster)

Warning: only a fragment complete at this time.

A genus of about 90 species, of the Americas and e. Asia. See, for instance, 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, 1994); Semple, Heard, & Xiang (1996); Noyes & Rieseberg (1999). References: Brouillet et al. FNA (in prep.); R. Jones (1983)=Z; Lamboy (1987)=Y; Nesom (1994)=X; Semple, Heard, & Xiang (1996)=S; Cronquist (1980)=SE; Sundberg (2004); R. Jones (1992); Lamboy (1992); Nesom (1997); Xiang & Semple (1996); Warners & Laughlin (1999).

{various fragments of keys}

Key to Section *Patentes*

1 Involucres 8-10 (-12) mm high; disk flowers 8-10 mm long, white with purplish lobes; heads 4-5 (-6) cm across (ray tip to ray tip); 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..... ***S. georgianum***

1 Involucres 5.5-7.5 (-8.5) mm high; disk flowers 5.5-8 mm long, either white with purplish lobes or yellow; heads 3-4 (-4.5) cm across (ray tip to ray tip); 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.

  2 Disk corollas white {or perhaps also yellow??}; cauline 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***

2 Disk corollas yellow; cauline 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; [widespread in our area, mostly in dry, semi-sunny to sunny situations] .... ***S. patens* *var*. *patens***

Symphyotrichum georgianum (Alexander) Nesom, Georgia Aster. Pd (GA, NC, SC), Cp (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 (GA Special Concern, NC Proposed Threatened). 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. [= FNA, K, 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 patens (Aiton) Nesom var. ***patens***, Common Clasping Aster. Pd, Mt, Cp (GA, NC, SC, VA): dry woodlands, roadsides, woodland edges, clearings, roadbanks; common. 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, panhandle FL, s. AL, s. MS, s. LA, and sc. TX. [= FNA, K, X; > *Aster patens* Aiton var. *patens* – C, F, G, SE; < *Aster patens* – RAB, W; >< *Aster patens* var. *gracilis* Hooker – C, F, G, SE, misapplied as to our area (now more narrowly defined and occurring only west of our area); = *Aster 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), Pd (NC, SC, VA): mesic, nutrient-rich mixed hardwood forests; uncommon (GA Special Concern, NC Watch List). 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; = *Aster phlogifolius* Muhlenberg ex Willdenow – S, W, Z; = *Aster patens* Aiton var. *phlogifolius* (Muhlenberg ex Willdenow) Nees – C, F, G, SE; = *Virgulus patens* (Aiton) Reveal & Keener var. *phlogifolius* (Muhlenberg ex Willdenow) Reveal & Keener]

Symphyotrichum patens (Aiton) Nesom var. *gracile* (Hooker) Nesom. Var. *gracile*, as defined more narrowly by Z, ranges east to 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. *patentissimus* (Lindley ex de Candolle) Nesom is largely Ozarkian, east to KY and MS. [= FNA, K; = *Aster patens* Aiton var. *patentissimus* (Lindley) Torrey & A. Gray – C, F, G, SE, Z]

[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 to section *Oxytripolium*

References: Nesom (2005b)=Y; Sundberg (1974)=Z. Key based on Nesom (2005b).

1 Plants perennial, from creeping rhizomes ..... ***S. tenuifolium***

1 Plants annual, from a short taproot.

2 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***

2 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.

3 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]***

3 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 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 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 3-4 or more times; disc florets (20-) 33-45 (-50); [sc. United States east to AL and scattered eastward as an introduction] ..... ***S. divaricatum***

Symphyotrichum bahamense (Britton) Nesom, Bahama Salt-marsh Aster. Cp (GA): salt, brackish, and fresh marshes, ditches, wet areas; uncommon. October-November. E. GA, peninsular FL, FL Panhandle; Bahamas. [= K, Y; = *S. subulatum* (Michaux) Nesom var. *elongatum* (Bosserd) S.D. Sundberg – FNA, Z; < *A. subulatus* – GW; < *A. subulatus* Michaux var. *cubensis* – SE; = *A. subulatus* Michaux var. *elongatus* Bosserd]

* ***Symphyotrichum divaricatum*** (Nuttall) Nesom, Midwestern Salt-marsh aster. Cp (SC, VA), Pd (VA): disturbed areas, including waste areas near wool-combing mill; rare, introduced from sc. United States and Mexico. October-November. See Nesom (2000). {distribution verified in part by specimens at NCU} [= K, X, Y; = *Aster exilis* Elliott – RAB, F, apparently misapplied; = *Symphyotrichum subulatum* (Michaux) Nesom var. *parviflorum* (Nees) S.D. Sundberg – FNA, Z; < *Aster subulatus* – GW; = *Aster subulatus* Michaux var. *ligulatus* Shinners – SE]

Symphyotrichum subulatum (Michaux) Nesom, Eastern Salt-marsh Aster. Cp (GA, NC, SC, VA): tidal marshes; common. September-November. S. ME south to FL, west to LA. See Sundberg (2004). [= K, X, Y; = *Aster subulatus* Michaux var. *subulatus* – C, SE; < *A. subulatus* – RAB, GW; = *S. subulatum* var. *subulatum* – FNA, Z; > *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 (GA, NC, SC, VA): brackish marshes; common. September-November. See Sundberg (2004). [= K, X, Y; = *Aster tenuifolius* Linnaeus – RAB, C, G, GW, SE; = *Symphyotrichum tenuifolium* var. *tenuifolium* – FNA]

* *Symphyotrichum squamatum* (Sprengel) Nesom, South American Salt-marsh Aster. On ballast and escaped to coastal marshes and dunes. AL (Mobile County), FL, LA, TX. Native of South America. [= K, X, Y; = *S. subulatum* (Linnaeus) Nesom var. *squamatum* (Sprengel) S.D. Sundberg – FNA; < *Aster subulatus* Michaux var. *cubensis* – SE; *? Aster subulatus* Michaux var. *australis* (A. Gray) Shinners]

Symphyotrichum adnatum (Nuttall) Nesom. Cp (GA): sandhills, pine flatwoods; common. S. GA south to s. peninsular FL, west to se. LA. [= FNA, K, X; = *Aster adnatus* Nuttall – S, SE]

Symphyotrichum concolor (Linnaeus) Nesom *var. **concolor***, Eastern Silvery Aster. Cp, Pd, Mt (GA, NC, SC, VA): sandhills, Piedmont woodlands, forest edges, roadbanks; common, rare in Mountains. September-October. [= FNA; < *Symphyotrichum concolor* (Linnaeus) Nesom – K, X; < *Aster concolor* Linnaeus – RAB, C, F, G, S, SE, W; < *Virgulus concolor* (Linnaeus) Reveal & Keener]

Symphyotrichum cordifolium (Linnaeus) Nesom. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): rich forests, shaded roadbanks; common, rare in Piedmont and Coastal Plain. September-October. [= K; < *Aster cordifolius* Linnaeus – RAB (also see *A. lowrieanus*); = *A. cordifolius* – C, G, S, SE, W; > *A. cordifolius* var. *cordifolius* – F; > *A. cordifolius* var. *polycephalus* Porter – F; > *A. cordifolius* var. *racemiflorus* Fernald – F; > *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): glades and barrens over mafic rocks (diabase); rare (NC Endangered). Early September-October. MD, se. PA, and nc. NC. [= FNA, K, X; = *Aster depauperatus* Fernald – C, F, G, SE]

Symphyotrichum dumosum (Linnaeus) Nesom var. ***dumosum***, Long-stalked Aster. Cp, Pd, Mt (GA, NC, SC, VA): old fields, disturbed areas, pastures; common. Late August-October. New Brunswick, 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; < *S. dumosum* – FNA; > *A. dumosus* – S; > *A. coridifolius* Michaux – S]

Symphyotrichum dumosum (Linnaeus) Nesom *var.* ***gracilipes*** (Wiegand) Nesom. {GA, SC}. Late August-October. SC south to FL, west to LA. [= K; < *Aster dumosus* – RAB, GW, SE; < *S. dumosum* – FNA; = *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, Ontario, 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. {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]

Symphyotrichum elliottii (Torrey & A. Gray) Nesom, Southern Swamp Aster, Elliott's Aster. Cp (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 (VA Rare). Late September-November. Jones & Coile (1988) record for n. GA must be erroneous {check}. [= FNA, K, 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 (GA Special Concern, VA Rare). [= K, X; = *Aster ericoides* Linnaeus var. *ericoides* – G; < *Aster ericoides* – C, F, SE, W; < *S. ericoides* ssp. *ericoides* – FNA; < *Virgulus ericoides* (Linnaeus) Reveal & Keener]

Symphyotrichum ericoides (Linnaeus) Nesom *var.* ***prostratum*** (Kuntze) Nesom, Squarrose White Aster. {VA}. [= K, X; = *Aster ericoides* Linnaeus var. *prostratus* (Kuntze) Blake – G; < *Aster ericoides* – C, F, SE, W; < *S. ericoides* ssp. *ericoides* – FNA; < *Virgulus ericoides* (Linnaeus) Reveal & Keener]

Symphyotrichum firmum (Nees) Nesom, Shining Aster. {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; > *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 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 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 (NC, SC, VA), Mt (VA), {GA}: dry woodlands over mafic rocks; rare (NC Rare, VA Watch List). September-October. NYand KY south to GA and MS. [= FNA, K, X; = *Aster concinnus* Willdenow – C, G, S, SE; < *A. laevis* – F; = *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 (NC, SC, VA), Mt (NC, VA), Cp (VA), {GA}: mesic hardwood forests; rare (GA Special Concern, SC Rare). September-October. Nova Scotia west to Manitoba, south to GA, LA, and OK. [= FNA, K, X; = *Aster laevis* Linnaeus var. *laevis* – RAB, C, G, SE, W; >< *A. laevis* – F; > *A. steeleorum* Shinners – F; > *A. laevis* – S; > *A. falcidens* 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; = *S. attenuatum* (Lindley) Semple]

Symphyotrichum lanceolatum (Willdenow) Nesom var. ***interior*** (Wiegand) Nesom. {VA}: (Kartesz 1999). Hew Hampshire 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; = *Aster simplex* Willdenow var. *interior* (Wiegand) Cronquist – F, G; *Symphyotrichum lanceolatum* (Willdenow) Nesom ssp. *lanceolatum* var. *interior* (Wiegand) Nesom – K; < *Aster lanceolatus* – W; = *Aster lanceolatus* ssp. *lanceolatus* var. *interior* (Wiegand) Semple & Chmielewski; *Aster lanceolatus* ssp. *interior* (Wiegand) A.G. Jones]

Symphyotrichum lanceolatum (Willdenow) Nesom var. ***lanceolatum***. {VA}. Newfoundland west to Saskatchewan, south to VA, NC (?), SC (?), TN, MS, LA, and TX. Reported for VA (FNA). South at least to s. PA (Rhoads & Klein 1993). [= FNA, X; < *Aster simplex* Willdenow – RAB, GW; = *Aster lanceolatus* Willdenow var. *lanceolatus* – C; = *Aster simplex* var. *ramosissimus* (Torrey & A. Gray) Cronquist – F, G; < *Aster simplex* var. *simplex* – SE; < *Aster lanceolatus* – W; = *Aster lanceolatus* ssp. *lanceolatus* var. *lanceolatus*; = *Aster lanceolatus* ssp. *lanceolatus*]

Symphyotrichum lanceolatum (Willdenow) Nesom *var.* ***latifolium*** (Semple & Chmielewski) Nesom. Mt, Pd, Cp (GA, NC, SC, VA): bottomlands, other moist sites; common. September-October. ME west to Manitoba, south to FL and TX. [= FNA, X; < *Aster simplex* Willdenow – RAB, GW; = *Aster lanceolatus* Willdenow var. *simplex* (Willdenow) A. G. Jones – C; = *A. simplex* var. *simplex* – F, G; = *Symphyotrichum lanceolatum* (Willdenow) Nesom ssp. *lanceolatum* var. *latifolium* (Semple & Chmielewski) Nesom – K; < *Aster lanceolatus* – W; *Aster lanceolatus* Willdenow var. *latifolius* Semple & Chmielewski]

Symphyotrichum lateriflorum (Linnaeus) Löve & Löve var. ***horizontale*** (Desfontaines) Nesom, Goblet Aster. {GA, NC, VA} September-November. [= K, X; < *S. lateriflorum* – FNA; < *Aster lateriflorus* – C, G, GW, SE, W; = *A. lateriflorus* var. *pendulus* (Aiton) Burgess – F; *A. lateriflorus* (Linnaeus) Britton var. *horizontalis* (Desfontaines) Farwell]

Symphyotrichum lateriflorum (Linnaeus) Löve & Löve var. ***lateriflorum***, Starved Aster. {GA, NC, SC, VA} September-November. [= K; < *A. lateriflorus* – RAB (also see *A. ontarionis*); < *A. lateriflorus* – C, G, GW, SE, W; = *Aster lateriflorus* (Linnaeus) Britton var. *lateriflorus* – F; < *S. lateriflorum* – FNA; > *S. lateriflorum* var. *lateriflorum* – X; > *S. lateriflorum* var. *hirsuticaule* (Lindley ex Augustin de Candolle) Nesom – X; > *A. lateriflorus* var. *hirsuticaulis* (Lindley ex Augustin de Candolle) Porter]

Symphyotrichum lowrieanum (Porter) Nesom, Smooth Heart-leaved Aster. Mt (GA, NC, VA), Pd (VA): mesic to dry-mesic forests; common (rare south of VA). September-October. MA, NY, and Ontario, south to w. VA, w. NC, ne. GA, e, 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; > *A. lowrieanus* var. *lanceolatus* Porter – F; > *A. lowrieanus* – S; > *A. plumarius* Burgess – S; *? A. cordifolius* ssp. *laevigatus* (Porter) A.G. Jones; *? A. cordifolius* ssp. *laevigatus* Porter]

Symphyotrichum novae-angliae (Linnaeus) Nesom, New England Aster. Mt (GA, NC, VA), Pd (VA), Cp* (VA*): wet meadows, bogs, prairies; common, rare south of VA (GA Special Concern, SC Rare). September-October. Nova Scotia west to MT, south to GA, AL, MS, AR, OK, and NM. [= FNA, K, Z; = *Aster novae-angliae* Linnaeus – RAB, C, F, G, GW, S, SE, W; = *Virgulus novae-angliae* (Linnaeus) Reveal & Keener]

Symphyotrichum novi-belgii (Linnaeus) Nesom *var.* ***elodes*** (Torrey & A. Gray) Nesom, New York Aster. Cp (NC, SC, VA): wet pine savannas, marshes; common. Late September-November. New Brunswick south to NY, apparently disjunct southward from e. MD south to e. SC. [= FNA, K, X; < *Aster novi-belgii* – RAB, C, G, GW, SE; = *Aster novi-belgii* Linnaeus var. *elodes* (Torrey & A. Gray) A. Gray – F; = *Aster elodes* Torrey & A. Gray – S]

Symphyotrichum oblongifolium (Nuttall) Nesom, Eastern Aromatic Aster, Shale-barren Aster. Mt (NC, VA), Pd (VA): rock outcrops and dry woodlands over limestone, calcareous shale; common, rare in NC (NC Rare). Late September-October. NY, WI, MN, and MT, south to sc. VA, w. NC, AL, MS, TX, and NM. [= FNA, K, X; > *Aster oblongifolius* Nuttall var. *angustatus* Shinners – G, SE; = *Aster oblongifolius* – RAB, C, F, S, W; = *Virgulus oblongifolius* (Nuttall) Reveal & Keener]

Symphyotrichum pilosum (Willdenow) Nesom var. ***pilosum***. Mt, Pd, Cp (GA, NC, SC, VA): old fields, disturbed areas, woodland borders; common. September-November. New Brunswick west to MN, south to FL and TX. [= FNA, K, X; = *Aster pilosus* Willdenow var. *pilosus* – C, F, G, SE; < *Aster pilosus* – RAB, W]

Symphyotrichum pilosum (Willdenow) Nesom var. ***pringlei*** (A. Gray) Nesom. Cp (NC), Pd (NC, VA), {GA, SC}: (VA Watch List). September-November. Nova Scotia 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; > *A. pilosus* var. *pringlei* – G; >< *A. pilosus* var. *pringlei* – F]

Symphyotrichum praealtum (Poiret) Nesom var. ***angustior*** (Wiegand) Nesom, Willow Aster, Veiny Lined Aster. Mt (VA), {NC?}: fen-like calcareous wetlands; rare (VA Rare). 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): moist forests over limestone, wooded fen (with *Acer rubrum* and *Fraxinus nigra*); rare (GA Special Concern, VA Rare). Giles County, VA. [= K, X; < *Aster praealtus* – C, GW, W; = *A. praealtus* Poiret *var. praealtus* – F; < *A. praealtus* var. *praealtus* – G, SE]

Symphyotrichum pratense (Rafinesque) Nesom, Barrens Silky Aster. Mt (GA, VA): calcareous barrens; rare (GA Rare, VA Rare). September-October. Sw. VA, KY, AR, and TX, south to e. TN (Chester, Wofford, & Kral 1997), nw. GA, FL, AL, MS, and LA. See Ludwig (1999). [= FNA, K, X; < *Aster sericeus* – C, F, G, SE; = *S. sericeum* (Ventenat) Nesom var. *microphyllum* (Augustin de Candolle) Wunderlin & B.F. Hansen; = *Aster pratensis* Rafinesque; = *Aster sericeus* Ventenat var. *microphyllus* Augustin de Candolle]

Symphyotrichum prenanthoides (Muhlenberg ex Willdenow) Nesom, Zigzag Aster. Mt (NC, VA), Pd (VA): forests, roadbanks; common. Late August-October. MA, NY, s. Ontario, 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]

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; < *Aster pilosus* – W; = *Aster priceae* Britton]

Symphyotrichum puniceum (Linnaeus) Löve & Löve var. ***puniceum***, Purple-stem Aster, Swamp Aster. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): bogs, seeps, ditches, wet meadows; common, rare in Coastal Plain south of VA. September-October. Newfoundland and Labrador west to British Columbia, 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; > *A. puniceus* var. *compactus* Fernald – F; = *A. puniceus* var. *puniceus* – G; *? A. conduplicatus* Burgess – S]

Symphyotrichum racemosum (Elliott) Nesom *var.* ***racemosum***, Small White Aster. Cp, Pd (GA, NC, SC, VA), Mt (VA): bottomlands, marshes; common. ME south to 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. {} {in e. WV and apparently through our area judging from F} [= X; < *Aster racemosus* Elliott – C; = *Aster vimineus* Lamarck var. *subdumosus* Wiegand – F; < *S. racemosum* – FNA; = *Aster fragilis* Willdenow var. *subdumosus* (Wiegand) A.G. Jones, misapplied]

Symphyotrichum retroflexum (Augustin 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 retroflexus* Lindley ex Augustin de Candolle – C; = *Aster curtisii* Torrey & A. Gray – RAB, S, SE, W]

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, Millboro Aster. Mt (VA): {VA} (US Species of Concern, VA Rare). [= K, X; = *Aster ×schistosus* Steele (pro sp.); = *Aster schistosus* Steele]

Symphyotrichum sericeum (Ventenat) Nesom, Western Silvery Aster. Mt (GA): limestone glades; rare (GA Rare). Nw. GA (Jones & Coile 1988). [= FNA, K, X; = *Aster sericeus* Ventenat – G, S; < *Aster sericeus* Ventenat – C, F, SE; = *Virgulus sericeus* (Ventenat) Reveal & Keener; *? Aster phyllolepis* Torrey & A. Gray]

Symphyotrichum shortii (Lindley) Nesom, Midwestern Blue Heart-leaved Aster, Short's Aster. Pd (GA, VA), Mt (GA, NC): dry, rocky slopes; rare (NC Rare, VA Rare). PA, s. Ontario, and MN, south to w. NC, c. GA, Panhandle FL (Gadsden County), 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; > *Aster shortii* – S; > *Aster camptosorus* Small – S]

Symphyotrichum simmondsii (Small) Nesom. Pd, Cp (SC), {NC?}: Also reported for NC by Kartesz (1999). [= K, X; < *S. simmondsii* – FNA (also see *S. kralii*); = *Aster simmondsii* Small]

Symphyotrichum undulatum (Linnaeus) Nesom. Mt, Pd, Cp (GA, NC, SC, VA): dry forests, woodlands, roadbanks; common. August-November. Nova Scotia west to s. Ontario, south to c. peninsular FL and LA. [= FNA, K, X; = *Aster undulatus* Linnaeus – RAB, C, G, SE, W; > *A. undulatus* var. *undulatus* – F; > *A. undulatus* var. *loriformis* Burgess – F; > *A. undulatus* var. *diversifolius* (Michaux) A. Gray – F; > *Aster asperifolius* Burgess – S; > *Aster linguiformis* Burgess – S; > *Aster loriformis* (Burgess) Burgess – S; > *Aster mohrii* Burgess – S; > *Aster claviger* Burgess – S; > *Aster corrigiatus* Burgess – S; > *Aster gracilescens* Burgess – S; > *Aster proteus* Burgess – S; > *Aster sylvestris* Burgess – S; > *Aster triangularis* (Burgess) Burgess – S; > *Aster truellius* Burgess – S; > *Aster undulatus* – S; > *Aster undulatus* Linnaeus *var. asperulus* (Torrey & A. Gray) Wood; > *Aster undulatus* Linnaeus *var. loriformis* Burgess]

Symphyotrichum urophyllum (Lindley in Augustin de Candolle) Nesom, White Arrowleaf Aster. {confused} Mt (VA), Pd, Cp (NC, SC), {GA, VA} Late August-October. [= FNA, K, X; = *Aster sagittifolius* Wedemeyer ex Willdenow – RAB, C, G, S, SE, W; = *A. sagittifolius var. sagittifolius* – F; = *Aster urophyllus* Lindley in Augustin de Candolle]

Symphyotrichum walteri (Alexander) Nesom. Cp (GA, NC, SC): sandhills, pine flatwoods; common. E. NC south to c. peninsular FL. [= FNA, K, X; = *Aster walteri* Alexander – S, SE; = *Aster squarrosus* Walter – RAB; = *Virgulus walteri* (Alexander) Reveal & Keener]

Symphyotrichum boreale (Torrey & A. Gray) Löve & Löve, Rushlike Aster, Northern Bog Aster. Reported for WV (Barbour and Fayette counties), PA, and NJ. [= FNA, K, X; = *Aster borealis* (Torrey & A. Gray) Provancher – C; = *? Aster junciformis* Rydberg – F, G]

Symphyotrichum chapmanii (Torrey & Gray) Semple & Brouillet, Chapman's Wood-aster. Endemic to Panhandle FL and s. AL. [= FNA; = *Eurybia chapmanii* (Torrey & Gray) Nesom – K, X; = *Aster chapmanii* Torrey & Gray – S, SE]

Symphyotrichum concolor (Linnaeus) Nesom var. *devestitum* (S.F. Blake) Semple. Cp (GA?, SC?): Panhandle FL, maybe extending to GA, AL, and SC. See Semple (2004). [= FNA; < *Symphyotrichum concolor* (Linnaeus) Nesom – K, X; < ***Aster concolor*** Linnaeus – RAB, S, SE; < *Virgulus concolor* (Linnaeus) Reveal & Keener; = *Aster concolor* Linnaeus var. *devestitus* S.F. Blake]

Symphyotrichum drummondii (Lindley) Nesom *var. drummondii*, Hairy Heart-leaved Aster. In WV (Nesom 2000), MD, KY, TN, AL, MS. [= FNA, K, X; < *Aster drummondii* Lindley – C, G, SE; = *Aster sagittifolius* var. *drummondii* (Lindley) Shinners – F; = *Aster drummondii* var. *drummondii*]

Symphyotrichum drummondii (Lindley) Nesom var. *texanum* (Burgess) Nesom. East to MS, AL, and KY. [= FNA, K; = *Aster texanus* Burgess – C, G, SE; = *Aster drummondii* Lindley var. *texanus* (Burgess) A.G. Jones] {synonymy incomplete}

Symphyotrichum kralii Nesom. 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; < *Aster dumosus* – SE]

Symphyotrichum lateriflorum (Linnaeus) Löve & Löve var. *angustifolium* (Wiegand) Nesom. South to KY and NJ (Kartesz (1999). [= K, X]

Symphyotrichum longifolium (Lamarck) Nesom. Cp (SC): [= X; = *A. longifolius* Lamarck]

Symphyotrichum novi-belgii (Linnaeus) Nesom var. *novi-belgii*, New York Aster. Newfoundland and 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 ontarionis (Wiegand) Nesom *var. **ontarionis***, Bottomland Aster. {GA} In GA, west. 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***. {GA} 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) and AL. [= K, X; < *Aster oolentangiensis* – C; = *A. azureus* Lindley var. *azureus* – F; < *A. azureus* – G, SE; < *S. oolentangiense* – FNA]

Symphyotrichum plumosum (Small) Semple. Endemic to Franklin County, FL. [= FNA; < *Symphyotrichum concolor* (Linnaeus) Nesom – K; = *Aster plumosus* Small]

Symphyotrichum praealtum (Poiret) Nesom var. *subasperum* (Lindley) Nesom. [= 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]

Notes on vegetative identification of "asters" with petioled, cordate leaves (from G. Kauffman, pers. comm., and needing additional work):

Eurybia divaricata and *Eurybia chlorolepis*: Apparently not distinguishable from one another in vegetative condition. Typically hairy on main veins on underside of leaf; main vein consistently ending in a tooth; secondary veins typically ending in sinuses; tooth 3.5-7 mm long, with abruptly pointed tip 1-2 mm long; petiole not winged.
Symphyotrichum urophyllum: few scattered hairs on main vein on undersides of leaves; main vein not consistently ending in a tooth; secondary veins primarily ending in teeth, with scarcely any veins ending at sinuses; tooth 0.5-2 mm long, with gradually tapering tip.
Symphyotrichum lowrieanum: glabrous undersides of leaves, with typically netlike venation resembling *S. laeve*; venation similar to *S. urophyllum*; teeth 2-3 mm long with sharply pointed tips; petiole prominently winged, with the cordate blade base more shallow than that of *S. urophyllum*.
Symphyotrichum cordifolium: similar to *Symphyotrichum lowrieanum*, but petiole is not or only obscurely winged; teeth intermediate between those of *S. urophyllum* and those of *E. divaricata* and *E. chlorolepis*.

Tagetes Linnaeus (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 (GA, NC, SC, VA), Pd, Mt (NC, SC, VA): commonly cultivated, rarely persistent or as a waif, introduced from Mexico. July-November. [= RAB, C, F, G, K, S, SE; < *T. erecta* – FNA]
* ***Tagetes minuta*** Linnaeus, Muster John Henry. Cp (GA, NC, SC, VA), Pd (GA, SC): sandy fields, pecan orchards, sandy roadsides; common, introduced from South America. Late September-November. [= RAB, C, F, FNA, G, K, S, SE]
* ***Tagetes patula*** Linnaeus, French Marigold. Mt (VA), Pd, Cp (NC, SC): commonly cultivated, rarely persistent or as a waif, introduced from Mexico. July-November. [= RAB, C, G, K, SE; < *T. erecta* – FNA]

Tanacetum Linnaeus (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 parthenium*** (Linnaeus) Schultz-Bipontinus, Feverfew. Cp (SC), Pd (NC): disturbed areas; rare, introduced from Europe. June-September. [= FNA, K, Z; = *Chrysanthemum parthenium* (Linnaeus) Bernhardi – RAB, C, F, G, SE; = *Matricaria parthenium* Linnaeus – S]
* ***Tanacetum vulgare*** Linnaeus, Common Tansy, Golden-buttons. Mt (NC, VA), Pd, Cp (VA), {GA}: uncommon, introduced from Eurasia. August-October. [= RAB, C, F, FNA, G, K, S, SE, W, Z]

* *Tanacetum balsamita* Linnaeus, Costmary. Disturbed areas. 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]

Taraxacum G.H. Weber ex Wiggers (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, Pd (GA, NC, VA), Cp (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; >< 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, Pd, Cp (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; > *T. officinale* var. *officinale* – F; > *T. officinale* ssp. *officinale* – K; = *Leontodon taraxacum* Linnaeus – S]

Tetragonotheca Linnaeus (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, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): sandy woodlands, forests, roadsides; common, uncommon in NC, rare in VA (VA Rare). April-July. Se. VA and e. TN south to c. peninsular FL and s. MS. [= RAB, C, F, FNA, G, K, S, SE, W, Z]

Tetraneuris 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, introduced from sc. United States. See Nesom (2004d). [= FNA, K; *? Hymenoxys linearifolia* Hooker]

Thymophylla Lagasca y Segura

A genus of about 13 species, herbs and shrubs, of sw. and sc. United States and Mexico. References: Strother in FNA (2006c).

* ***Thymophylla tenuiloba*** (Augustin de Candolle) Small *var. **tenuiloba***, Dahlberg Daisy, Golden-fleece Cp (SC): waste areas near wool-combing mill; rare, perhaps merely a waif, introduced from sc. United States. Also known as a naturalized introduction in AL, MS, and FL (Nesom 2004d, FNA). [= FNA, K; < *Th. tenuiloba* – S; = *Dyssodia tenuiloba* (Augustin de Candolle) B.L. Robinson var. *tenuiloba* – SE]

Tragopogon Linnaeus (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, Pd (NC, VA), Cp (VA): roadsides, fields, other disturbed places; common (rare in NC), introduced from Europe. April-July. [= RAB, C, FNA, G, K, SE, W; *? T. major* Jacquin – F]
* ***Tragopogon porrifolius*** Linnaeus, Salsify, Vegetable-oyster. Mt (NC, VA), Pd (GA, NC, VA): roadsides, fields; rare, introduced from Europe. Late April-July. [= RAB, C, F, FNA, G, K, S, SE, W]
* ***Tragopogon pratensis*** Linnaeus, Showy Goat's-beard, Yellow Goat's-beard, Meadow Salsify, Jack-go-to-bed-at-noon. Mt, Pd (VA) {GA?, NC?}: roadsides, fields; rare, introduced from Europe. April-August. Also reported for NC and GA in FNA. [= C, F, FNA, G, K, S, SE, W]

Tripleurospermum Schulz-Bipontinus (Mayweed)

A genus of about 40 species, herbs, of the northern hemisphere.

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 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; = *T. maritima* ssp. *maritima* – K, orthographic variant]

Tussilago Linnaeus (Coltsfoot)

A monotypic genus, an herb, of Eurasia and n. Africa. References: Barkley in FNA (2006b); Cronquist (1980)=SE.

* ***Tussilago farfara*** Linnaeus, Coltsfoot. Mt, Pd (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 NC Piedmont), introduced from 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]

Uropappus Nuttall

* ***Uropappus lindleyi*** (Augustin de Candolle) Nuttall. Cp (SC): waste area near wool-combing mill; rare, perhaps merely a waif, introduced from sw. United States. See Nesom (2004d). [= K]

Verbesina Linnaeus (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]; [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, Pd (GA, NC, SC, VA), Cp (NC, VA): alluvial forests, marshes, floodplain pastures; common. August-September. NY and s. Ontario west to IA, south to panhandle FL and LA. [= RAB, C, FNA, G, GW, K, SE; = *Ridan alternifolia* (Linnaeus) Britton – S]

Verbesina aristata (Elliott) Heller, Coastal Plain Crownbeard. Cp (GA): longleaf pine sandhills, swamp margins, dry woodlands; rare. Sw. GA and FL Panhandle west to s. AL. June-August. [= FNA, K, SE; = *Pterophyton aristatum* (Elliott) Alexander – S]

* ***Verbesina encelioides*** (Cavanilles) Bentham & Hooker f. ex A. Gray *var.* ***encelioides***, Skunk-daisy. Cp (GA, NC, SC): fields, pastures, and disturbed areas; uncommon, introduced from w. United States. May-October. [= C, SE; < *V. encelioides* – RAB, F, FNA, G; = *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 (NC 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 occidentalis (Linnaeus) Walter, Southern Crownbeard. Mt, Pd, Cp (GA, NC, SC, VA): forests, woodlands, pastures, and roadsides, especially abundant in alluvial areas or upslope over mafic or calcareous rocks; common. MD west to OH and MO, south to FL panhandle and MS. [= RAB, C, F, FNA, G, GW, K, SE; = *Phaethusa occidentalis* (Linnaeus) Britton – S]

Verbesina virginica Linnaeus *var.* ***laciniata*** (Poiret) A. Gray, Southern Frostweed. Cp (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; < *V. virginica* – FNA; = *Phaethusa laciniata* (Poiret) Small – S; = *V. laciniata* (Poiret) Nuttall]

Verbesina virginica Linnaeus *var.* ***virginica***, Common Frostweed. Mt, Pd (GA, NC, SC), Cp (GA, SC, VA): moist to dryish forests, especially over mafic or calcareous rocks, in Coastal Plain ravines in VA over coquina limestone; uncommon (VA Watch List). 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; = *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]

Verbesina chapmanii J.R. Coleman. Bogs and wet pine flatwoods. Florida Panhandle (6 county endemic). June-August. [= FNA, GW, K, SE; *Pterophyton pauciflorum* (Nuttall) Alexander – S; *V. warei* A. Gray, misapplied]

Verbesina heterophylla (Chapman) A. Gray. Pine flatwoods. Ne. FL (8 county endemic). (April-) June. [= FNA, GW, K, SE; = *Pterophyton heterophyllum* (Chapman) Alexander – S]

Vernonia Schreber (Ironweed)

A genus of about 500 species, trees, shrubs, and herbs, of tropical, subtropical, and warm temperate regions, especially America and Africa. There is considerable question whether this broad circumscription of *Vernonia* will prove defensible. 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 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 (GA): sandhills; uncommon? Sw. GA and Panhandle FL west to s. AL and s. MS. [< *V. angustifolia* Michaux – FNA, S; = *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; = *V. angustifolia* ssp. *scaberrima* (Nuttall) S.B. Jones & Faust – K, SE; > *V. scaberrima* Nuttall – S; > *V. recurva* Gleason – S]

* ***Vernonia arkansana*** Augustin 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] {not keyed at this time}

Vernonia flaccidifolia Small. Pd, 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] {not keyed at this time}

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, Pd (GA, NC?, SC?, VA), Cp (GA): {habitat}; 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; = *V. gigantea* var. *gigantea* – C; > *V. altissima* var. *altissima* – F; < *V. gigantea* -- FNA; > *V. altissima* var. *taeniotricha* Blake – F; > *V. altissima* – S; > *V. gigantea* – S]

Vernonia glauca (Linnaeus) Willdenow. Cp, Pd, Mt (GA, NC, SC, VA): late June-September; August-October. NJ and PA south to GA, AL, and MS. [= RAB, C, F, FNA, G, K, S, SE, W]

Vernonia missurica Rafinesque, Missouri Ironweed. {GA}: prairies, glades; rare. IN, C. TN (Chester, Wofford, & Kral 1997), and GA (FNA) west to IA, KS, OK, and TX. [= C, F, K, S, SE]

Vernonia noveboracensis (Linnaeus) Michaux. Mt, Pd, Cp (GA, NC, SC, VA): {habitat}; common. July-September; August-October. [= RAB, C, FNA, G, K, SE, W; > *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 (GA): rich woods, stream banks; common. Sw. GA south to Panhandle FL and c. peninsular FL. [= S; < *V. gigantea* – FNA; = *Vernonia gigantea* (Walter) Trelease ssp. *ovalifolia* (Torrey & A. Gray) Urbatsch – K, SE, Y] {not keyed at this time}

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 Manitoba and Colorado. [= 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]

Viguiera

(see *Helianthus* and *Heliomeris*)

Vittadinia A. Richard

* ***Vittadinia sulcata*** N. Burbidge. Cp (SC): waste area near wool-combing mill; rare, perhaps merely a waif, introduced from sw. United States. See Nesom (2004d).

Wedelia

(see *Pascalia* and *Sphagneticola*)

Xanthium Linnaeus (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), Cp (NC, SC), Pd (GA, VA): fields, disturbed ground; rare, introduced, but the native distribution unknown. July-November. [= RAB, C, FNA, K, SE; > *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, Pd, Mt (GA, NC, SC, VA): 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. Most commonly recently is a treatment 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* (Augustin 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* (Augustin de Candolle) Cronquist – RAB, C, G, K, SE, W; > *X. strumarium* var. *strumarium* – RAB, misapplied; > *X. strumarium* var. *canadense* (P. Miller) Torrey & A. Gray – C, G, K, SE, W; > *X. chinense* P. Miller – F; > *X. echinatum* Murray – F; > *X. italicum* Moretti – F; > *X. oviforme* Wallroth – F; > *X. pensylvanicum* Wallroth – F; > *X. strumarium* – F]

Youngia Cassini (Youngia)

A genus of about 30-40 species, herbs, of Asia. References: Spurr in FNA (2006a); Cronquist (1980)=SE.

* ***Youngia japonica*** (Linnaeus) Augustin de Candolle, Asiatic Hawk's-beard, Youngia. Cp, Pd (GA, NC, SC, VA): roadsides, disturbed areas; uncommon, introduced from se. Asia. Spreading rapidly in our area. [= C, FNA, K, SE; = *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, Zinnia. Cp (GA, NC, SC): disturbed areas; rare (commonly cultivated), introduced from the New World tropics. May-November. [= FNA, K, SE; *? Z. pauciflora* Linnaeus – S]
* ***Zinnia violacea*** Cavanilles, Garden Zinnia. Cp (GA, NC, SC): disturbed areas; rare (commonly cultivated), introduced from the New World tropics. May-November. [= FNA, K; *? Z. elegans* Jacquin – S, SE]

BALSAMINACEAE A. Richard 1822 (Touch-me-not Family)

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. Cp (NC, SC, VA), Mt (VA): frequently cultivated, sometimes escaped as a waif or "throw-out"; rare, introduced from s. Asia. June-November. [= RAB, C, F, G, K, S]

Impatiens capensis Meerburg, Orange Jewelweed, Orange Touch-me-not, Spotted Touch-me-not. Mt, Pd, Cp (GA, NC, SC, VA): moist forests, bottomlands, cove forests, streambanks, bogs; common (rare in Coastal Plain of GA). May-November. Newfoundland west to Saskatchewan and AK, south to SC, panhandle FL, AL, and TX. 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; = *I. biflora* Walter – G, S]

Impatiens pallida Nuttall, Yellow Jewelweed, Yellow Touch-me-not, Pale Touch-me-not. Mt (GA, NC, VA), Pd (NC, VA), Cp (VA): cove forests, streambanks, seepages, moist forests, bogs, roadsides; common (rare in Piedmont of NC and Coastal Plain of VA). July-September. Nova Scotia and Québec west to Saskatchewan, south to e. VA, wc. NC, TN, WV, MO, and OK. [= RAB, C, F, G, GW, K, S, W]

* ***Impatiens walleriana*** Hooker f., Garden Impatiens. Pd (NC): suburban woodlands, weakly spreading from horticultural plantings; rare, native of Africa. [= K]

BATACEAE von Martius ex Meisner 1842 (Batis Family)

A monogeneric family, low shrubs, of tropical and subtropical shores of the Americas, New Guinea, the Pacific, and Australia. References: 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: Rogers (1982b); Goldblatt (1976); Bayer & Appel in Kubitzki & Bayer (2003).

Batis maritima Linnaeus, Saltwort, Beachwort, Batis. Cp (GA, NC?, SC): brackish marshes; rare north of GA (but locally common). June-July; October. Se. SC south to s. FL, west to TX, and in Central and South America (apparently introduced in

HI). *B. maritima* is alleged (as by 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, GW, K, S, Z]

BEGONIACEAE C. Agardh 1824 (Begonia Family)

Begonia Linnaeus (Begonia)

* ***Begonia cucullata*** Willdenow, Begonia. Cp (GA): disturbed places; rare, native of South America. Escaped or persistent in e. GA (Jones and Coile 1988) south to FL (Wunderlin 1998). [= K]

BERBERIDACEAE A.L. de Jussieu 1789 (Barberry Family)

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); Stearn (2002); Kim & Jansen (1996, 1998); Ahrendt (1961); Loconte & Estes (1989b); Meacham (1980); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

1 Plant a shrub.
  2 Leaves ternately compound; [subfamily *Nandinoideae*] ..... ***Nandina***
  2 Leaves simple or 1-pinnately compound; [subfamily *Berberideae*, tribe *Berberidinae*].
    3 Leaves simple, < 6 cm long, fascicled on short spur shoots; stems spiny ..... ***Berberis***
    3 Leaves 1-pinnately compound, > 10 cm long, not fascicled on short spur shoots; stems not spiny ..... ***Mahonia***
1 Plant an herb.
  4 Leaves compound; flowers greenish or maroon; [subfamily *Berberidoideae*, tribe *Leonticeae*] ..... ***Caulophyllum***
  4 Leaves simple (though parted); flowers white; [subfamily *Berberideae*, tribe *Epimediinae*].
    5 Plant acaulescent; flower solitary and scapose; leaf segments 2; fruit a capsule ..... ***Jeffersonia***
    5 Plant caulescent; flower solitary, or cymose to umbellate, borne on a stem with leaves; leaf segments several; fruit a berry.
      6 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) ..... ***Diphylleia***
      6 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) ..... ***Podophyllum***

Berberis Linnaeus (Barberry)
(also see *Mahonia*)

A genus of 300-500 species, shrubs, of North America, South America, Asia, Europe, and n. Africa. References: Whittemore in FNA (1997); Kim, Kim, & Landrum (2004); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaves entire; flowers solitary or 2-4 in umbels; spines mostly simple; [section *Tschonoskyanae*] ..... ***B. thunbergii***
1 Leaves bristly-serrate; flowers 5-many in racemes (sometimes the racemes umbelliform); spines mostly trifurcate (some simple or bifurcate).
  2 Leaves evergreen, coriaceous; leaf teeth tipped with firm prickles; fruits blue-black, pruinose; [section *Wallichianae*] ... . ***B. julianiae***
  2 Leaves deciduous, herbaceous; leaf teeth tipped with weak bristles; fruits red, not pruinose.
    3 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***
    3 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 canadensis P. Miller, American Barberry, Allegheny Barberry. Pd, Mt (GA, NC, SC, VA): 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); uncommon, rare south of VA and in VA Piedmont (GA Special Concern, NC Rare). 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, SE, W]

* ***Berberis julianiae*** Schneider, Evergreen Barberry. Mt (NC): seeding down and escaping locally near horticultural plantings; rare, native of China. First reported for NC by Pittillo & Brown (1988). [= K; = *B. julianiae*, orthographic variant]

* ***Berberis thunbergii*** Augustin de Candolle, Japanese Barberry. Mt (NC, SC, VA), Pd (GA, NC, VA), Cp (NC, VA): rich forests, old fields; uncommon, introduced from 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, SE, W]

* ***Berberis vulgaris*** Linnaeus, European Barberry, Common Barberry. Mt (NC, VA): disturbed areas; rare, introduced from 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, SE]

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.

Caulophyllum Michaux (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 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 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. Mt (NC, VA): rich forests; rare (NC Rare). 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, SE, W, Y, Z; < *C. thalictroides* – RAB, F, G, S; = *C. thalictroides* var. *giganteum* Farwell – C]

Caulophyllum thalictroides (Linnaeus) Michaux, Common Blue Cohosh, Green Vivian. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): rich forests; common (rare in Piedmont and Coastal Plain) (SC Rare). April-May; July-August. The species is widespread in e. North America, south to GA, AL, and AR. [= FNA, K, SE, W, Y, Z; < *C. thalictroides* – RAB, F, G, S (also see *C. giganteum*); = *C. thalictroides* var. *thalictroides* – C]

Diphylleia Michaux (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. Mt (GA, NC, SC, VA): 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; uncommon (SC Rare, VA Watch List). 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, SE, W, Y, Z]

Jeffersonia W. Barton (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. Mt (GA, NC, VA), Pd (VA): moist and extremely nutrient-rich forests, generally over calcareous or mafic rocks (including limestone, dolostone, amphibolite, greenstone, etc.) or very rich alluvium; uncommon, rare in NC (GA Endangered, NC Rare). 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, SE, W, Y]

Mahonia Nuttall (Mahonia, Holly-grape, Oregon Grape)

A genus of over 100 species, shrubs, of w. North America and e. Asia. 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, & 2004). References: Whittemore in FNA (1997); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

1 Leaflet blades with 2-7 teeth per side, each tooth 3-8 mm long; leaflets very thick and stiff ..... ***M. bealei***
1 Leaflet blades with 6-13 teeth per side, each tooth 1-2 (-3) mm long; leaflets thickish, but flexible when fresh ..... ***M. nervosa***

* ***Mahonia bealei*** (Fortune) Carrière, Leatherleaf Mahonia, Chinese Mahonia, Holly-grape. Pd (GA, NC, VA), Cp (NC, VA): in deciduous forests in suburban areas, spread from plantings; rare, introduced from China. December-March; May-July. Naturalizing widely in the southeastern United States, including (at least) NC, SC, GA, FL, DE, and AL. [= RAB, K, SE; = *Berberis bealei* Fortune – FNA]
* ***Mahonia nervosa*** (Pursh) Nuttall. Pd (SC): disturbed areas; rare, introduced from w. North America. Introduced in SC (Hill & Horn 1997). [= K; = *Berberis nervosa* – FNA]

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 likely 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. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): forests and woodlands in suburban areas, commonly planted, increasingly escaping and spreading; rare, introduced from 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, SE]

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. Mt, Pd, Cp (GA, NC, SC, VA): rich forests, bottomlands, slopes, pastures; common. March-April; May-June. ***P. peltatum*** is widespread through most of e. United States. 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, SE, W; > ***P. peltatum*** var. *peltatum* – Z; > ***P. peltatum*** var. *annulare* J.M.H. Shaw – Z]

BETULACEAE S.F. Gray 1821 (Birch Family)

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 incana (Linnaeus) Moench *ssp.* ***rugosa*** (Du Roi) Clausen, Speckled Alder. Mt (VA): braided streamhead seepage swamps; rare (VA Rare). 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. Mt (GA): standing water of Ridge-and-Valley spring run; rare (GA Special Concern). 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 serrulata (Aiton) Willdenow, Tag Alder, Smooth Alder, Hazel Alder. Cp, Pd, Mt (GA, NC, SC, VA): streambanks, bogs, wet thickets; common. February-March; August-October. Nova Scotia west to s. Québec, MO, and OK, south to n. 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. Mt (NC): 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, TN; rare (though 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 on the NC-TN border (Chester, Wofford, & Kral 1997). [= 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]

* *Alnus glutinosa* (Linnaeus) Gaertner, Black Alder, European Alder. 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 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]

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..... ***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 ..... ***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 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..... ***B. cordifolia***
      7 Twigs densely pubescent; leaves cuneate to rounded (rarely truncate) basally; leaves with 6-9 lateral veins on each side of the midvein..... ***[B. papyrifera]***

Betula alleghaniensis Britton, Yellow Birch. Mt (GA, NC, SC, VA): forests at medium to high elevations, rarely at low elevations; common (SC Rare). April-May; June-August. Newfoundland west to se. Manitoba, 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, 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. Mt (NC, VA): 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; rare (NC Rare, VA Rare). May-August; July-September. Newfoundland and e. Québec 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." Mt (GA, NC, SC, VA), Pd (NC, SC, VA): 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, Z; < *B. lenta* – C, Y (also including *B. uber*)]

Betula lenta Linnaeus *var. **uber*** Ashe, Virginia Roundleaf Birch. Mt (VA): mountain forests in Smyth County, VA; rare (US Endangered, VA Endangered). 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, in part; *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. Cp, Pd, Mt (GA, NC, SC, VA): riverbanks, streambanks, floodplains, sandbars; common (uncommon in VA Mountains). March-April; May-June. NH west to se. MN and e. KS, south to FL and TX. [= RAB, C, F, FNA, G, GW, K, S, W, Y, Z]

* ***Betula pendula*** Roth, European Weeping Birch, European White Birch. Mt, Pd (VA): persistent and escaping from plantings; rare, introduced from Europe. [= C, F, FNA, K]

Betula populifolia Marshall, Gray Birch, White Birch. Mt (NC*, VA): native in old fields and young forests in the Big Meadows area on greenstone (Madison & Page counties, VA), introduced in disturbed areas; rare (native in VA, introduced only in NC) (VA Rare). May-June; June-July. Nova Scotia to s. Québec, south to s. NJ and MD, more or less disjunct in n. VA, s. Ontario, n. OH, and n. IN. [= RAB, C, F, FNA, G, K, W, Y, Z]

Betula papyrifera Marshall, Paper Birch, Canoe Birch, has sometimes been attributed to the Mountains of VA, but apparently these reports are based on ***B. cordifolia*** (see above). [= FNA, G, Y, Z; = ***B. papyrifera*** var. *papyrifera* – C, F, K, W]

* ***Betula pubescens*** Ehrhart ***ssp. pubescens***, European White Birch, Downy Birch, is 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] {not keyed at this time}

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; [trees 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; [trees primarily of the Mountains and Piedmont].....***C. caroliniana*** *var.* ***virginiana***

Carpinus caroliniana Walter *var.* ***caroliniana***, Coastal American Hornbeam. Cp, Pd (GA, NC, SC, VA), Mt [GA, SC]: streambanks, riverbanks, bottomland forests, lower slopes, maritime forests; common. 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, Y]

Carpinus caroliniana Walter *var.* ***virginiana*** (Marshall) Fernald, Inland American Hornbeam. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): rich cove forests, streambanks, riverbanks, bottomland forests, lower slopes; common. March-April; September-October. ME, Québec and s. Ontario 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. Mt, Pd, Cp (GA, NC, SC, VA): rocky woodlands, mesic to rich forests and thickets; common. February-March; September-October. ME west to Saskatchewan, south to GA, LA, and OK. [= RAB, C, FNA, K, S, W, Y, Z; > *C. americana* var. *americana* – F, G; > *C. americana* var. *indehiscens* Palmer & Steyermark – F, G]

Corylus cornuta Marshall *var. **cornuta***, Beaked Hazelnut. Mt, Pd (GA, NC, SC, VA): dry rocky woodlands, thickets, high elevation forests and openings, seepage swamps; common. February-March; August-October. The species ranges from Newfoundland west to British Columbia, 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, Y; = *C. cornuta* ssp. *cornuta* – FNA]

Ostrya Scopoli 1760 (Hop-hornbeam, Ironwood)

A genus of 7-9 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. Mt, Pd, Cp (GA, NC, SC, VA): mesic to dry forests, often rocky, especially over basic rocks, reaching high elevations; common. April-May; August-October. Nova Scotia west to Manitoba, south to FL and TX. One of our heaviest and hardest woods. [= RAB, C, FNA, G, S, W, Y, Z; > *O. virginiana* var. *lasia* Fernald – F; > *O. virginiana* var. *virginiana* – F; = *O. virginiana* var. *virginiana* – K]

BIGNONIACEAE A.L. de Jussieu 1789 (Bignonia Family)

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*] ..... ***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*] ..... ***Campsis***
  2 Leaves 2-foliolate, with a 3-branched tendril in the terminal position; [tribe *Bignonieae*].
    3 Tendrils not hooked, claw-like ..... ***Bignonia***
    3 Tendrils hooked, claw-like ..... ***Macfadyena***

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. Cp, Pd, Mt (GA, NC, SC, VA): swamp forests, bottomlands, forests, woodlands; common (rare in Mountains). April-May; July-August. MD west to s. OH and s. MO, south to s. 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, Z; = *Anisostichus capreolata* (Linnaeus) Bureau – RAB, G; = *Anisostichus crucigera* (Linnaeus) Bureau – S]

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. Cp, Pd, Mt (GA, NC, SC, VA): bottomland forests, swamp forests, fencerows, old fields, forests, thickets, disturbed areas; common. June-July; September-October. NJ west to IA, south to 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, Z; = *Bignonia radicans* Linnaeus – S]

Catalpa Scopoli 1777 (Catalpa)

A genus of about 10 species, trees, of eastern North America (2 species), e. Asia (4 species), and the West Indies (4 species). References: Manning (2000)=Z; Fischer, Theisen, & Lohmann in Kubitzki (2004).

1 Corolla 2-4 cm wide, the lower corolla lobe entire; pod 6-10 mm thick; 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..... ***C. bignonioides***
1 Corolla 4-6 cm wide, the lower corolla lobe notched; pod 10-15 mm thick; 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 ..... ***C. speciosa***

Catalpa bignonioides Walter, Southern Catalpa. Cp (GA, NC*, SC*), Mt*, Pd* (GA, *NC*, SC*, VA*), Cp (NC, SC): bottomlands and streambanks (as a native), escaped or persistent after cultivation; uncommon, introduced from the Gulf Coastal Plain. June; October. The native range was apparently from 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, Z; = *C. catalpa* (Linnaeus) Karsten – S]

* ***Catalpa speciosa*** (Warder) Warder ex Engelmann, Northern Catalpa. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): escaped or persistent after cultivation, and sometimes thoroughly naturalized; uncommon, introduced from the northern Mississippi River Embayment. May-June; July-August. 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]

* *Catalpa ovata* G. Don, Chinese Catalpa, is introduced in WV, MD, and PA (Manning 2000; Kartesz 1999). [= K, Z] {not keyed at this time}

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. Cp (GA, SC): cultivated and naturalized; rare, introduced from tropical America. This vine is introduced and naturalized in s. and e. GA (Jones & Coile 1988) and is locally commonly naturalized in Charleston. [= K, Z; = *Bignonia unguis-cati* Linnaeus]

BORAGINACEAE A.L. de Jussieu 1789 (Borage Family)
[also see *HELIOTROPIACEAE*]

A family of about 130 genera and ca. 2500 species, herbs, shrubs, and trees, nearly cosmopolitan (Al-Shehbaz 1991). Closely related to the Hydrophyllaceae, and the two may either be combined or subfamily Heliotropioideae elevated to family status as Heliotropiaceae (Ferguson 1998; Diane, Förther, & Hilger 2002; Hilger & Diane 2003). References: Al-Shehbaz (1991)=Z throughout the family. Key to genera based on RAB, C, and Z.

1 Ovary slightly 2-4-lobed, or not at all lobed; style terminal or reduced to a sessile terminal stigma ..... [see ***Heliotropium*** in ***HELIOTROPIACEAE***]
1 Ovary deeply 4-parted; style gynobasic; [subfamily *Boraginoideae*].
  2 Mericarps with glochidiate prickles (like grappling hooks), these visible early in development.
    3 Mericarps spreading or divergent, attached to the gynobase on the upper third of the mericarp; [tribe *Cynoglosseae*] ..... ***Cynoglossum***
    3 Mericarps erect, attached to the gynobase near the middle of the mericarp; [tribe *Eritrichieae*]
      4 Fruiting pedicels deflexed; plant perennial or biennial..... ***Hackelia***
      4 Fruiting pedicels erect-ascending; plant annual ..... ***Lappula***
  2 Mericarps smooth, rugose, or pitted, lacking glochidiate prickles.
    5 Corolla rotate, lacking a well-developed tube, blue; [tribe *Boragineae*] ..... ***Borago***
    5 Corolla with a well-developed tube at least 3 mm long, of various colors (including blue).
      6 Corolla lobes distinctly unequal, pink to blue.
        7 Stamens equal in length, entirely included within the corolla tube ..... ***Anchusa***
        7 Stamens unequal in length, the longer conspicuously exserted ..... ***Echium***
      6 Corolla lobes equal, of various colors (including pink to blue).
        8 Mericarps attached laterally to a pyramidal gynobase.
          9 Corolla yellow, the tube 4-5 mm long; corolla throat lacking appendages..... ***Amsinckia***
          9 Corolla white (with a yellow eye), or pink to blue, the tube 6-20 mm long; corolla throat with appendages.

10 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] ..... ***Mertensia***
10 Corolla white with a yellow eye; leaves linear; [plant a rare alien, of disturbed habitats] ..... ***Plagiobothrys***

8 Mericarps attached basally to a flat or broadly convex gynobase.
11 Mericarps laterally compressed, with an evident raised margin ..... ***Myosotis***
11 Mericarps neither laterally compressed nor with an evident thickened margin.
12 Mericarps with a prominent, toothed, basal rim ..... ***Symphytum***
12 Mericarps lacking a prominent, toothed, basal rim.
13 Corolla lobes erect or slightly spreading, acute to acuminate; style exserted ..... ***Onosmodium***
13 Corolla lobes spreading, rounded; style included.
14 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] ..... ***Buglossoides***
14 Corolla bright yellow-orange, or greenish-white; plant perennial from a thickened, woody rhizome; mericarps white, shining, smooth or pitted; [plant a native] ..... ***Lithospermum***

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, introduced from 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]

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): disturbed areas, rare, introduced from Europe. [= C, K; = *Lycopsis arvensis* Linnaeus – F, G, S]

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): disturbed areas; rare, introduced from s. Europe. [= C, F, G, K, Z]

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), Pd, Cp (GA, NC, SC, VA): roadsides, dry disturbed areas, sandy fields; common, introduced from 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]

Cynoglossum Linnaeus (Comfrey)

A genus of about 75 species, herbs, of temperate regions. References: Al-Shehbaz (1991)=Z.

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), Pd (VA): disturbed areas, roadsides, pastures, calcareous shale barrens; common (rare south of VA), introduced from Eurasia. May-July. [= RAB, C, F, G, K, S, W, Z]

Cynoglossum virginianum Linnaeus *var***. *virginianum***, Wild Comfrey. Mt, Pd, Cp (GA, NC, SC, VA): moist deciduous forests; common (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; = *C. virginianum* – F, G, Z; = *C. virginicum* – S, orthographic error]

Cynoglossum virginianum Linnaeus var. *boreale* (Fernald) Cooperrider, Northern Hound's-tongue, ranges from New Brunswick west to British Columbia, 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]

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 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, Pd (NC, SC, VA), Cp (VA): roadsides, dry pastures, disturbed areas; common, introduced from Mediterranean Europe. June-September. [= RAB, C, K, W; = *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]

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, Pd (GA, NC, SC, VA), Cp (VA): rich forests and woodlands; common (rare south of VA). June-September. S. Québec west to ND, south to ne. GA (Jones & Coile 1988), LA, and TX. [= RAB, C, F, G, K, W, Z; = *Lappula virginiana* (Linnaeus) Greene – S]

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, introduced from 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. Introduced south to MD, WV, KY, and TN. [= C, Z; = *L. echinata* Gilibert – F, G; = *L. lappula* (Linnaeus) Karst. – S]

Lithospermum Linnaeus (Gromwell, Puccoon, Stoneseed)
(also see *Buglossoides*)

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 7-14 mm long.
  4 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***
  4 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].
    5 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***
    5 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), 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. Ontario west to Saskatchewan, south to c. NC, nw. GA, AL, and TX. [= RAB, C, F, G, K, W, Y, Z; = *Batschia canescens* Michaux – S]

Lithospermum caroliniense (Walter ex J.F. Gmelin) MacMillan, Coastal Plain Puccoon. Cp (GA, SC, VA): sandhills, dry sandy soils; common (rare north of s. SC). April-June. A Southeastern Coastal Plain endemic: se. SC south to FL, and west to TX, on the Southeastern Coastal Plain; disjunct in e. VA. 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, Z; = *L. caroliniense* var. *caroliniense* – C, K; = *Batschia caroliniensis* Walter ex J.F. Gmelin – S; = *L. carolinense* ssp. *carolinense* – Y]

Lithospermum latifolium Michaux, American Gromwell, Broadleaf Gromwell. Mt (GA, VA): dry to moist woodlands over calcareous rocks; rare (GA Special Concern). May-June. NY west to MN, south to nw. GA, s. TN and MO. [= C, F, G, K, S, W, Y, Z]

Lithospermum tuberosum Rugel ex Augustin de Candolle, Southern Stoneseed. Mt (GA, VA), Pd (GA, SC), Cp (GA): nutrient-rich forests; rare (VA Watch List). March-June. KY and TN, south to FL and LA. [= RAB, C, F, G, K, S, Z]

Lithospermum croceum Fernald ranges from Ontario 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, is introduced from Europe and occurs at scattered localities in ne. North America, south to PA and NJ (Kartesz 1999). [= C, F, G, K, Y, Z]

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), Pd (NC, VA), Cp (VA): nutrient-rich, moist, alluvial soils of floodplain forests and thickets; common (rare south of VA) (GA Special Concern). 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, Z; = *M. pulmonarioides* Roth]

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 (NC, SC, VA), Cp (VA), Mt (NC): roadsides, fields, disturbed areas; rare, introduced from Eurasia. May-August. [= RAB, C, F, G, K, S, W, Z]
* ***Myosotis discolor*** Persoon, Yellow-and-blue Scorpion-grass, Changing Forget-me-not. Pd (GA, NC, SC, VA), Cp (VA): fields, disturbed areas, roadsides; uncommon, introduced from 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, Pd, Cp (NC, VA): marshes, streambanks; common. May-August. 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]
Myosotis macrosperma Engelmann, Bigseed Forget-me-not. Cp, Pd, Mt (GA, NC, SC, VA): 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, Z]
* ***Myosotis scorpioides*** Linnaeus, Water Scorpion-grass. Mt (NC, VA), Pd, Cp (VA): wet meadows, streambanks; common, introduced from Europe. May-August. [= RAB, C, F, G, GW, K, W, Z; *? M. palustris* (Linnaeus) Hill – S]
* ***Myosotis stricta*** Link ex Roemer & J.A. Schultes, Blue Scorpion-grass. Pd (NC, VA), Cp (VA), Mt (NC): disturbed areas; uncommon, introduced from 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, introduced from Eurasia. April-September. [= RAB, C, F, G, K, Z]
Myosotis verna Nuttall, Early Forget-me-not. Cp, Pd, Mt (GA, NC, SC, VA): dry woodlands, roadsides, disturbed areas, dry fields; common. March-July. ME west to SD, south to GA and TX; also from ID and British Columbia south to OR. [= RAB, C, F, G, K, W, Z; = *M. virginica* – S, misapplied]

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. References: 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 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 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 hispidissimum Mackenzie, Eastern Prairie Marbleseed, Shaggy Marbleseed. Mt (VA): calcareous woodlands, barrens, and glades, and nearby in disturbed areas, such as older pasture edges; rare. June-July. W. NY and Ontario 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; = *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]
Onosmodium occidentale Mackenzie. Mt (GA): open woodlands over limestone; rare (GA Special Concern). 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, in part; *O. bejariense* Alphonse de Candolle var. *occidentale* (Mackenzie) B.L. Turner – Y]

Onosmodium virginianum (Linnaeus) Alphonse de Candolle, Virginia Marbleseed. Cp, Pd, 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 NC and VA (NC Watch List, VA Rare). 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]

Onosmodium decipiens J. Allison, Deceptive Marbleseed. Dolomitic Ketona glades. April-early May; June-August. Endemic to c. AL (Bibb County) (Allison & Stevens 2001).

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* was attributed to our area (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]

Onosmodium subsetosum Mackenzie & Bush ranges east to c. and sc. 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]

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, introduced from 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]

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), Pd (VA): disturbed areas; uncommon, introduced from 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, 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]

BRASSICACEAE Burnett 1835 ***or CRUCIFERAE*** A.L. de Jussieu 1789 (Mustard Family)

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: Rollins (1993); Al-Shehbaz (1984, 1985a, 1985b, 1986, 1987, 1988a, 1988b); Appel & Al-Shehbaz in Kubitzki & Bayer (2003).

Alliaria Heister ex Fabricius 1759 (Garlic Mustard)

A genus of 2 species, annual or biennial herbs, of Eurasia. References: Rollins (1993)=Z; Al-Shehbaz (1988b)=Y.

* ***Alliaria petiolata*** (Bieberstein) Cavara & Grande, Garlic Mustard, Hedge Garlic. Mt (NC, VA), Pd, Cp (VA) {GA, SC}: moist forests in bottomlands and on slopes; common (uncommon in VA Piedmont, rare in NC and VA Coastal Plain), introduced from 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, 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: Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

* ***Alyssum alyssoides*** (Linnaeus) Linnaeus, Yellow Alyssum. Mt, Pd, Cp (VA): roadsides, disturbed areas, especially in dry, barren soil; uncommon, introduced from Europe. June-September. [= C, F, 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: 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), Pd, Cp (NC, VA): rock crevices in or thin soil around calcareous or mafic rock outcrops; uncommon, rare in NC (GA Special Concern, NC Watch List). 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. The GA record is an old and indefinite collection ("northern Georgia") by Vasey. [= 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, Pd, Mt (GA, NC, SC, VA): disturbed areas, fields, roadsides, lawns; common, introduced from 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, G, K, S, W, X, Y, Z]

Arabis Linnaeus 1753 (Rockcress)
(also see *Arabidopsis, Boechera, Turritis*)

The circumscription of *Arabis* is in flux; there is increasing evidence that the broad circumscription 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: Hopkins (1937)=Z; Rollins (1993)=Y; Wieboldt (1987); Al-Shehbaz (1988a)=X; Koch, Bishop, & Mitchell-Olds (1999); Koch & Al-Shehbaz (2002).

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 (4.5-) 5-7 cm long; [endemic to w. GA and c. AL]..... ***A. georgiana***
  2 Petals 3-5 mm long; siliques 3-6 cm long; [collectively known from NC, TN, VA, and northward and westward from those states].
    3 Stem pubescence primarily appressed and of 2-armed or dolabriform hairs..... ***A. pycnocarpa* var. *adpressipilis***
    3 Stem pubescence primarily spreading and of simple hairs..... ***[A. pycnoacrpa* var. *pycnocarpa]***

Arabis georgiana Harper, Georgia Rockcress. Mt, Pd, Cp (GA): nutrient-rich streambanks and rock outcrops; rare (US Candidate, GA Threatened). 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). [= K, Y, Z]

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 (NC Rare, VA 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. [= 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 caucasica* Willdenow, Gray Rockcress. Introduced in KY and TN (Kartesz 1999). [= K, Y; *? A. alpina* (Linnaeus) var. *albida* (Steven ex Jacquin) Paoletti]

Arabis pycnocarpa M. Hopkins var. *pycnocarpa*. Québec 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*). [= *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]

Armoracia Gaertner, Meyer, & Scherbius 1800 (Horseradish, Lake Cress)
(also see *Neobeckia*)

A genus of 3 species, perennial herbs, of Eurasia. References: Al-Shehbaz & Bates (1987)=Z; Rollins (1993)=Y; Al-Shehbaz (1988a)=X.

1 Plant aquatic; stem submersed or prostrate; fruit unilocular .....***[see Neobeckia aquatica]***
1 Plant terrestrial; stem erect; fruit bilocular..... ***A. rusticana***

* ***Armoracia rusticana*** P. Gaertner, Meyer, & Scherbius, Horseradish. Mt (NC): persistent after cultivation; rare, 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 (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, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): fields, disturbed areas; common, introduced from Eurasia. March-June. Formerly a commonly used winter and spring green in rural parts of our area. [= RAB, C, F, G, K, W, Y, Z; = *Campe verna* (P. Miller) Heller – S]

* ***Barbarea vulgaris*** R. Brown, Common Winter-cress, Yellow Rocket. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): fields, disturbed areas; common, introduced from 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 (1997), for instance. [= RAB, C, 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; > *B. vulgaris* var. *sylvestris* Fries]

Berteroa Augustin de Candolle 1821 (Hoary Alyssum)

A genus of about 5 species, annual or perennial herbs, of Europe and the Middle East. References: Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

* ***Berteroa incana*** (Linnaeus) Augustin de Candolle, Hoary Alyssum. Pd, Mt (VA): disturbed areas; uncommon, introduced from Europe. [= C, F, G, K, Y, Z]

Boechera Löve & Löve 1975 (Rockcress)

Most of our native eastern North American "*Arabis*" are now in *Boechera*. References: References: 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 ..... ***B. 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; plant 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 with wing 0.2-0.5 mm wide ..... ***B. laevigata** var**. 1***
11 Calyx 2.0-3.3 mm long; plant 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 with wing 0.1-0.2 mm wide ..... ***B. sp. 1***
10 Cauline leaves auricled or sagittate-clasping at the base.
12 Mature fruits 2.5-4.5 cm long..... ***B. patens***
12 Mature fruits 5-10 cm long.
13 Basal leaves subentire to serrate or sinuate-serrate; petals white, to 5 mm long, equalling or slightly surpassing the sepals; longest cauline leaves usually 8-18 cm long; plant glaucous ..... ***B. laevigata** var**. laevigata***
13 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 canadensis (Linnaeus) Al-Shehbaz, Sicklepod, Canada Rockcress. Mt, Pd (GA, NC, SC, VA), Cp (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). May-July; June-August. Québec and ND south to FL and TX. [= Q; = *Arabis canadensis* Linnaeus – RAB, C, F, G, K, S, W, X, Y, Z]

Boechera laevigata (Muhlenberg ex Willdenow) Al-Shehbaz *var**. 1*** Porter, Burk's Smooth Rockcress. Mt (NC, VA): limestone barrens, shale barrens, and other dry, rocky habitats; rare (NC Watch List). April-May. E. and c. PA south to e. WV, ne. TN, and w. NC in the sedimentary rock Appalachians. RAB assigns this variety 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). [= *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 laevigata (Muhlenberg ex Willdenow) Al-Shehbaz *var**. laevigata***, Common Smooth Rockcress. Mt, Pd (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). April-May; May-June. ME west to MN and SD, south to GA, AL, MS, AR, OK, and CO. Of our *Arabis*, *A. laevigata* var. *laevigata* is the most common, being the least limited to calcareous substrates. [= *Arabis laevigata* (Muhlenberg ex Willdenow) Poiret *var**. laevigata*** – RAB, 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): thin soil around outcrops of metamudstone, diabase, or granite; rare (GA Special Concern, NC Rare, SC Rare). April-May; May-June. ME to WI, south to KY, AR, and OK; disjunct eastward in NC, SC, and GA. [= 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 patens (Sullivant) Al-Shehbaz, Spreading Rockcress. Mt (GA, NC, VA), Pd (VA): thin soils around calcareous or dolomitic outcrops, very rarely in nutrient-rich seepage from mafic rocks; rare (GA Special Concern, NC Rare, VA 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. [= Q; = *Arabis patens* Sullivant – RAB, C, F, G, K, S, W, X, Y, Z]

Boechera shortii (Fernald) Al-Shehbaz. Pd (VA): nutrient-rich alluvial and river bluff forests (along the Potomac River in our area); rare (VA Rare). April-May. NY west to MN, south to n. VA, nc. TN (Chester, Wofford, & Kral 1997), and AR. [= 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 sp. 1, Shale Barren Rockcress. Mt (VA): shale barrens; rare (US Endangered, VA Threatened). 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. [= *Arabis serotina* Steele – C, K, X, Y; < *A. laevigata* var. *burkii* – F, G, Z (included within concept of *A. laevigata* var. *burkii* by Z and most earlier floras); < *Boechera laevigata* – Q]

Boechera perstellata (E.L. Braun) Al-Shehbaz is apparently endemic to KY and c. TN (Chester, Wofford, & Kral 1997). [= Q; = *Arabis perstellata* – K, Y; > *Arabis perstellata* E.L. Braun var. *perstellata* – X; > *Arabis perstellata* E.L. Braun var. *ampla* Rollins – X]

Boechera stricta (Graham) Al-Shehbaz. Labrador and AK south to NJ, DE, OH, IL, NM, AZ, and CA. [= 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]

Brassica Linnaeus 1753 (Mustard, Turnip, Rape, Cabbage, Collard Greens, Kale, Broccoli, Cauliflower, Kohlrabi, Rutabaga, Bok-Choy, Chinese Cabbage, Brussels Sprouts)

(also see *Erucastrum, Sinapis*)

A genus of about 40 species, herbs, of the Old World. References: Rollins (1993)=Z; Al-Shehbaz (1985b)=Y. Key adapted from Z.

1 Upper cauline leaves auriculate, slightly to strongly clasping the stem; [section *Rapa*].
  2 Petals 10-18 mm long, dark yellow; beak of the silique usually 7-10 mm long; plant usually glaucous; siliques 5-10 cm long ..... ***Br. napus***
  2 Petals 6-10 (-11) mm long, pale yellow; beaks of the silique usually 10-15 mm long; plant usually green; siliques 3-7 cm long ..... ***Br. rapa*** *var.* ***rapa***
1 Upper cauline leaves petiolate, or sessile and cuneate.
  3 Pedicels and siliques widely spreading to divaricately ascending; siliques 2-4 cm long, terete or nearly so; [section *Rapa*] ..... ***Br. juncea***
  3 Pedicels and siliques erect and appressed to the rachis; siliques 1-2 cm long, more-or-less 4-angled; [section *Melanosinapis*]..... ***Br. nigra***

* ***Brassica juncea*** (Linnaeus) Czern., Leaf Mustard, Brown Mustard, Indian Mustard, Mustard Greens, Chinese Mustard. Cp (GA, SC, VA), Mt (NC, SC, VA), Pd (SC, VA): fields, disturbed areas; uncommon, introduced from Eurasia. April-June. This species is apparently a recently derived polyploid of *B. nigra* and *B. rapa*. 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 – S]

* ***Brassica napus*** Linnaeus, Rutabaga, Rape, Canola, Colza, Swede. Mt, Pd (GA, NC, SC, VA?), Cp (SC): fields, disturbed areas; rare, introduced from Eurasia. May-July. This species is apparently a recently derived polyploid of *B. oleracea* and *B. rapa*. The seeds of this species are the source of "canola" oil, the name recently coined by marketers from "Canadian" and "oil" to avoid the negative connotation of "rape." [= K, W, Y, Z; < *B. napus* – RAB (also see *B. rapa*)]

* ***Brassica nigra*** (Linnaeus) W.D.J. Koch, Black Mustard, Charlock. Cp, Pd, Mt (VA) {NC}: fields, disturbed areas; uncommon, introduced from Eurasia. May-August. The seeds of this species are one source of table mustard; other components 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), Pd (NC, VA), Cp (NC, SC, VA): fields, disturbed areas; common, introduced from 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 is commonly cultivated in our area in a variety of forms, including *B. oleracea* var. *acephala* Augustin 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). [= K] {not keyed}

Braya Sternberg & Hoppe 1815

A genus of about 6 species, perennial herbs, of alpine and arctic Eurasia and North America. References: Rollins (1993)=Z.

*? ***Braya humilis*** (C. A. Meyer) B.L. Robinson. (VA): rare, perhaps introduced. Ranging from boreal e. Asia and North America south to VT, MI, CO, and (probably as an introduction) VA. [= C, K, Z; > *B. humilis* var. *leiocarpa* (Trautvetter) Fernald – F, G]

Bunias Linnaeus 1753 (Warty-cabbage)

A genus of 3 species, herbs, of Eurasia. References: 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 per silique..... ***B. orientalis***

* ***Bunias erucago*** Linnaeus, Southern Warty-cabbage. Cp? (VA): disturbed areas; rare, introduced from Europe. April-June. [= C, K, Z]
* ***Bunias orientalis*** Linnaeus, Warty-cabbage. Pd (VA): disturbed areas; rare, introduced from Europe. June-July. [= C, F, 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: 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 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 edentula (Bigelow) Hooker, Northeastern Sea Rocket. Cp (NC, VA): beaches, at or near the wrack line; common. May-June (-October). 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* – K, X, Y, Z]

Cakile harperi Small, Southeastern Sea Rocket. Cp (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 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 – GW, K, X, Y, Z]

* ***Cakile maritima*** Scopoli *ssp. **maritima***, European Sea Rocket. Cp (NC, VA): beaches, at or near the wrack line; uncommon, introduced from 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. [= X, Y; < *C. maritima* – C, F, G, K, Z; = *C. cakile* (Linnaeus) Karstens – S]

Cakile constricta Rodman, Gulf Coast Sea Rocket. Beaches, coastal sands. February-October. FL, AL, MS, LA, TX. [= GW, K, X, Y, Z]

Cakile lanceolata (Willdenow) O.E. Schulz ssp. *pseudoconstricta* Rodman. Beaches, coastal sands. January-December. FL, AL, LA, TX, Tamaulipas. [= K, X, Y, Z; < *C. lanceolata* – GW, S]

Calepina Adanson 1763

A monotypic genus, an annual herb, of c. and sw. Asia. References: Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

* ***Calepina irregularis*** (Asso) Thellung. Mt (NC), Pd, Cp (VA): fields, disturbed areas; rare, introduced from Eurasia. April. [= RAB, C, K, Y, Z]

Camelina Crantz 1762 (Gold-of-pleasure, False-flax)

A genus of 6-7 species, herbs, of se. Europe and the Middle East. References: 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 Augustin de Candolle, Lesser Gold-of-pleasure. Pd (GA, NC, VA), Mt (NC, VA), Cp (NC, SC, VA): fields, disturbed areas; uncommon, introduced from Eurasia. April-May. [= RAB, C, F, G, K, S, W, Y, Z]
* ***Camelina sativa*** (Linnaeus) Crantz, Gold-of-pleasure, False-flax. Pd (NC, VA): fields, disturbed areas; rare, introduced from Eurasia. April-May. [= RAB, C, F, G, S, Y, Z; > *C. sativa* ssp. *sativa* – K]

Capsella Medikus 1792 (Shepherd's Purse)

A monotypic genus, an annual or biennial herb, of Europe. References: Rollins (1993)=Z; Al-Shehbaz (1986)=Y.

* ***Capsella bursa-pastoris*** (Linnaeus) Medikus, Common Shepherd's Purse. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, introduced from Europe. March-June. *C. rubella* Reuter, Pink Shepherd's Purse, is sometimes distinguished (as by F, G, Stace 1997), 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, K, W, Y, Z; > *C. bursa-pastoris* – F, G; > *C. rubella* Reuter – F, G; > *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: 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; 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 pubescence on the stem, inflorescence, and petioles; leaflets entire, toothed, or deeply lobed; [collectively widespread in our area].
    3 Rhizome toothed, not fragile, and rarely breaking into irregular segments.
      4 Trichomes of leaf margins appressed and ca. 0.1 mm long; cauline leaves usually 2 ..... ***C. diphylla***
      4 Trichomes of leaf margins erect and 0.2-0.3 mm long; cauline leaves usually 3 ..... ***[C. maxima]***
    3 Rhizome toothless or only obscurely toothed, fragile and readily breaking into narrowly fusiform, oblong, or linear segments.

5 Trichomes of the leaf margin appressed and ca. 0.1 mm long; lateral leaflets of the cauline leaves typically not lobed, or shallowly and irregularly lobed ..... ***C. angustata***
5 Trichomes of the leaf margin erect and ca. 0.2-0.3 mm long; lateral leaflets of the cauline leaves frequently deeply 2-lobed ..... ***C. concatenata***

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*].
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, Mt (GA, NC, SC, VA), Cp (NC, SC, VA): rich, mesic forests; common (rare in VA Mountains and VA Coastal Plain). 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, 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, Pd, Mt (GA, NC, SC, VA): swampy forests and bogs, primarily (but not strictly) in circumneutral soils over limestone or mafic rocks; uncommon. March-May; April-May. Widespread in e. North America. There has been recent disagreement over the correct nomenclature of

this species (Kartesz & Gandhi 1992). [= RAB, F, G, GW, K, S, W, Z; = *C. rhomboidea* (Persoon) Augustin de Candolle – C, X]

Cardamine clematitis Shuttleworth ex A. Gray, Mountain Bittercress. Mt (NC, VA): shaded brookbanks, rock outcrops with seepage, at high elevations (1200m and above); rare (US Species of Concern, NC Rare, VA Rare). April-May; June-July. Endemic to the high elevation Southern Appalachians of w. NC, e. TN, and sw. VA. [= C, 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, Pd, Cp (GA, NC, SC, VA): rich, mesic forests; common (uncommon in VA Coastal Plain). March-May; April-May. Widespread in e. North America. [= RAB, C, 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, introduced from 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]

Cardamine diphylla (Michaux) A. Wood, Crinkleroot, Toothwort. Mt (GA, NC, VA), Pd (NC): rich, mesic forests; common. April-May; May-June. Widespread in e. North America, south to n. GA and SC. [= 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 (GA Special Concern, NC 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, 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): 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 (NC Rare, VA Watch List). March-April; April-May. Fairly widespread in ne. United States, south to NC, sc. TN, and MO. [= RAB, C, F, 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 (NC Watch List, SC Rare, VA Rare). 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 (followins Small's recognition of two species) needs further evaluation. [= K, Z; < *C. flagellifera* – C, 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; uncommon (NC Watch List, SC Rare, VA Rare). March-April; June-July. Endemic to the Southern Appalachians of NC and TN. [= K, Z; < *C. flagellifera* – C, W, X; < *C. clematitis* – RAB, GW; = *C. hugeri* Small – S]

* ***Cardamine flexuosa*** Withering, Woodland Bittercress. Mt, Cp, Pd (NC, VA): disturbed sites; rare, introduced from Europe. 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]

* ***Cardamine hirsuta*** Linnaeus, Hairy Bittercress. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas, including fields and gardens; common, intoduced from Europe. February-May (or irregularly earlier in response to mild winter weather). [= RAB, C, F, G, GW, K, S, W, X, Z]

* ***Cardamine impatiens*** Linnaeus, Narrowleaf Bittercress. Mt (NC, VA), Pd (NC): alluvial floodplains, in the New River drainage; rare, introduced from Europe. June-July. See Poindexter (2006). [= C, F, K, X, Z]

Cardamine longii Fernald, Long's Bittercress. Cp (NC, VA): tidal freshwater marshes and cypress-gum swamps; rare (NC Rare, VA Watch List). June-September. Coastal in distribution, irregularly from ME south to NC. 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, 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 (US Endangered, NC Endangered, VA Rare). April-May; May-June. A narrow endemic, known only from Stokes County, NC and Patrick County, VA; apparently extirpated from Forsyth County, NC. Note that 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, K, X, Z]

Cardamine parviflora Linnaeus *var.* ***arenicola*** (Britton) O.E. Schulz, Sand Bittercress. Mt, Pd, Cp (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. 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* – G, GW, S, W; = *C. arenicola* Britton – S]

Cardamine pensylvanica Muhlenberg ex Willdenow, Quaker Bittercress. Mt, Pd, Cp (GA, NC, SC, VA): various wet habitats, especially swampy depressions, streambanks, small woodland seeps; common. March-May. Widespread, ranging over most of North America. [= RAB, C, 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 (VA Rare). April-July. Var. *palustris* ranges from Canada south to NJ, VA, OH, IN, MN, and British Columbia. 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* var. *pratensis* – K, Z]

Cardamine rotundifolia Michaux, American Bittercress, Mountain Watercress. Mt, Pd (GA?, NC, VA): seepages, streambanks, swampy depressions; rare (NC Rare). April-May; June-July. Characteristically, *C. rotundifolia* branches from the upper nodes while in flower, the branches rooting down and proliferating vegetatively. This species is a rather broad endemic of the Central Appalachians, ranging from PA and w. NY, west to OH and KY, south to the Mountains and upper Piedmont of NC. [= RAB, C, F, G, GW, K, S, W, X, Z]

Cardamine maxima (Nuttall) Wood, Large Toothwort ranges south to NJ, PA, OH, WV, and KY. [= K, Y, Z; = *C.* ×*maxima* – C; = *Dentaria maxima* Nuttall – F, G]

Cardaria Desvaux (Hoary Cress)
(see *Lepidium*)

Chorispora Augustin de Candolle 1821 (Chorispora)

A genus of 11 species, herbs, of Central Asia and the Middle East. References: Rollins (1993)=Z; Al-Shehbaz (1988d)=Y.

* *Chorispora tenella* (Pallas) Augustin de Candolle, Chorispora, Blue Mustard, native of w. Asia is 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, 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: 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): roadsides; rare, introduced from 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. [= K, Q; *? Brassica erucastrum* – RAB, misapplied; *? 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: Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

* ***Conringia orientalis*** (Linnaeus) Andrzejowski, Hare's-ear Mustard, Treacle Mustard. Cp (NC), Pd (GA, NC, VA), Mt (VA): disturbed areas; rare, introduced from Eurasia. April-June. [= RAB, C, F, G, K, S, Y, Z]

Coronopus Zinn (Wart-cress, Swine-cress)
(see *Lepidium*)

Descurainia Webb & Berthelot 1836 (Tansy-mustard, Flixweed)

A genus of ca. 40 species, primarily of North and South America. References: 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, Pd (VA), Cp (NC*): dry rocky openings and woodlands; rare (VA Watch List). April-June. Québec west to Mackenzie, 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; < *D. pinnata* – W]

* ***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]

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 (in the narrow sense); = *D. pinnata* ssp. *pinnata* – K, X, Y, Z; = *Sophia pinnata* (Walter) T.J. Howell – S]

* ***Descurainia sophia*** (Linnaeus) Webb ex Prantl, Herb Sophia. Pd (GA, NC, VA), Cp (NC, SC, VA), Mt (VA): disturbed areas; rare, introduced from Eurasia. April-June. [= RAB, C, F, G, K, X, Y, Z; = *Sophia sophia* (Linnaeus) Britton – S]

Diplotaxis Augustin de Candolle 1821 (Wall-rocket)

A genus of ca. 30 species, herbs, of Eurasia and Africa. References: Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

1 Leaves mostly basal or very low-cauline; plant annual or biennial; siliques lacking a 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 stipe between the sepal scars and the base of the valves; [section *Diplotaxis*].....***D. tenuifolia***

* ***Diplotaxis muralis*** (Linnaeus) Augustin de Candolle, Annual Wall-rocket, Sand-rocket, Stinking Wall-rocket. Cp (VA): disturbed areas; rare, introduced from 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, G, K, S, Y, Z]

* ***Diplotaxis tenuifolia*** (Linnaeus) Augustin de Candolle, Perennial Wall-rocket, Flixweed. Cp, Pd (VA): disturbed areas; rare, introduced from Europe. July-October. [= C, F, 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: Rollins (1993)=Z; Al-Shehbaz (1987)=Y; Koch & Al-Shehbaz (2002).

1 Leaves all basal; petals deeply bifid (about 1/2 way to base).....***Dr. 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] .....***Dr. 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 1-4 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 .....***Dr. aprica***
4 Pubescence of the lower leaves of sessile cruciform trichomes; siliques glabrous; fruiting branches elongate .....***Dr. 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.....***Dr. 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 ..... ***Dr. 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 .... ***Dr. 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 (GA Endangered, SC Rare). March-April; April-May. Ozark highlands of AR, MO, and OK; disjunct on granitic flatrocks in SC and GA. [= RAB, 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 (VA Watch List). February-April; March-May. VA west to IN and KS, south to FL and TX. [= RAB, C, F, G, K, S, W, Y, Z]

Draba cuneifolia Nuttall ex Torrey & A. Gray *var*. ***cuneifolia***. Cp (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 introduced from 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) and AL, where it occurs in prairies. [= 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, introduced from w. North America. [= 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 (rare in NC and VA Piedmont) (NC Rare). April-May; May-July. W. MD and e. WV south through w. VA and e. KY south to w. NC and e. TN. [= RAB, K, S, W, Z]

Draba reptans (Lamarck) Fernald. Pd (NC), Cp (SC): dry soil; rare (NC Rare, SC Rare). February-March; March-April. MA and Ontario 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, K, Z; > *D. reptans* var. *reptans* – C, F, G; > *D. caroliniana* Walter – S]

* ***Draba verna*** Linnaeus, Whitlow-grass Cp (NC, SC, VA), Pd, Mt (GA, NC, SC, VA): disturbed areas, especially in dry, barren soils, including granitic flatrocks; common, introduced from Europe. February-April; March-May. [= RAB, C, K, S, W, 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: Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

* ***Eruca vesicaria*** (Linnaeus) Cavanilles *ssp*. ***sativa*** (P. Miller) Thellung, Garden Rocket, Rocket-salad, Arugula. Pd (NC): cultivated as a salad green, persistent around gardens or occurring as a waif; rare, introduced from Mediterranean Europe. [= K, Y, Z; = *E. sativa* P. Miller – C, F; < *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: Rollins (1993)=Z; Luken, Thieret, & Kartesz (1993); Al-Shehbaz (1985b)=Y.

* ***Erucastrum gallicum*** (Willdenow) O.E. Schulz, Dog-mustard. Mt (NC?, SC, VA): disturbed areas; rare, introduced from 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, G, K, Y, Z]

Erysimum Linnaeus 1753 (Wallflower, Treacle Mustard)

A genus of ca. 180 species, of the Northern Hemisphere. References: 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, < 3 mm wide; seeds ca. 1 mm long; annual or biennial; [introduced, usually in disturbed situations].
  2 Sepals 2-3.5 mm long; petals 3.5-5.5 mm long; fruits 1.2-3 cm long; pedicels slender, (6-) 8-12 (-14) mm long .... ***E. cheiranthoides***
  2 Sepals 4.5-5.5 mm long; petals 6-10 mm long; fruits (3-) 5-12 cm long; pedicels thick, 2-8 mm long ..... ***E. repandum***

Erysimum capitatum (Douglas ex Hooker) E.L. Greene *var.* ***capitatum***, Western Wallflower. Mt (VA): shale barrens and shale woodlands of Alleghany and Bath counties, VA; rare (VA 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, as well as in ec. TN (Chester, Wofford, & Kral 1997) and e. WV (Pendleton and Grant counties). [= 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 (VA), Mt (NC, VA), Cp (VA): disturbed areas; uncommon, introduced from Eurasia. June-July; July-August. [= RAB, C, F, G, K, W, Y, Z; = *Cheirinia cheiranthoides* (Linnaeus) Link – S]

* ***Erysimum repandum*** Linnaeus, Treacle Mustard, Bushy Wallflower. Cp, Pd, Mt (NC, VA): disturbed areas; uncommon, introduced from Eurasia. April-May; May-July. [= RAB, C, F, G, K, Y, Z; = *Cheirinia repanda* (Linnaeus) Link – S]

* *Erysimum inconspicuum* (S. Watson) MacM. var. *inconspicuum*, Shy Wallflower. South to PA and MD. Var. *coarctatum* (Fernald) Rossback is more northern. [= K, Z; < *E. inconspicuum* – C, Y; = *E. inconspicuum* – F, G] {not keyed at this time}

Hesperis Linnaeus 1753 (Dame's Rocket)

A genus of ca. 25 species, herbs, of Eurasia and n. Africa. References: Al-Shehbaz (1988d)=Y; Rollins (1993)=Z.

* ***Hesperis matronalis*** Linnaeus, Dame's Rocket. Mt (NC, VA), Pd, Cp (VA), {GA}: bottomlands, roadsides, moist forests; common (uncommon in Piedmont, rare in Coastal Plain), native of Europe. April-June. The flowers are white or pink. [= RAB, C, F, G, K, S, W, Y, Z]

Iberis Linnaeus 1753 (Candytuft)

A genus of ca. 40 species, herbs, of Eurasia and n. Africa. References: Rollins (1993)=Z.

* *Iberis amara* Linnaeus, Annual Candytuft, is reported from PA, WV, and KY (Kartesz 1999). [= C, 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. [= K]

Iodanthus Torrey & A. Gray 1840 (Purple Rocket)

A monotypic genus, a perennial herb, of e. North America. References: 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, is a native crucifer occurring from w. PA west to MN and IA, south through WV and e. and c. TN to AL and TX. It may occur in the westernmost parts of our area, especially in sw. VA, in rich bottomlands. [= C, F, G, K, S, Y, Z]

Isatis Linnaeus 1753 (Woad)

A genus of about 50 species, herbs, of Eurasia and n. Africa. References: Rollins (1993)=Z.

* ***Isatis tinctoria*** Linnaeus, Woad. Mt, Pd (VA): disturbed areas; uncommon, introduced from Eurasia. April-June. Formerly cultivated as an important source of a blue dye. [= C, F, G, K, W, Z]

Leavenworthia Torrey 1837 (Glade Cress)

A genus of 8 species, annual herbs, endemic to e. North America. References: 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 exigua Rollins *var. **exigua***, Gladecress. Mt (GA): limestone glades; rare (GA Threatened). 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]

Leavenworthia uniflora (Michaux) Britton, Gladecress. Mt (GA): limestone glades; rare (GA Special Concern). 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, G, K, S, Y, Z]

Leavenworthia alabamica Rollins var. *alabamica*. Endemic to n. AL (Colbert, Franklin, and Lawrence counties). [= K, Y, Z]

Leavenworthia alabamica Rollins var. *brachystyla* Rollins. Endemic to n. AL (Morgan County). [= K, Y, Z]

Leavenworthia crassa Rollins var. *crassa*. Endemic to n. AL (Lawrence and Morgan counties). [= K, Y, Z]

Leavenworthia crassa Rollins var. *elongata* Rollins. Endemic to n. AL (Morgan County). [= K, Y, Z]

Leavenworthia exigua Rollins var. *laciniata* Rollins. Endemic to the Western Highland Rim and w. Knobs of c. KY (Bullitt and Jefferson counties). [= C, K, Y, Z]

Leavenworthia exigua Rollins var. *lutea* Rollins. Endemic to the Central Basin of n. AL (Jefferson County) and c. TN (Bedford and Maury counties) (Chester, Wofford, & Kral 1997). [= K, Y, Z]

Leavenworthia stylosa A. Gray. Endemic to the Central Basin of c. TN (Sumner, Smith, Wilson, Davidson, Rutherford, Bedford, and Maury counties) (Chester, Wofford, & Kral 1997). [= K, S, Y, Z]

Leavenworthia torulosa A. Gray. 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, 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: Rollins (1993)=Z; Al-Shehbaz (1986a, 1986b)=Y; Al-Shehbaz, Mummenhof, & Appel (2002)=X. Key based closely on Al-Shehbaz (1986b).

section *Lepidium*: perfoliatum, graminifolium
section *Cardamon*: sativum
section *Lepia*: campestre
section *Dileptium*: austrinum, densiflorum var. densiflorum, oblongum var. oblongum, virginicum var. virginicum
??: didymum, draba ssp. draba, ruderale, africanum, bonariense, lasiocarpum, schinzii

1Upper cauline leaves perfoliate or sagittate.
1

* ***Lepidium campestre*** (Linnaeus) R. Brown, Field Pepperwort, Cow Cress, Field Cress. Pd, Mt (GA, NC, VA), Cp (NC, SC, VA): disturbed areas; common, introduced from Europe. March-June. [= RAB, C, F, G, K, W, S, Y, Z; = *Neolepia campestre* (Linnaeus) W.A. Weber]

* ***Lepidium densiflorum*** Schrader *var. **densiflorum***, Prairie Pepperweed, Green-flowered Peppergrass. {provinces unknown} (NC, SC, VA): disturbed areas; rare, introduced from further west. May-June. [= K, Y, Z; < *L. densiflorum* – C, F, G, S]

* ***Lepidium didymum*** Linnaeus, Wart-cress, Lesser Swine-cress. Cp, Pd (GA, NC, SC, VA), Mt (VA): fields, roadsides, disturbed areas; common (rare in VA Mountains), introduced from South America. [= X; = *Coronopus didymus* (Linnaeus) Smith – RAB, C, F, G, K, Y, Z; = *Carara didyma* (Linnaeus) Britton – S]

* ***Lepidium draba*** Linnaeus *ssp. **draba***, Hoary Cress. Cp (VA): disturbed areas; rare, introduced from Eurasia. April-August. Reported for VA by Harvill et al. (1992). Al-Shehbaz (1986) discusses 2 subspecies of *L. draba* (as *Cardaria draba*). [= X; < *Cardaria draba* (Linnaeus) Desvaux – C, F, G, Z; = *Cardaria draba* ssp. *draba* – K, Y; *? Lepidium draba* Linnaeus]

* ***Lepidium perfoliatum*** Linnaeus, Perfoliate Pepperwort, Clasping Pepperweed, Shieldcress. Cp (NC), Pd (GA, NC) {SC, VA}: disturbed areas; rare, introduced from Europe. April-May. [= RAB, C, F, G, K, Y, Z]

* ***Lepidium ruderale*** Linnaeus, Narrowleaf Pepperwort, Stinking Pepperweed. Cp (NC, VA), Pd (VA): disturbed areas; rare, introduced from Europe. April-June. [= RAB, C, F, G, K, S, Y, Z]

Lepidium virginicum Linnaeus *var. **virginicum***, Poor Man's Pepper. Cp, Pd, Mt (GA, NC, SC, VA): 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, Central America. [= C, G, K, Y, Z; < *L. virginicum* – RAB, F, S, W]

* *Lepidium africanum* (Burmann f.) Augustin 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 area. March-June. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= 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 graminifolium* Linnaeus, Grassleaf Pepperwort. Introduced, especially on ballast, south to MD, PA. April-June. [= K, Y, Z]

* *Lepidium lasiocarpum* Nuttall var. *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). [= K, Z; < *L. lasiocarpum* – Y]

* *Lepidium oblongum* Small var. *oblongum.* 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, Z; < *L. oblongum* – Y]

* ***Lepidium sativum*** Linnaeus, Garden Cress, is reported for scattered locations in sc. and se. PA (Rhoads & Klein 1993) and VA (K based on Massey 1961). May-August. [= C, F, G, 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]

* *Lepidium squamatum* Forsskål, introduced at scattered locations in se. PA (Rhoads & Klein 1993), TN, AL, and FL (K). [= X; = *Coronopus squamatus* (Forsskål) Ascherson – C, K; *? Coronopus procumbens* Gilibert – F, G; = *Carara coronopus* (Linnaeus) Medikus – S]

Lesquerella S. Watson 1888 (Bladderpod)

(see *Paysonia* and *Physaria*)

Lobularia Desvaux 1815 (Sweet Alyssum)

A genus of 4 species, herbs, of Eurasia and Macaronesia. References: Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

* ***Lobularia maritima*** (Linnaeus) Desvaux, Sweet Alyssum. Pd (VA), Cp (NC, VA): disturbed areas, lawns; rare, introduced from Europe. June-November. The NC occurrences are doubtfully established, from gardens and a "lawn." [= C, F, G, K, Y, Z]

Lunaria Linnaeus 1753 (Honesty)

A genus of 3 species, biennial herbs, of Europe. References: Rollins (1993)=Z; Al-Shehbaz (1987)=Y. Key based on Z.

1 Upper cauline leaves coarsely and irregularly dentate; siliques broadly rounded at both ends; plant annual or biennial .... ***L. annua***

1 Upper cauline leaves spinulose-dentate; siliques acute at both ends; plant perennial ..... ***[L. rediviva]***

* ***Lunaria annua*** Linnaeus, Annual Honesty, Silver-dollar. Cp, Pd (VA), Mt (NC, VA) {GA}: escaped from cultivation around gardens, not usually persistent; rare, introduced from se. Europe. April-June. [= C, F, G, K, Z]

* *Lunaria rediviva* Linnaeus, Perennial Honesty. Mt (VA): cultivated ornamental, perhaps persistent around gardens; rare, introduced from Europe. Reported for VA by Kartesz (1999), on the basis of a specimen at VPI. April-June. [= C, F, G, K, Z]

Matthiola R. Brown 1812 (Stock)

A genus of about 50 species, herbs, mainly of Eurasia and Africa. References: Rollins (1993)=Z.

* ***Matthiola incana*** (Linnaeus) R. Brown, Stock. Cp (NC): disturbed dunes, sandy fields, vacant lots; rare, introduced from Europe. Reported for the Buxton area, Dare County, NC, by Burk (1961). [= K, Z]

Microthlaspi F.K. Meyer 1973 (Penny-cress)

Mummenhoff & Koch (1994) and Meyer (1973, 1979) discuss the reasons for separating *Microthlaspi* from *Thlaspi*. References: Rollins (1993)=Z; Thieret & Baird (1985)=Y; Mummenhoff & Koch (1994)=X; Al-Shehbaz (186)=V.

* ***Microthlaspi perfoliatum*** (Linnaeus) F.K. Meyer, Perfoliate Penny-cress, Thoroughwort Penny-cress. Pd, Mt (NC, VA), Cp (VA): fields, disturbed areas; common (rare south of VA and in VA Coastal Plain), introduced from Europe. March-April; April-May. [= K, X; = *Thlaspi perfoliatum* Linnaeus – RAB, C, F, G, V, W, Y, Z]

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: 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 microphyllum*** Boenninghausen ex Reichenbach, Narrow-fruited Watercress. Mt (NC, VA): streams, springs; rare, introduced from Europe. See Green (1962) for additional information. [= 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, Pd, Cp (GA, NC, SC, VA): streams, springs, seepages; common (uncommon or rare south of VA), introduced from Eurasia. April-July. [= GW, V; = *Rorippa nasturtium-aquaticum* (Linnaeus) Hayek – C, K, Q, 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]

Nasturtium floridanum (Al-Shehbaz & Rollins) Al-Shehbaz & R.A. Price, Florida Watercress. Endemic to FL, but north to counties adjacent to se. GA. [= V; = *Rorippa floridana* Al-Shehbaz & Rollins – K, Z; < *Nasturtium microphyllum* Boenninghausen ex Reichenbach – GW, misapplied; *Nasturtium stylosum* Shuttleworth ex O.E. Schulz] {synonymy incomplete}

Neobeckia Greene 1896 (Lake Cress)

A monotypic genus, an aquatic herb, of e. North America. References: Rollins (1993)=Z; Al-Shehbaz & Bates (1987)=Y; Les, Anderson, & Cleland (1995)=X; Al-Shehbaz (1988a)=Q.

Neobeckia aquatica (Eaton) Greene, Lake Cress. Cp (GA, VA): shallow water of swamps and lake margins; rare (GA Special Concern, VA 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*. [= K, S, X; = *Armoracia lacustris* (A. Gray) Al-Shehbaz & V. Bates – C, Q, Y, Z; = *Armoracia aquatica* (Eaton) Wiegand – F, G, GW; = *Rorippa aquatica* (Eaton) Palmer & Steyermark; = *Rorippa americana* (A. Gray) Britton]

Orychophragmus Bunge 1833

A genus of 7 species, herbs, of s. Europe and n. Africa. References: Rollins (1993)=Z.

* ***Orychophragmus violaceus*** (Linnaeus) O.E. Schulz, Purple-mistress. Pd (VA): disturbed areas; rare, introduced from Mediterranean Europe. March-May. Introduced and apparently well established in and around Richmond, VA, as *Moricandia arvensis* (Rollins 1993). [= K, Z; >< *Moricandia arvensis* (Linnaeus) Augustin 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: 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. Endemic to an area from c. TN south to n. AL. [= X; = *Lesquerella densipila* Rollins – K, V, Y, Z]

Paysonia lescurii (A. Gray) O'Kane & Al-Shehbaz. Endemic to an area from sc. KY south through c. TN to n. AL. [= X; = *Lesquerella lescurii* (A. Gray) S. Watson – K, S, V, Y, Z]

Paysonia lyrata (Rollins) O'Kane & Al-Shehbaz. Endemic to Colbert, Franklin, and Lawrence counties, AL. [= X; = *Lesquerella lyrata* Rollins – K, V, Y, Z]

Paysonia perforata (Rollins) O'Kane & Al-Shehbaz . Endemic to Rutherford and Wilson counties, TN (Chester, Wofford, & Kral 1997). [= X; = *Lesquerella perforata* Rollins – K, V, Y, Z]

Paysonia stonensis (Rollins) O'Kane & Al-Shehbaz . Endemic to Rutherford County, TN (Chester, Wofford, & Kral 1997). [= 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. Key adapted from Rollins (1993). References: 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 Siliques (1-) 2-2.8 mm long, sparsely pubescent on the exterior; petals 3.5-6.5 (-7.5) mm long ..... ***[Physaria globosa]***
  2 Siliques (3.5-) 4-8 mm long, glabrous on the exterior; petals 5-8 mm long..... ***Physaria gordonii ssp. gordonii***

* ***Physaria gordonii*** (A. Gray) O'Kane & Al-Shehbaz *ssp.* ***gordonii***, Gordon's Bladderpod. Mt (VA): roadside; rare, introduced from further west. Rollins (1993) reports this species (identification unconfirmed) as a waif along the Blue Ridge Parkway, VA; it may not be established. [= X; = *Lesquerella gordonii* (A. Gray) S. Watson var. *gordonii* – Z; < *L. gordonii* – K, Y]

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]

Raphanus Linnaeus 1753 (Radish)

A genus of 3 species, herbs, of the Old World. References: Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

1 Siliques moniliform (contricted 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***
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, Wild Radish, Jointed Charlock, White Charlock. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common (rare in Mountains), introduced from Mediterranean Europe. March-June (and sporadically later). Many European authors (such as Stace 1997) recognize several infraspecific taxa in *R. raphanistrum*; their validity (and applicability in North America) is poorly known. [= RAB, C, F, G, K, W, Y, Z]

* ***Raphanus sativus*** Linnaeus, Radish, Garden Radish. Cp, Pd, Mt (GA, NC, SC, VA): persistent after cultivation or as a "throwout"; rare, introduced from Mediterranean Europe. April-June. Cultivated for at least 5000 years. [= RAB, C, F, G, K, S, W, Y, Z]

Rapistrum Crantz 1769 (Bastard-cabbage)

A genus of 2 species, herbs, of Europe. References: Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

* ***Rapistrum rugosum*** (Linnaeus) Allioni *var.* ***rugosum***, Annual Bastard-cabbage. Cp (SC): waste areas around wool-combing mills; rare, introduced from Mediterranean Europe. Also naturalized at scattered sites in e. TN (Chester, Wofford, & Kral 1997), PA (Rhoads & Klein 1993), and elsewhere. [= G; = *R. rugosum* ssp. *rugosum* – K, Y; < *R. rugosum* – C, F, Z]

Rorippa Scopoli (Yellow Cress, Marshcress)
(also see *Nasturtium*)

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. References: Al-Shehbaz (1988a)=X; Rollins (1993)=Z; Stuckey (1972)=Y.

1 Plant a rhizomatous, colony-forming perennial; petals (2.0-) 2.8-6.0 mm long.
  2 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; [section *Sinuatae*] ..... ***[R. sinuata]***
  2 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; [section *Rorippa*] ..... ***R. sylvestris***
1 Plant a taprooted annual or biennial; petals 1-3.5 mm long; siliques 1-9 (-10)× as long as wide; [section *Rorippa*].
  3 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***
  3 Flowers clearly pedicellate; petals present; lower fruiting pedicels > 4 mm long; siliques 4-20 mm long, 1-15× as long as wide.
    4 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*** *var.* ***teres***
    4 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.
      5 Leaves hirsute on the lower surface; stems hirsute usually up to the terminal raceme ..... ***R. palustris*** *var.* ***hispida***
      5 Leaves glabrous on the lower surface; stems glabrous or sparsely hirsute.
        6 Plants mostly 4-10 dm tall, often reddish; stems thick, mostly > 3 mm in diameter; leaves thick-textured; siliques 2.5-5 mm long ..... ***R. palustris*** *var.* ***fernaldiana***
        6 Plants mostly 1-4 dm tall, often purplish; stems slender, mostly < 3 mm in diameter; leaves thin-textured; siliques 4-9 mm long ..... ***[R. palustris*** *var.* ***palustris]***

Rorippa palustris (Linnaeus) Besser *var.* ***fernaldiana*** (Butters & Abbe) R. Stuckey, American Marshcress. Pd, Cp, Mt (GA, NC, SC, VA): marshes, bogs, seeps; common. May-October. ME and New Brunswick west to Saskatchewan, south to FL, TX, ID, and n. South America. [= C, Z; < *Rorippa islandica* (Oeder) Bolbás – RAB, misapplied; = *Rorippa islandica* var. *fernaldiana* Butters & Abbe – F, G, misapplied; < *Rorippa palustris* – GW, W; = *Rorippa palustris* ssp. *fernaldiana* (Butters & Abbe) Jonsell – K, X; ? *Radicula palustris* (Linnaeus) Moench – S (in part?); = *Rorippa palustris* ssp. *glabra* (O.E. Schulz) R. Stuckey var. *fernaldiana* (Butters & Abbe) R. Stuckey – Y]

Rorippa palustris (Linnaeus) Besser *var.* ***hispida*** (Desvaux) Rydberg. Pd (VA): moist soils; rare. 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*. [= C, Z; *Rorippa islandica* (Oeder) Bolbás var. *hispida* (Desvaux) Butters & Abbe – F, G; = *Rorippa palustris* ssp. *hispida* (Desv.) Jonsell – K; = *Radicula hispida* (Desvaux) Heller – S; = *Rorippa palustris* ssp. *hispida* (Desvaux) Jonsell var. *hispida* – Y]

Rorippa sessiliflora (Nuttall ex Torrey & A. Gray) A.S. Hitchcock, Stalkless Marshcress. Cp, Pd (NC, SC, VA): 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, 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 (NC, VA), Mt, Cp (VA): lawns, disturbed moist to wet soils; rare, introduced from Eurasia. May-August. [= RAB, C, F, G, GW, K, W, X, Y, Z; = *Radicula sylvestris* (Linnaeus) Druce – S]

Rorippa teres (Michaux) R. Stuckey *var.* ***teres***. Cp (GA, NC, SC): cypress-gum ponds, marshes, swamps, ditches, disturbed wet areas; rare. March-May. Var. *teres* occurs from se. NC south to s. FL, west to se. OK, sw. TX, and s. Mexico; var. *rollinsii* R. Stuckey occurs in w. Mexico (Sinaloa). [= GW, X, Y, Z; = *Rorippa walteri* – RAB; < *Rorippa teres* – C, K; = *Radicula walteri* (Elliott) E.L. Greene – S]

* *Rorippa palustris* (Linnaeus) Besser var. *palustris*, European Marshcress. May-October. South in ne. North America to MD and DC. Var. *palustris* may be native further north (in ne. and nw. North America), but appears to be introduced in our area. [= C, Z; = *Rorippa islandica* var. *islandica* – F, G, misapplied; < *Rorippa palustris* – GW, W; = *Rorippa palustris* ssp. *palustris* – K, X; < *Radicula palustris* (Linnaeus) Moench – S; = *Rorippa palustris* ssp. *palustris* var. *palustris* – Y]

Rorippa sinuata (Nuttall) A.S. Hitchcock. Native, east to w. KY. [= C, F, G, GW, K, X, Y, Z]

Sibara E.L. Greene 1896 (Sibara)

A genus of 6 species, of North America and Mexico. References: Al-Shehbaz (1988a)=Y; Rollins (1993)=Z.

Sibara virginica (Linnaeus) Rollins, Sibara. Cp, Pd (GA, NC, SC, VA), Mt (NC): disturbed areas, fields, roadsides; common. February-June. VA west to IN and KS, south to FL and TX. A native weed, presumably much more common now than formerly. [= RAB, C, F, G, K, W, Y, Z; = *Arabis virginica* (Linnaeus) Poiret – S]

Sinapis Linnaeus 1753 (Mustard)

A genus of 7 species, herbs, of s. Europe. References: 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, Pd (NC): disturbed areas; rare, introduced from Mediterranean Europe. April-June. The seeds of this species are one source of table mustard; other components include *Brassica juncea* and *B. nigra*. [= C, K, S, Y, Z; *? Brassica hirta* – RAB, F, G]

* ***Sinapis arvensis*** Linnaeus, Charlock, Crunchweed, Wild Mustard. Pd (GA, NC, VA), Mt (NC), Cp (GA, NC, SC): disturbed areas; rare, introduced from Mediterranean Europe. April-July. [= C, K, S, Y, Z; *? Brassica kaber* (Augustin de Candolle) L.C. Wheeler – RAB, G; > *Brassica kaber* var. *pinnatifida* (Stokes) L.C. Wheeler – F]

Sisymbrium Linnaeus (Jim Hill Mustard)

References: 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 (GA, NC, SC, VA), Mt, Cp (NC, SC, VA): fields, disturbed areas; uncommon, native of Eurasia. May-June. [= RAB, C, F, G, W, Y, Z; = *Norta altissima* (Linnaeus) Britton – S]

* ***Sisymbrium officinale*** (Linnaeus) Scopoli, Hedge Mustard. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): fields, pastures, barnyards, disturbed areas; common, native of Europe. [= C, K, Y, Z; > *S. officinale* var. *leiocarpum* Augustin de Candolle – RAB, F, G, W; > *S. officinale* var. *officinale* – RAB, F, G, W; = *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, G, K, Y, Z]

* ***Sisymbrium loeselii*** Linnaeus. 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, G, K, Y, Z]

* ***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]

Teesdalia Aiton f. 1812 (Shepherd's Cress)

A genus of 3 species, herbs, of Europe, n. Africa, and the Middle East. References: Rollins (1993)=Z; Appel (1998); Al-Shehbaz (1986)=Y.

* ***Teesdalia nudicaulis*** (Linnaeus) Aiton f., Shepherd's Cress, Hedge Mustard, Bank Cress. Pd, Cp (NC) {SC, VA}: lawns, fields, roadsides, disturbed areas; uncommon, introduced from Europe. March-April; April-June. [= RAB, C, F, G, K, Y, Z]

Thlaspi Linnaeus 1753 (Penny-cress)
(also see *Microthlaspi*)

A genus of about 5 species, as much more narrowly circumscribed, annual herbs native to Eurasia. Mummenhoff & Koch (1994), Meyer (1973, 1979), and Koch & Al-Shehbaz (2004) discuss the reasons for separating *Microthlaspi* from *Thlaspi*. References: Rollins (1993)=Z; Al-Shehbaz (1986)=Y.

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 (NC, VA): fields, disturbed areas, roadsides; rare, native of Europe. March-April; April-May. [= RAB, K, X, Y, Z]

* ***Thlaspi arvense*** Linnaeus, Field Penny-cress, Frenchweed. Pd, Mt, Cp (GA, NC, SC, VA): fields, disturbed areas; common (rare south of NC), native of Europe. March-May; April-June. [= RAB, C, F, G, K, S, W, X, Y, Z]

Turritis Linnaeus 1753 (Tower Mustard)

A monotypic genus, an annual or biennial herb, circumboreal. References: Rollins (1993)=Z; Al-Shehbaz (1988a)=Y; Koch, Bishop, & Mitchell-Olds (1999); Koch & Al-Shehbaz (2002).

Turritis glabra Linnaeus, Tower Mustard. Mt (NC, VA): open disturbed areas, forest edges; rare (NC Rare, VA Rare). 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. [= *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 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: 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 (GA, NC, SC): xeric white sands of sandhills, primarily in Sandhill Region; rare (NC Rare). July-September; August-September. Sc. NC south to panhandle FL and se. AL. [= RAB, K, S, Y, Z]

Warea sessilifolia Nash, Sessile-leaf Warea, Sessile-leaf Pineland-cress. Cp (GA): sandhills; rare. August-September. Panhandle FL and adjacent AL and wc. GA (Stewart County) (Sorrie 1998b). [= K, S, Y, Z]

BUDDLEJACEAE (Butterfly-bush Family)
(see *SCROPHULARIACEAE* and *TETRACHONDRACEAE*)

1 Plant a shrub ..... **[see *SCROPHULARIACEAE – Buddleja]***
1 Plant an herb ..... **[see *TETRACHONDRACEAE – Polypremum]***

BUXACEAE Dumortier 1822 (Boxwood Family)

References: von Balthazar, Endress, & Qiu (2000); Channell & Wood (1987).

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 (Boxwood)

A genus of about 50-90 species, shrubs, of tropical to temperate areas of Europe, Africa, West Indies, and Central America.

* ***Buxus sempervirens*** Linnaeus, Boxwood. Mt (NC, VA): persistent for decades at abandoned homesites; rare, introduced from Europe. Popular for hedges and landscaping; also cultivated in the Mountains for wreathing. [= K]

Pachysandra Michaux (Pachysandra)

A genus of 4 species, 1 of e. North America, the other 3 of e. Asia, suffruticose herbs and shrubs. References: Robbins (1968)=Z.

1 Leaves subcoriaceous, semi-evergreen, pubescent, mottled (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. Pd (GA, NC, SC), Mt (GA): moist rich woods in the upper Piedmont (nearly in the Mountains); rare (GA Special Concern, NC Rare, SC Rare). 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). 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*). Channell & Wood (1987) refer to *P. procumbens* as a "nonagressive if not 'senile' species with a very low evolutionary potential." 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. [= RAB, C, F, G, K, S, W, Z]

* ***Pachysandra terminalis*** Siebold & Zuccarini, Pachysandra, Japanese-spurge. Pd (NC, VA): 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]

CABOMBACEAE A. Richard 1828 (Water-shield Family)

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 (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 leaves and mucilaginous petioles make *Brasenia* unmistakable.

Brasenia schreberi J.F. Gmelin, Water-shield, Purple Wen-dock. Cp (GA, NC, SC, VA), Pd, Mt (NC, VA): lakes, ponds, sluggish streams, floodplain oxbow ponds; common (rare in Piedmont and Mountains). June-October. Nova Scotia west to MN, south to s. FL and TX; also from British Columbia south to CA; also in tropical America and the Old World. [= RAB, C, F, FNA, G, GW, K, S, W]

Cabomba Aublet (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. Cp (GA, NC, SC, VA), Pd (GA, NC, VA): millponds, lakes, slow-moving streams; uncommon (rare and probably only introduced in the Piedmont). 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]

CACTACEAE A.L. de Jussieu 1789 (Cactus Family)

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).

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); 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 1-11 per areole, 1.2-4 (-6) cm long; pads 20-30 cm long, 5-12 cm broad.....***O. stricta* var. *dillenii***

6 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.

7 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***

7 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].

8 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***

8 Joints mostly 5-7.5 (-12.5) cm long, 4-6.2 (-7.5) cm broad; spines to 3 cm long; hypanthiuym with 6 or fewer areoles; style diameter > 3.5 mm; petals < 3 cm long; [widespread in our area].....***O. humifusa* var. *humifusa***

Opuntia humifusa (Rafinesque) Rafinesque *var.* ***austrina*** (Small) Dress, Southern Prickly-pear. Cp (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. 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. cumulicola* Small – S; = *O. compressa* (Salisbury) J.F. Macbride var. *austrina* (Small) L. Benson]

Opuntia humifusa (Rafinesque) Rafinesque *var.* ***humifusa***, Eastern Prickly-pear. Cp, Pd, Mt (GA, NC, SC, VA): 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. 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; > *O. impedita* Small – S; > *O. macrarthra* Gibbes – S; > *O. opuntia* (Linnaeus) Karten – S]

* ***Opuntia monacantha*** (Willdenow) Haworth, Common Prickly-pear. Cp (NC): frequently cultivated, rarely escaped or persistent; rare, native of n. South America. May-June; August-October. [= FNA, K; *? O. vulgaris* P. Miller – RAB, Y]

Opuntia pusilla (Haworth) Nuttall, Dune Prickly-pear, Sand-bur Prickly-pear, Little Prickly-pear, Creeping Cactus. Cp (GA, NC, SC): dunes on barrier islands; uncommon. May-June; August-October. A Southeastern Coastal Plain endemic: NC (Dare County) south to 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, Z; = *O. drummondii* Graham – RAB, S]

Opuntia stricta (Haworth) Haworth *var.* ***dillenii*** (Ker-Gawler) L. Benson. Cp (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, Y, Z; < *O. stricta* – FNA; > *O. tunoidea* Gibbes – S]

Opuntia stricta (Haworth) Haworth *var.* ***stricta***. Cp (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, 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, Y, Z; < *O. stricta* – FNA; > *O. stricta* – S (in the narrow sense)]

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.

CALLITRICHACEAE (Water-starwort Family)
(see *PLANTAGINACEAE*)

CALYCANTHACEAE Lindley 1819 (Sweet-shrub Family)

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, Strawberry-shrub, Carolina Allspice, Sweet Bubby-bush)

A genus of 3-4 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.
  2 Twigs, petioles, and leaf undersurfaces pubescent ..... ***C. floridus*** *var.* ***floridus***
  2 Twigs, petioles, and leaf undersurfaces glabrous or very sparsely pubescent ..... ***C. floridus*** *var.* ***glaucus***

Calycanthus brockianus Ferry & Ferry, Brock Sweetshrub. Mt (GA): moist slopes; rare. Endemic to mesic hardwood forests in GA (GA Special Concern). Its taxonomic validity is uncertain and controversial. [= *C. brockiana* – K, Y, orthographic variant]

Calycanthus floridus Linnaeus *var.* ***floridus***, Hairy Sweet-shrub. Mt (GA, NC, SC, VA), Pd (GA, NC, SC), Cp (GA, SC, VA): forested slopes and streambanks; uncommon (rare in NC and VA) (NC Watch List, VA Rare). April-May; August-September. MD and VA south and west to GA, nw. FL, AL, and s. MS, overall more southern and at lower elevations than var. *glaucus* (though with great overlap). [= RAB, FNA, GW, K, Y, Z; = *C. floridus* – F; > *C. floridus* – S; > *C. mohrii* Small – S]

Calycanthus floridus Linnaeus *var.* ***glaucus*** (Willdenow) Torrey & A. Gray, Smooth Sweet-shrub. Mt, Pd (GA, NC, SC, VA), Cp (GA, NC, SC): forested slopes and streambanks; common (rare in VA) (VA Rare). March-June; July-September. PA, WV, and KY, south to GA, nw. FL, ne. AL, overall more northern and montane than var. *floridus* (though with great overlap). [= C, FNA, K, Y; = *C. floridus* var. *laevigatus* (Willdenow) Torrey & A. Gray – RAB, GW, Z; = *C. fertilis* Walter – F, G; > *C. fertilis* – S; > *C. nanus* Loiseleur – S; > *C. floridus* var. *oblongifolius* (Nuttall) Boufford & Spongberg]

CALYCERACEAE R. Brown ex Richard 1820 (Calycera Family)

Acicarpha Antoine Laurent de Jussieu

A genus of 5 species, of tropical America. References: DeVore (1991)=Z.

* ***Acicarpha tribuloides*** Antoine Laurent de Jussieu. Cp (NC, SC): on ship's ballast near old port-cities; rare (probably no longer present), introduced from South America (native range 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 and Charleston. 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, Z]

CAMPANULACEAE A.L. de Jussieu 1789 (Bellflower Family)
(also see *SPHENOCLEACEAE*)

A family of about 82 genera and 2000 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).

1 Corollas bilaterally symmetrical (zygomorphic); carpels 2; [subfamily *Lobelioideae*] ..... ***Lobelia***

1 Corollas radially symmetrical (actinomorphic); carpels (2-) 3-5; [subfamily *Campanuloideae*].
  2 Capsule dehiscent laterally (the pores nearly apical in *Campanulastrum*); flowers in spikes, racemes, or panicles; [mostly native species of various habitats (some of them weedy)]; [tribe *Campanuleae*].
    3 Inflorescence spicate, the flowers sessile, mostly in the axils of well-developed leaves; corollas rotate and style straight ..... ***Triodanis***
    3 Inflorescence racemose or paniculate, the flowers pedicelled, sometimes axillary to well-developed leaves; corollas campanulate or funnelform, with a straight or curved style (*Campanula*) or rotate witha curved style (*Campanulastrum*).
      4 Corolla campanulate or funnelform; style straight or curved; small to fairly coarse perennials..... ***Campanula***
      4 Corolla rotate; style curved; coarse annual or biennial..... ***Campanulastrum***
  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].
    5 Flowers and fruits borne in an involucrate umbel ..... ***Jasione***
    5 Flowers and fruits solitary or in a diffuse inflorescence.
      6 Flowers large, 1 to few, solitary or nearly so; leaves large, ovate to elliptic ..... ***Platycodon***
      6 Flowers small, several to many, borne in a diffuse inflorescence; leaves small, linear to narrowly elliptic..... ***Wahlenbergia***

Campanula Linnaeus (Bellflower)
(also see *Campanulastrum*)

A genus of about 300 species, herbs (rarely shrubby), north tempearte, most diverse in s. Europe. References: Rosatti (1986)=Z; Shetler & Morin (1986); Shetler (1982)=Y.

1 Stems weak and slender, reclining, 3-angled.
  2 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***
  2 Corolla 5-13 mm long; pedicels ascending, the bractless portion 1-8 cm long; corolla pale blue..... ***[C. aparinoides*** *var*. ***grandiflora]***
1 Stems more robust, erect, terete or nearly so.
  3 Flowers on long pedicels (generally longer than 40 mm long), the inflorescence a diffuse panicle; [native species of rock outcrops or rocky woodlands].
    4 Corolla 6-8 mm long; leaves lanceolate, averaging about 1 cm wide, generally with prominent, often somewhat divergent teeth; [section *Rapunculus*] ..... ***C. divaricata***
    4 Corolla 12-20 mm long; leaves (of the stem) linear, averaging < 5 mm wide, generally lacking teeth (or the teeth minute and obscure); [section *Campanula*, subsection *Heterophylla*] ..... ***C. rotundifolia***
  3 Flowers mostly on short pedicels (the upper < 5 mm long), the inflorescence a raceme; [alien species usually of disturbed areas].
    5 Capsules with pores in the apical half; [section *Rapunculus*, subsection *Campanulastrum*] ..... ***C. persicifolia***
    5 Capsules with pores at or near the base..... ***C. rapunculoides***

Campanula aparinoides Pursh *var.* ***aparinoides***, Marsh Bellflower. Mt (GA, NC, VA), Pd, Cp (VA): bogs, marshes, wet meadows, seepage slopes over mafic or calcareous rocks; uncommon (rare in NC and VA Piedmont and VA Coastal Plain) (GA Special Concern, NC Rare). 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 divaricata Michaux, Southern Harebell, Appalachian Bellflower. Mt, Pd (GA, NC, SC, VA), Cp (NC): rock outcrops, cliffs, rocky summits, talus, up to at least 1850m; common (uncommon in Piedmont). 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]

* ***Campanula persicifolia*** Linnaeus, Peachleaf Bellflower. Mt (NC): naturalized from gardens; rare, 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* (L.) A.A.Kolakovskiĭ & L.B.Serdyukova]

* ***Campanula rapunculoides*** Linnaeus, Rampion Bellflower, Rover Bellflower. Mt (NC, VA), Pd, Cp (VA): disturbed areas; rare, introduced from Eurasia. June-August (-October). [= RAB, C, F, G, K, S, Z]

Campanula rotundifolia Linnaeus, Bluebell, Harebell, Bluebell-of-Scotland. Mt (NC, VA): limestone outcrops, high elevation rocky summits (in thin soil over amphibolite); rare (NC Rare, NC Rare). July-August; August-September. A circumboreal species, widespread and common in n. North America and n. Eurasia, southward becoming rare, and generally limited to limestone in its occurrences in the Central Appalachians of WV and VA. It was added to the flora of NC in 1991. See Shetler (1982) for a detailed study of the species. [= C, F, G, K, Y, Z]

Campanula aparinoides var. *grandiflora* Holzinger ranges south to PA. It should be sought in our area. It has been variously treated at a species, variety, geographic phase, or form; its taxonomic status is uncertain. [= C, G; < *C. aparinoides* – K; = *C. uliginosa* Rydberg – F]

Campanulastrum Small (Tall Bellflower)

A monotypic genus, a biennial herb, distinct from *Campanula* (Shulkina, Gaskin, & Eddie 2003). As stated by Shetler & Morin (1986), "Small's view [segregating *Campanula americana* into the monotypic genus *Campanulastrum*] appears to have increasing justification from palynological, cytological, and now seed evidence." References: Rosatti (1986)=Z; Shetler & Morin (1986); Shulkina, Gaskin, & Eddie (2003).

Campanulastrum americanum (Linnaeus) Small, Tall Bellflower. Mt, Pd (GA, NC, SC, VA), Cp (GA, VA): moist to fairly dry forests, especially over mafic or calcareous rocks; common (uncommon in Piedmont and rare in Coastal Plain) (SC Rare). Late June-September; August-October. This coarse annual or biennial is distributed nearly throughout e. North America. [= K, S; = *Campanula americana* Linnaeus – RAB, C, F, G, W, Z]

Jasione Linnaeus (Sheep's-bit)

References: Rosatti (1986)=Z.

* ***Jasione montana*** Linnaeus, Sheep's-bit. Cp (NC): disturbed areas in sandy soils; rare, introduced from Europe. June-September. [= C, F, G, K; > *J. montana* var. *montana* – Z]

Lobelia Linnaeus 1753 (Lobelia)

References: Rosatti (1986)=Z; McVaugh (1936)=Y; Thompson & Lammers (1997). Key based in part on Y, GW, and C.

1 Corolla bright red (faded in dried specimens) or very rarely white, 30-45 mm long ..... ***L. cardinalis***
1 Corolla blue, purple, or white, 10-33 mm long.
  2 Larger leaves in a basal rosette, elongate, either linear or linear-oblanceolate with an elongate petiole; [plants of wetlands, often growing in shallow water].
    3 Leaves linear, fleshy, and hollow; [of the northern United States, rarely south to MD, PA, and NJ] ..... ***[L. dortmanna]***
    3 Leaves linear-oblanceolate, not hollow; [of the Southeastern Coastal Plain from NC (?) or GA southward and westward].
      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; larger leaves 10-30 cm long; plants (5-) 8-10 (-15) dm tall ..... ***L. floridana***
      4 Calyx segments not auriculate; pedicels lacking bracteoles; filemant tube 3-4.5 mm long; corolla tube fenestrate; 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.
      6 Calyx with prominent leafy auricles; pedicels with bracteoles near the middle ..... ***L. siphilitica*** *var.* ***siphilitica***
      6 Calyx not auriculate; pedicels with bracteoles near the base (or sometimes near the middle in *L. puberula*).

L. amoena
L. elongata
L. georgiana

[L. brevifolia]

L. glandulosa
L. sp. 1

[L. puberula var. mineolana]
L. puberula var. puberula
L. puberula var. simulans

    5 Flowers relatively small, the corolla (including the hypanthium) 7-22 mm long, not fenestrate (except XX).
      15 Stem leaves very narrow, the largest on a plant 1-5 mm wide.

16 Pedicels lacking bracteoles (but with subtending bracts); plant perennial from rhizomes, the stem often spongy-thickened toward the base..... ***L. boykinii***
16 Pedicels bearing bracteoles near the base or middle (and also with subtending bracts); stems not spongy-thickened.
17 Bracteoles borne near the middle of the pedicel; [of northern wetlands, south to WV and PA]..... ***[L. kalmii]***
17 Bracteoles borne at the base of the pedicel; [collectively widespread in our area].
18 Lower lip of corolla pubescent inside at the base; corolla blue, lacking a white eye.... ***L. canbyi***
18 Lower lip of the corolla glabrous; corolla blue, with a white eye..... ***L. nuttallii***
15 Stem leaves broader, the largest on a plant > 10 mm wide.
19 Bracteoles borne near the middle of the pedicel..... ***L. flaccidifolia***
19 Bracteoles borne at the base of the pedicel.

[L. appendiculata var. appendiculata]
[L. appendiculata var. gattingeri]
L. inflata
L. spicata var. leptostachys
L. spicata var. scaposa
L. spicata var. spicata
[L. spicata var. campanulata]

Lobelia amoena Michaux. Mt (GA, NC, SC), Pd (GA): marshes, streambanks, seeps; common. Late July-October. W. NC and e. TN south to c. GA and ec. AL. Reported for VA by Kartesz (1999), supposedly on the basis of McVaugh (1936), but McVaugh does not record *L. amoena* for VA. [= RAB, C, GW, S, Y; = *L. amoena* var. *amoena* – K; < *L. amoena* – W]

Lobelia boykinii Torrey & A. Gray ex Alphonse de Candolle. Cp (GA, NC, SC): cypress ponds and depression meadows; rare (GA Special Concern). May-July (-August). NJ south to w. Panhandle FL, s. AL, and s. MS (Sorrie & Leonard 1999). [= RAB, C, F, G, GW, K, S, Y]

Lobelia canbyi A. Gray. Cp (GA, NC, SC): pine savannas; uncommon. July-November. NJ to GA in the Coastal Plain; disjunct in Coffee County, TN, with other Coastal Plain plants. [= RAB, C, F, G, GW, K, S, Y]

Lobelia cardinalis Linnaeus, Cardinal Flower. Cp, Pd, Mt (GA, NC, SC, VA): streambanks, riverbanks, marshes, swamp forests; common. July-October. New Brunswick, Québec, Ontario, 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, Y; > *L. cardinalis* var. *cardinalis* – C; > L. *cardinalis* ssp. *cardinalis* – GW; > *L. cardinalis* ssp. *cardinalis* var. *cardinalis*]

Lobelia elongata Small. Cp (GA, NC, SC, VA): marshes, bogs, pine savannas; common. August-October. A Southeastern Coastal Plain endemic: DE to se. GA. [= C, F, G, GW, K, S, Y; < *L. elongata* – RAB]

Lobelia flaccidifolia Small. Cp (GA): depression ponds, swampy woods along rivers and streams; common. June-September. E. GA south into FL. [= GW, K, S; *? L. halei* Small – Y]

Lobelia floridana Chapman. Cp (GA, NC?): wet pine savannas and flatwoods, depression ponds; rare. Se. GA (Jones & Coile 1988), 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, Y]

Lobelia georgiana McVaugh. Cp, Pd (GA, NC, SC, VA), Mt (NC): swamps, wet places; common. August-October. 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; = *L. glandulifera* (A. Gray) Small – S, Y; < *L. amoena* – W]

Lobelia glandulosa Walter. Cp (GA, NC, SC, VA?), Pd (GA, NC, SC): pine savannas, flatwoods, depression ponds; common. September-October. [= RAB, C, F, G, GW, K, S, W, Y]

Lobelia inflata Linnaeus. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): July-November. [= RAB, C, F, G, GW, K, S, W, Y]

Lobelia nuttallii J.A. Schultes. Cp (GA, NC, SC, VA), Mt (GA, NC, SC), Pd (NC, SC): May-November. [= RAB, C, F, G, GW, K, S, W, Y]

Lobelia paludosa Nuttall. Cp (GA): FL and se. GA (Jones & Coile 1988). [= F, GW, K, S, Y]

Lobelia puberula Michaux *var.* ***puberula***. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): Late July-October. [= F, K; < *L. puberula* – RAB, C, G, GW, S, W, Y]

Lobelia puberula Michaux *var.* ***simulans*** Fernald. Mt, Pd (GA, NC, SC, VA), Cp (GA, VA): Late July-October. [= F, K; < *L. puberula* – RAB, C, G, GW, S, W; *L. puberula* "form a" – Y]

Lobelia siphilitica Linnaeus *var.* ***siphilitica***, Great Blue Lobelia. Mt (GA, NC, VA), Pd, Cp (VA): Late July-October. [= C, F, G, GW, K, Y; < *L. siphilitica* – RAB, S, W]

Lobelia sp. 1. Cp (NC, SC): seepages; rare. Endemic to the Sandhills Region of NC and SC. Under study by A. Bert Pittman. ["*L. batsonii*" in prep.]

Lobelia spicata Lamarck *var.* ***leptostachys*** (Alphonse de Candolle) Mackenzie & Bush. (GA, NC, SC, VA) Late May-August. [= C, F, G, K, Y; < *L. spicata* – RAB, GW, W; = *L. leptostachys* Alphonse de Candolle – S]

Lobelia spicata Lamarck *var.* ***scaposa*** McVaugh. (NC, SC, VA): Late May-August. [= C, F, G, K, Y; < *L. spicata* – RAB, GW, S, W]

Lobelia spicata Lamarck ***var. spicata***. (GA, NC, SC, VA): Late May-August. [= F, G, K; < *L. spicata* var. *spicata* – C; < *L. spicata* – RAB, GW, W; > *L. spicata* – S; > *L. bracteata* Small – S; = *L. spicata* var. *originalis* – Y]

Lobelia appendiculata Alphonse de Candolle var. *appendiculata*. AL westward to KS, OK, and TX. [= K; = *L. appendiculata* – GW, S, Y]

Lobelia appendiculata Alphonse de Candolle var. *gattingeri* (A. Gray) McVaugh. Endemic to sc. KY south through c. TN to n. AL. [= K; = *L. gattingeri* A. Gray – GW, S, Y]

Lobelia brevifolia Nuttall ex Alphonse de Candolle Savannas, flatwoods, and bogs, endemic to the East Gulf Coastal Plain of FL, AL, MS, and LA. [= GW, K, S, Y]

Lobelia dortmanna Linnaeus, Water Lobelia, south to NJ, MD, and PA (Kartesz 1999). [= C, F, G, K, Y]

Lobelia kalmii Linnaeus, south to WV and PA. [= C, F, G, K, Y]

Lobelia puberula Michaux var. *mineolana* F. Wimmer. East to AL and KY. [= K; < *L. puberula* – C, G, GW, S; = *L. puberula* "form d" – Y]

Lobelia spicata Lamarck var. *campanulata* McVaugh. South to MD, WV, PA. [= F, G, K, Y; < *L. spicata* var. *spicata* – C; < *L. spicata* – W]

Platycodon Alphonse de Candolle (Japanese Bellflower, Balloonflower)

A monotypic genus, an herb, of ne. Asia. References: Rosatti (1986)=Z.

* ***Platycodon grandiflorum*** (Jacquin) Alphonse de Candolle, Japanese Bellflower, Balloonflower. Cp, Pd (NC): ditches, disturbed areas, spread from horticultural cultivation; rare, introduced from e. Asia. [= RAB, K, Z]

Triodanis Rafinesque ex Greene (Venus's Looking-glass)

A genus of 8 species, annual herbs, American and s. Europe. References: McVaugh (1945)=Z; McVaugh (1948). Key based on Z.

1 Openings of the capsule linear, 0.2-0.4 mm wide; seeds minutely tuberculate in longitudinal lines ..... ***[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.
  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. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): roadsides, gardens, glades, disturbed areas; common (rare in Mountains). April-June. E. VA, KY, KS, AZ, and OR south to Mexico; South America. [= C, K, Z; = *Specularia biflora* (Ruiz & Pavón) Fischer & C.A. Meyer – RAB, F, G; = *T. perfoliata* var. *biflora* (Ruiz & Pavón) Bradley – W]

Triodanis perfoliata (Linnaeus) Nieuwland. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, gardens, glades, disturbed areas; common. April-June. ME and British Columbia south to FL and Mexico; West Indies; Ecuador. [= C, K, Z; = *Specularia perfoliata* (Linnaeus) Alphonse de Candolle – RAB, F, G; = *T. perfoliata* var. *perfoliata* – W]

Triodanis holzingeri McVaugh, east to TN. [= K, Z; = *Specularia holzingeri* (McVaugh) Fernald – F]

Wahlenbergia Schrader ex Roth (Wahlenbergia)

References: Rosatti (1986)=Z.

* ***Wahlenbergia marginata*** (Thunberg) Alphonse de Candolle. Cp (GA, NC, SC), Pd (GA): sandy soils along roadsides and in fields; common, introduced from e. Asia and Oceania. 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]

CANNABACEAE Endlicher 1827 (Hops Family)

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. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas and clandestinely cultivated plots; uncommon, introduced from Asia. June-October. Though perhaps not truly naturalized or persistent, *Cannabis* is treated here since clandestine cultivated plots will be encountered fairly regularly by the field biologist, especially in fairly remote areas in the mountainous parts of our area. [= F, FNA, G; > *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 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***
  2 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].
    3 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***
    3 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 laevigata Willdenow, Southern Hackberry, Sugarberry. Cp, Pd, Mt (GA, NC, SC, VA): bottomland forests, especially on natural levees, upland calcareous forests and woodlands, shell middens; common (uncommon in the Mountains). April-May; August-October. MD, WV, IN, IL, MO and KS south to 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. Mt, Pd, Cp (GA, NC, VA): xeric to mesic glades, outcrops, barrens, woodlands, and bottomland forests, usually over calcareous substrate; common (rare in NC). April-May; August-October. NH, Québec, Manitoba, and MT south to FL, TX, and NM. [= C, FNA, G, K, S, W; = *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]

Celtis tenuifolia Nuttall, Dwarf Hackberry, Georgia Hackberry. Mt (GA, NC, VA), Pd, Cp (GA, NC, SC, VA): xeric to mesic glades, outcrops, barrens, woodlands, often over calcareous substrate; common (uncommon in Mountains of NC). April-May; August-October. NJ, PA, IN, IL, and KS south to FL and TX. [= C, FNA, G, K, W; = *C. occidentalis* var. *georgiana* (Small) Ahles – RAB; > *C. tenuifolia* var. *georgiana* (Small) Fernald & Schubert – F; > *C. tenuifolia* var. *tenuifolia* – F; = *C. georgiana* Small – S]

Celtis iguanaea (Jacquin) Sargent, Iguana Hackberry. Shell-middens and calcareous coastal sites. AL, FL, West Indies, American tropics. [= K; = *Momisia iguanaea* (Jacquin) Rose & Standley – S]

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) with 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. Mt (VA), Pd (GA, NC, SC, VA), Cp (NC, VA): disturbed areas, particularly in rich, alluvial soils, where it has become a serious weed along major VA rivers; common (rare in NC and SC), introduced from Asia, native to Japan, Taiwan, and China. June-October; July-October. [= RAB, C, F, FNA, G, K, W, Z]

Humulus lupulus Linnaeus *var***. *lupuloides*** E. Small, Northeastern Hops. Pd, Mt (VA), Cp (NC, VA): disturbed areas, particularly in rich, alluvial soils; uncommon (rare in NC and in VA Coastal Plain) (NC Watch List). July-August; September-October. Nova Scotia and Newfoundland south to VA and NC, west to NE, MT, and Alberta. It is not clear whether its occurrence in NC is native or introduced from 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]

* ***Humulus lupulus*** Linnaeus *var***. *lupulus***, Brewer's Hops, European Hops. Pd (VA): disturbed areas; rare, introduced from 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]

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 (NC Watch List). 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]

CAPPARACEAE A.L. de Jussieu 1789 (Caper Family)
(see *CLEOMACEAE*)

CAPRIFOLIACEAE A.L. de Jussieu 1789 (Honeysuckle Family)
(also see *ADOXACEAE, DIERVILLACEAE, and LINNAEACEAE*)

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. References: Backlund & Pyck (1998); Ferguson (1966a).

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].
3 Leaves ciliate, pubescent on the upper surface; hypanthium glandular or glabrous; stems glandular or glabrous ..... ***L. sempervirens* var. *hirsutula***
3 Leaves entire, glabrous on the upper surface; hypanthium glabrous; stems glabrous ..... ***L. sempervirens* var. *sempervirens***
2 Corolla tube 10-30 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].
4 Leaves pubescent on the upper surface; [of moist forests, south to PA] ..... ***[L. hirsuta]***
4 Leaves glabrous on the upper surface.
5 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]***
5 Fused leaves immediately below the inflorescence green on the upper surface, pointed to mucronate.
6 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***
6 Corolla tube 15-25 mm long; leaves strongly white-glaucous beneath; [of rocky forests, ridgetops, and bogs of n. NC, VA, and northward].
7 Hypanthium glabrous; leaves glabrous beneath; style glabrous to sparsely hairy ..... ***L. dioica* var. *dioica***
7 Hypanthium densely glandular; leaves sparsely to densely villous beneath; style hirsute..... ***L. dioica* var. *orientalis***

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.
8 Trailing or climbing vine; corolla 30-50 mm long; fruit black at maturity; leaves of vigorous shoots often pinnately lobed ..... ***L. japonica***
8 Upright shrub; corolla 7-25 mm long; fruit red or yellow at maturity; leaves unlobed.
9 Branches with solid and continuous, white pith; [native and exotic species].
10 Corolla lobes 5, nearly equal; ovaries separate, divergent; [native species of cool moist forests and bogs] ..... ***L. canadensis***
10 Corolla lobes fused into a 4-lobed lip and a 1-lobed lip; ovaries fused; [exotic species].
11 Branches glabrous; corolla glabrous on the exterior..... ***L. fragrantissima***
11 Branches retrorsely hispid with reddish-brown hairs; corolla pilose on the exterior..... ***L. standishii***
9 Branches hollow between the nodes, with tannish pith; [exotic species, many of them seriously invasive and likely to be encountered in natural areas].
12 Peduncles shorter than or equal to the subtending petiole; leaves ovate (broadest near the base) and distinctly long-acuminate..... ***L. maackii***
12 Peduncles longer than the subtending petiole; leaves elongate (broadest near the middle) and obtuse to acute (rarely short-acuminate).
13 Leaves glabrous; peduncles 15-25 mm long..... ***L. tatarica***
13 Leaves pubescent, at least on the lower surface; peduncles 5-15 mm long.
14 Corolla pink (aging to yellow), nearly glabrous on the exterior, barely bulging on one side at the base; leaves thinly pubescent beneath ..... ***L. ×bella***
14 Corolla white (aging to yellow), pubescent on the exterior, distinctly bulging on one side at the base; leaves rather densely grayish-pubescent beneath.
15 Bracts and sepals ciliate, not glandular; ovary lacking glands; leaf blades broadest at or below the middle..... ***L. morrowii***
15 Bracts and sepals glandular; ovary glandular; leaf blades broadest beyond the middle..... ***L. xylosteum***

* ***Lonicera ×bella*** Zabel [*L. morrowii* × *tatarica*], Pretty Honeysuckle. Pd (NC, SC): forests, woodlands, fencerows, suburban woodlands; uncommon, introduced from Eurasia. April-May. [= RAB, C, F, K, Z; = *L. bella* – G; = *L. tatarica* × *morrowii* – Y]

Lonicera canadensis Bartram ex Marshall, American Fly-honeysuckle. Mt (GA, NC, VA): shrubby mountain bogs at high elevations, bouldery northern hardwood forests, hemlock and spruce swamps; rare (GA Special Concern). May-June; June-July. South Nova Scotia to Saskatchewan, south to PA, w. NC, n. GA, OH, IN, and MN. [= RAB, C, F, G, K, W, Y, Z; = *Xylosteon ciliatum* Pursh – S]

Lonicera dioica Linnaeus *var.* ***dioica***. Mt (GA, NC, VA): shrubby mountain bogs at high elevations; rare (GA Special Concern}. June-August; August-September. MA and Québec west to WI, south to NJ, NC, and IN. [= C, F, G, Z; < *L. dioica* – RAB, K, W; = *L. dioica* – S, Y]

Lonicera dioica Linnaeus *var.* ***orientalis*** Gleason. Mt (NC, VA): seepages; rare. June-August; August-September. S. Ontario west to s. MI, south to w. VA and w. NC. [= C, G; < *L. dioica* – RAB, K, W; < *L. dioica* var. *glaucescens* (Rydberg) Butters – F, Z; = *L. glaucescens* (Rydberg) Rydberg – S, Y]

Lonicera flava Sims, Yellow Honeysuckle. Mt (GA, NC, SC), Pd (GA): in soil mats around granitic domes; uncommon. April-May; July-August. W. NC, KY, and MO, south to GA and AR. [= RAB, C, G, K, W, Y; > *L. flava* – F, S, in a narrower sense; > *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. Pd (GA, NC, VA), Cp, Mt (VA), {SC}: forests, woodlands, old house sites; common and invasive, introduced from China. February-early April; April-May. [= RAB, K, Y, Z; = *Xylosteon fragrantissimum* (Lindley & Paxton) Small – S]

* ***Lonicera japonica*** Thunberg, Japanese Honeysuckle. Cp, Pd, Mt (GA, NC, SC, VA): nearly ubiquitous, especially common in the Piedmont and Coastal Plain and in mesic habitats; common, introduced from 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, 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. Pd (GA, NC, SC, VA), Cp (NC, VA), Mt (GA, VA): suburban woodlands, moist forests, fencerows; common, introduced from e. Asia (Korea, China, Japan). May-June. Aggressively invasive in the vicinity of DC. [= C, K, Y, Z]

* ***Lonicera morrowii*** A. Gray, Morrow's Honeysuckle. Mt (NC, SC, VA), Pd, Cp (VA): forests, woodlands, old house sites, suburban woodlands; common, introduced from 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, orthographic variant]

Lonicera sempervirens Linnaeus *var.* ***hirsutula*** Rehder, Coral Honeysuckle. Pd (NC, VA), Mt (NC): {habitat}; rare. VA and NC southwest to AL. [= C, F, G, K, Y; < *L. sempervirens* – RAB, GW, W, Z; < *Phenianthus sempervirens* (Linnaeus) Rafinesque – S]

Lonicera sempervirens Linnaeus *var.* ***sempervirens***, Coral Honeysuckle. Cp, Pd, Mt (GA, NC, SC, VA): dry forests and woodlands, maritime forests; common. March-July (and sporadically to November); July-September. CT to OK, south to FL and TX; and more widely distributed as an escape from cultivation. [= C, G, K, Y; < *L. sempervirens* – RAB, GW, W, Z; > *L. sempervirens* var. *sempervirens* – F; > *L. sempervirens* var. *minor* Aiton – F; < *Phenianthus sempervirens* (Linnaeus) Rafinesque – S]

* ***Lonicera standishii*** Jacques, Standish's Honeysuckle. Pd (NC): forests, woodlands, old home sites; rare but locally abundant, introduced from China. 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. Pd, Cp, Mt (VA): disturbed forests; uncommon, introduced from Central Asia. [= C, F, G, K; > *L. tatarica* var. *tatarica* – Y]

* ***Lonicera xylosteum*** Linnaeus, European Fly-honeysuckle. Mt (VA): disturbed forests; uncommon, introduced from 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]

Lonicera hirsuta Eaton, Hairy Honeysuckle. Québec west to Manitoba, south to c. PA (Rhoads & Klein 1993) and MN. [= F, K, Y; > *L. hirsuta* var. *interior* Gleason – C]

* *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 keyed}

Lonicera reticulata Rafinesque. 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]

Symphoricarpos Duhamel (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. Mt (VA): limestone woodlands; rare (VA Rare). Québec west to s. AK, south to w. VA, WV, MI, MN, and CA. Var. *albus* is the more eastern variety. [= C, F, G, K, Z; < *S. albus* – RAB, S, W]

* ***Symphoricarpos albus*** (Linnaeus) Blake *var.* ***laevigatus*** (Fernald) Blake, Pacific Snowberry. Pd (NC, VA?): disturbed areas; rare, introduced from w. North America. [= C, F, G, K, Z; < *S. albus* – RAB, S, W; *? S. rivularis* Suksdorf]

Symphoricarpos orbiculatus Moench, Coralberry. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): moist to dry forests, woodlands, thickets, pastures, and old fields, especially over mafic or calcareous rocks; common. Late July-September; September-November (and often persisting well into winter). CT west to IN, MN, and CO, south to FL, TX, and Mexico. Seemingly increasing in VA and behaving aggressively in dry woodlands and barrens over greenstone and diabase. [= RAB, C, F, G, K, W, Z; = *S. symphoricarpos* (Linnaeus) MacM. – S]

Symphoricarpos occidentalis Hooker, Western Snowberry, in PA, MD, KY. {investigate} [= K] {not keyed at this time}

Triosteum Linnaeus (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 equalling 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. {Pd (NC, VA), Mt (GA, VA): distributional and habitat information needed for two varieties} (GA Rare). April-May; July-August. CT west to Ontario and MO, south to NC, nw. GA (Jones & Coile 1988), AL, and LA. [= C, F, G; < *T. angustifolium* – RAB, K, S, W, Z]

Triosteum angustifolium Linnaeus *var.* ***eamesii*** Wiegand, Hairy Lesser Horse-gentian. {Pd (NC, VA), Mt (VA): 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), Pd (NC, VA): woodlands and forests in circumneutral soils, particularly those over mafic or calcareous rocks; uncommon (GA Rare, NC Watch List). Late May-early June; August-October. Québec 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, Z; < *T. perfoliatum* Linnaeus var. *aurantiacum* (Bicknell) Wiegand – G]

Triosteum perfoliatum Linnaeus, Perfoliate Horse-gentian. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): woodlands and forests in circumneutral soils, particularly those over mafic or calcareous rocks; uncommon. 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, Z; = *T. perfoliatum* var. *perfoliatum* – G]

CARYOPHYLLACEAE A.L. de Jussieu 1789 (Pink Family)

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 cylindrical, twice as long as the sepals ..... ***Cerastium***
9 Capsule spherical or ellipsoid, as long as or slightly longer than the sepals ..... ***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, Pd, Mt (GA, NC, SC, VA): fields, disturbed areas; common, introduced from Europe. May-July. [= FNA; < *A. githago* – RAB, C, F, G, K, S, W]

Arenaria Linnaeus 1753 (Sandwort)
(also see *Minuartia*)

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).

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 (GA, NC, SC, VA): dunes, maritime forests, coquina limestone outcrops; rare (NC Watch List, VA Rare). May-July. Se. VA south to 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; = *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. {GA, NC, SC, VA} 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]

* ***Arenaria serpyllifolia*** Linnaeus, Large Thyme-leaved Sandwort. {GA, NC, SC, VA} 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*]

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.
    3 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***
    3 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, equalling, 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*).
  4 Perennial, matted at the base and rooting at the nodes ..... ***C. fontanum** ssp. **vulgare***
  4 Annual, taprooted.
    5 Sepals with long, appressed, eglandular hairs extending beyond the tip of the sepal.
      6 Inflorescence an open cyme, most of the pedicels longer than the sepals ..... ***C. brachypetalum***
      6 Inflorescence a compact, cymose cluster, most of the pedicels shorter than the sepals ..... ***C. glomeratum***
    5 Sepals lacking long, appressed, eglandular hairs.
      7 Styles, sepals, and petals 3-4 (-5); capsule teeth 6-8 (-10).
        8 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]***

8 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***

7 Styles, sepals, and petals 5; capsule teeth 10.

9 Bracts of the inflorescence with distinctly scarious margins; leaves mostly 0.5-1.0- (-1.5) cm long.

10 Petals equalling or surpassing the sepals; cleft in petal apex 1.0-1.5 mm deep ..... ***C. pumilum***

10 Petals shorter than the sepals; cleft in petal apex 0.2-0.5 (-0.9) mm deep ..... ***C. semidecandrum***

9 Bracts of the inflorescence with green margins; leaves mostly (1.0-) 1.5-8 cm long.

11 Pedicels 3-10 (-15) mm long; leaves to 3.5 cm long ..... ***C. brachypodum***

11 Pedicels (10-) 15-40 (-55) mm long; leaves to 8 cm long..... ***C. nutans***

* ***Cerastium brachypetalum*** Desportes, Gray Mouse-ear. Mt (NC, SC), Pd (NC, SC, VA), Cp (NC, VA): roadsides, disturbed areas; common (rare in SC), introduced from 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 Alberta 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, introduced from 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, Pd, Cp (NC, SC, VA): fields, disturbed areas; common, introduced from Europe. March-June. [= FNA, K; = *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, Pd, Mt (NC, SC, VA): fields, disturbed areas; common, introduced from Europe. March-May. [= RAB, FNA, K, W; = *C. viscosum* Linnaeus – C, F, G, S, an ambiguous name, of uncertain application]

Cerastium nutans Rafinesque. Mt, Pd (NC, SC, VA), Cp (VA): alluvial forests, bottomlands, moist forests; common. April-May. Nova Scotia west to Mackenzie, south to SC, GA, AZ, 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): disturbed areas; rare, introduced from 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 (NC, SC, VA), Mt, Pd (NC, VA): disturbed areas; uncommon (rare in NC), introduced from Europe. April-June. Reported for SC by Nelson & Kelly (1997). [= RAB, C, F, FNA, G, K, S, W]

* ***Cerastium tomentosum*** Linnaeus, Snow-in-summer. Mt (NC, VA): disturbed areas; rare. 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, 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 arvense Linnaeus ssp. *strictum* (Linnaeus) Ugborogho. 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 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, S, W; < *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, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): fields, roadsides, pastures; common, introduced from Europe. May-September. [= FNA; < *D. armeria* – RAB, C, F, G, K, S, W]
* ***Dianthus barbatus*** Linnaeus *ssp. **barbatus***, Sweet William. Pd (NC, SC), Mt (VA), {GA}: cultivated as an ornamental, rarely escaped to disturbed areas; rare, introduced from Europe. June-August. [= FNA; < *D. barbatus* – RAB, C, F, G, K]
* ***Dianthus deltoides*** Linnaeus *ssp. **deltoides***, Maiden Pink, Meadow Pink. Pd (NC, VA), Mt (NC): cultivated as an ornamental, rarely escaped to adjacent areas; rare, introduced from 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, introduced from 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 (GA): moist hammocks, moist disturbed areas; rare. Sc. GA south to 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]

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 Stems simple, few-branched toward the top; leaves (1-) 3-16 mm wide.....***G. elegans***
1 Stems diffusely and repeatedly near the base and upward; leaves 0.2-2 (-3) mm wide .....***[G. muralis]***

* ***Gypsophila elegans*** Bieberstein, Annual baby's-breath. Cp, Pd (NC): disturbed areas, persistent from cultivation, doubtfully established; rare, introduced. See Rabeler & Thieret (1988) for additional information. [= C, FNA, K]

* *Gypsophila muralis* Linnaeus, Cushion baby's-breath. Disturbed areas, roadsides, yards, cemeteries; native of Europe, reported for various eastern states, including KY, TN, PA, NJ (FNA, Kartesz 1999). [= C, FNA, K]

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, Pd (GA, NC, SC, VA), Cp (VA): fields, roadsides, lawns, other disturbed areas; common, introduced from 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]

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 (VA): seabeaches and dunes; rare (VA Rare). June-July. The species is circumboreal, in North America ranging south to e. VA. Ssp. *robusta* ranges from Newfoundland south to e. VA; 3 other subspecies do not occur south of Newfoundland. [= FNA, K; = *Honckenya peploides* var. *robusta* (Fernald) House – C; = *Arenaria peploides* Linnaeus var. *robusta* Fernald – F; = *Honkenya peploides* ssp. *robusta* – G (apparently misspelled)]

Lychnis Linnaeus 1753 (Campion)
(see *Silene*)

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 (GA, NC, SC, VA): deep white sands of barren sandhills; uncommon (VA Rare). April-June. NY (and formerly RI) to panhandle FL, on the Coastal Plain. [= FNA, K; = *Arenaria caroliniana* Walter – RAB, C, F, G; = *Sabulina caroliniana* (Walter) Small – S; = *Alsinopsis caroliniana* (Walter) Small; = *Minuopsis caroliniana* (Walter) W.A. Weber]

Minuartia glabra (Michaux) Mattfeld, Appalachian Sandwort. Pd, 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 (NC, SC), {GA}: tidal freshwater marshes, other wetlands; rare (US Species of Concern, NC Endangered, SC 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, nc. FL, wc. AL, and se. AR.

[= FNA, K; = *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), 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 (NC Rare, VA Rare). May-October. Greenland, Nova Scotia, and Québec 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): limestone, dolostone, calcareous sandstone, and calcareous shale outcrops and barrens; uncommon. 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]

Minuartia patula (Michaux) Mattfeld, Lime-barren Sandwort. Mt (GA, VA), Pd (VA), Cp (GA): on 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; rare (NC Endangered, SC Rare). 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 cumberlandensis (B.E. Wofford & Kral) McNeill, Cumberland Sandwort. Endemic to 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 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): rocky, disturbed areas (powerline) over mafic rocks (diabase); rare (VA Rare). May-July. Circumboreal, ranging south in North America to n. VA (Fairfax County), e. 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), Pd, Cp (VA): marshes, streambeds; uncommon, though locally abundant (rare south of VA), introduced from Europe. June-October. [= F, FNA, K; = *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 (1962)=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 equalling 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; sepals oblong-ovate, 1-nerved, planar, the apiculate hood very short ..... ***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 2-3 mm long.
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 (GA, SC): sandhills; rare (SC 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, 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), Pd (NC, VA): thin soils of rock outcrops, especially on mountain summits at medium to high elevations, disjunct to a few Piedmont monadnocks; uncommon (GA Special Concern). 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; > *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 (GA, NC, SC): dry sandy sites, woodlands or dunes; uncommon. June-October. E. NC south to FL and west to AL (and LA?), on the Coastal Plain. [= K, Y, Z; < *P. baldwinii* – FNA; = *P. baldwinii* – RAB; = *Anychiastrum baldwinii* (Torrey & Gray) Small – S]

Paronychia baldwinii (Torrey & A. Gray) Fenzl ex Walpers *ssp.* ***riparia*** (Chapman) Chaudhri, Perennial Dune Whitlow-wort. Cp (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* Chapman – RAB, C, F; < *P. baldwinii* – FNA; = *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), Pd, Cp (NC, SC, VA): dry rocky woods, shale barrens; uncommon (rare on the Coastal Plain). June-October. NH and s. Ontario 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, Z; = *Anychia canadensis* (Linnaeus) Britton, Sterns, & Poggenburg – S]

Paronychia fastigiata (Rafinesque) Fernald *var.* ***fastigiata***, Common Forked Whitlow-wort. Mt, Pd, Cp (NC, SC, VA): dry, usually rocky, woodlands, often on thin soil around outcrop edges; uncommon. 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, 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): habitat not known; rare. June-October. NY, sc. PA, n. VA, WV, e. TN, and w. NC. [= C, F, FNA, G, K, Z; < *P. fastigiata* – RAB, W; < *Anychia polygonoides* Rafinesque – S]

Paronychia fastigiata (Rafinesque) Fernald *var.* ***paleacea*** Fernald, Green Forked Whitlow-wort. Mt, Pd, Cp (NC, VA): dry, mostly rocky woodlands; uncommon. June-October. NJ, DE, and PA west to IL, south to VA, NC, KY, TN, MO, and TX. [= C, F, G, K, Z; < *P. fastigiata* – RAB, W; < *P. fastigiata* var. *fastigiata* – FNA; < *Anychia polygonoides* Rafinesque – S]

Paronychia herniarioides (Michaux) Nuttall, Michaux's Whitlow-wort. Cp (NC, SC): sandhills; rare. April-July. Sc. NC south to c. peninsular 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. [= RAB, FNA, K, 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 (GA): sandhills; rare (GA Special Concern). July-September. Sw. GA west to s. AL, south to c. peninsular FL. [= FNA, K, X, Y, Z; = *Siphonychia diffusa* Chapman – S]

Paronychia rugelii (Chapman) Shuttleworth ex Chapman, Sand-squares, Rugel's Nailwort. Cp (GA): sandhills; rare (GA Special Concern). July-October. S. GA south to c. peninsular FL. [= FNA, 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), Pd (GA, VA): shale barrens, rocky riversides, calcareous rock outcrops and talus, serpentine outcrops; rare (US Species of Concern, GA Special Concern, VA 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; = *P. virginica* ssp. *virginica* – G; = *P. dichotoma* (Linnaeus) Nuttall – S]

Paronychia erecta (Chapman) Shinners var. *corymbosa* (Small) Chaudhri, Hairy Squareflower. Coastal dunes, Panhandle FL west to se. LA. March-November. [= K, Y, Z; = *Odontonychia corymbosa* Small – S; < *Paronychia erecta* – FNA, X]

Paronychia erecta (Chapman) Shinners var. *erecta*, Smooth Squareflower. Coastal dunes, Panhandle FL west to s. MS. March-November. [= K, Y, Z; = *Odontonychia erecta* (Chapman) Small – S; < *Paronychia erecta* – FNA, X]

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 (SC, VA), Mt (NC, VA), Pd (GA, NC, VA): roadsides, disturbed areas; uncommon, introduced from Europe. May-September. Reported for GA by Duncan (1985). [= C, FNA, K, Z; = *Dianthus prolifer* Linnaeus – F; = *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 (GA, SC): disturbed areas; rare, introduced from Europe. April-October. [= FNA, K; < *Polycarpon tetraphyllum* – RAB, S]

Sagina Linnaeus 1753 (Pearlwort)
[also see *Moenchia*]

A genus of about 25 species, herbs, mainly north temperate. References: Crow in FNA (2005); Crow (1978)=Z; Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

1 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***
1 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, Pd, Mt (GA, NC, SC, VA): disturbed ground, fields, cracks in pavement or sidewalks; common (uncommon in Mountains). March-June. New Brunswick west to IL and MO, south to 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; = *S. decumbens* ssp. *decumbens* – FNA, K, Z]

* ***Sagina procumbens*** Linnaeus, Northern Pearlwort, Bird's-eye. Mt (NC): gravel parking lot on summit of Roan Mountain; rare, introduced from 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 Nova Scotia and Québec south to MD, and from sw. British Columbia 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 is almost certainly adventive. [= C, FNA, G, K, Z; > *S. procumbens* var. *procumbens* – F; > *S. procumbens* var. *compacta* Lange – F]

* *Sagina japonica* (Swartz) Ohwi, Japanese Pearlwort, native of e. Asia, is naturalized in se. PA (Rhoads & Klein (1993). [= FNA, K]

Saponaria Linnaeus 1753 (Soapwort)
(also see *Vaccaria*)

A genus of about 40 species, herbs, of temperate regions of Eurasia. References: Thieret & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

* ***Saponaria officinalis*** Linnaeus, Soapwort, Bouncing Bet. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas, fields, roadsides; common, introduced from Europe. May-October. [= RAB, C, F, FNA, G, K, S, W]

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. Pd, Cp, Mt (GA, NC, SC, VA): fields, ditches, roadsides, other disturbed areas; common (uncommon in Mountains), introduced from Europe. April-October. [= RAB, C, F, G, K, W]

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).

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; plants perennial; [native].
      - 10 Plants (5-) 7-15 dm tall; calyx ca. 1 cm long; stem with short rigid pubescence..... ***S. ovata***
      - 10 Plants 2-6 dm tall; calyx ca. 2.5 cm long; stem with long, villous pubescence ..... ***S. polypetala***
    - 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 Plants rhizomatous perennials (biennial in *S. csereii*); petals white.
          - 15 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***
          - 15 Fruiting calyx clavate or campanulate, not contracted at the mouth; stamens 1.0-1.5 × as long as the calyx; filaments usually white.

16 Petal appendages 1.0-1.6 mm long; inflorescences leafy; [native] ..... ***S. nivea***
16 Petal appendages absent or to 0.2 mm long; inflorescences with reduced leaves resembling bracts; [alien, mostly of disturbed habitats]..... ***S. vulgaris***
14 Plants annuals; petals white, pink, or lavender.
17 Stems glabrous or sparsely pubescent (if pubescent, puberulent).
18 Calyx 4-10 mm long; carpophore ca. 1 mm long..... ***S. antirrhina***
18 Calyx 13-17 mm long; carpophore 7-8 mm long..... ***S. armeria***
17 Stems densely pubescent (hirsute or glandular-hirsute).
19 Petals entire or emarginate; fruiting calyx 6-10 mm long..... ***S. gallica***
19 Petals deeply 2-lobed; calyx; fruiting calyx 10-30 mm long.
20 Fruiting calyx 10-15 mm long; petal appendages ca. 0.2 mm long..... ***S. dichotoma***
20 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, Pd, Cp (GA, NC, SC, VA): fields, disturbed areas; common. April-July. Nearly throughout North America, and in Mexico and South America; introduced in Europe. [= RAB, C, F, FNA, G, K, S, W]

* ***Silene armeria*** Linnaeus, Sweet William Catchfly, None-so-pretty, Garden Catchfly. Mt, Pd (NC, VA), Cp (NC, SC, VA): disturbed areas; rare, introduced from Europe. June-October. [= RAB, C, F, FNA, G, K, W]

Silene caroliniana Walter *var.* ***caroliniana***, South Carolina Wild-pink, Rock Catchfly. Pd, Cp (GA, NC, SC): in acidic, sandy, open woodlands, especially woodlands around granitic flatrocks and sandy Coastal Plain woodlands; common (rare in NC) (GA Special Concern, NC Watch List). April-July. Sc. NC south through the e. three-quarters of SC just into e. GA. See Wilbur (1970b) and Clausen (1939) for additional discussion of these infraspecific taxa in *S. caroliniana*. [= C, F; < *S. caroliniana* – RAB, S; = *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, Pd (NC, VA), Cp (NC, SC, VA): open woodlands, especially calcareous; common (rare in NC) (NC Watch List). 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. caroliniana* ssp. *caroliniana* var. *pensylvanica* – Y]

* ***Silene coronaria*** (Linnaeus) Clairville, Mullein-pink, Rose Campion. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): disturbed areas; uncommon (rare south of VA), introduced from Europe. May-July. [= FNA; = *Lychnis coronaria* (Linnaeus) Desrousseaux – RAB, C, F, G, K]

* ***Silene csereii*** Baumgarten, Balkan Bladder-campion. Mt (NC): habitat not known; rare, introduced from 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), Pd (VA), {GA}: fields, disturbed areas; common, introduced from Europe. May-August. [= FNA; < *S. dichotoma* – RAB, C, F, G, K, S, W]

* ***Silene gallica*** Linnaeus, Small-flowered Catchfly. Cp (NC, SC, VA): sandy disturbed areas; rare, introduced from Europe. May-July. [= RAB, C, F, FNA, G, K; > *S. anglica* Linnaeus – S, misapplied]

* ***Silene latifolia*** Poiret, White Campion, White Cockle, Evening Lychnis. Mt, Pd, Cp (NC, SC, VA): fields, roadsides, disturbed areas; common (rare south of NC), introduced from Europe. May-July. [= C, FNA; > *S. latifolia* Poiret ssp. *alba* (P. Miller) Greuter & Burdet – K; = *Lychnis alba* P. Miller – RAB, F, G, S, W; *? S. pratensis* (Rafinesque) Grenier & Godron; *? Melandrium dioicum* (Linnaeus) Cosson & Germain]

Silene nivea (Nuttall) Muhlenberg ex Otth, Snowy Campion. Mt (GA, VA), 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, s. WV, nw. GA (Jones & Coile 1988), TN, and MO. [= C, F, FNA, G, K, W; = *Silene alba* Muhlenberg – S, misapplied]

* ***Silene noctiflora*** Linnaeus, Sticky Cockle, Night-flowering Catchfly, Sticky Campion. Mt, Pd, Cp (NC, VA): fields, disturbed areas; rare, introduced from Europe. June-August. [= RAB, C, F, FNA, G, K, S, W; = *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 (US Species of Concern, GA Special Concern, NC Rare, SC Rare, VA 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 polypetala (Walter) Fernald & Schubert, Eastern Fringed Catchfly, Fringed Campion. Cp (GA): mesic deciduous forests along streams or on lower- to mid-slopes; rare (US Endangered, GA Endangered). Mid-March-early May. C. GA south to Panhandle FL, and possibly in AL based on a C.T. Mohr specimen (see FNA). [= FNA, K; = *S. baldwinii* Nuttall – S]

Silene regia Sims, Royal Catchfly. Cp (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]

Silene rotundifolia Nuttall, Roundleaf Fire-pink, Sandstone Fire-pink. Mt (GA, VA): sandstones cliffs, ledges, and talus, and at bases of sandstone cliffs; rare (GA, Special Concern, VA 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]

Silene stellata (Linnaeus) Aiton f., Starry Campion, Widow's-frill. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): dry to mesic forests, rock outcrops; common (rare in Coastal Plain). July-September. CT west to SD, south to c. GA and TX. [= RAB, F, FNA, K, S, W; > *S. stellata* var. *stellata* – C, G; > *S. stellata* var. *scabrella* Palmer & Steyermark – C, G]

Silene virginica Linnaeus, Fire-pink. Mt, Pd, Cp (GA, NC, SC, VA): woodlands, rock outcrops, crevices in cliffs, roadbanks; common (rare in Coastal Plain). April-July. NJ and NY west to s. Ontario and se. MI, south to Panhandle FL (Bay County), GA and OK. Three varieties require additional investigation. Var. *robusta* Strausbaugh & Core, named from locations in e. WV, should be in our area, but the distinction stated in Strausbaugh & Core (1978) ("a more vigorous plant with leaves up to 15 cm. long") needs strengthening to warrant recognition. [= RAB, C, F, FNA, G, S, W; > *S. virginica* var. *virginica* – K; > *S. virginica* var. *robusta* Strausbaugh & Core – K]

* ***Silene vulgaris*** (Moench) Garcke, Bladder Campion, Maiden's-tears. Mt (NC, VA), Pd (GA, NC, VA), Cp (NC, SC, VA): disturbed areas; common (uncommon to rare south of VA and in VA Coastal Plain), introduced from Europe. May-August. [= C, FNA, K; = *S. cucubalus* Wibel – RAB, G, W; > *S. cucubalus* var. *cucubalus* – F; > *S. cucubalus* var. *latifolia* (Reichenbach) G. Beck – F; > *S. latifolia* (P. Miller) Britten & Rendle - S]

Silene caroliniana Walter var. *wherryi* (Small) Fernald. {VA}: {habitat}; rare? 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 dioica* (Linnaeus) Clairville, Red Campion, Red Catchfly, is 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]

Silene flos-cuculi (Linnaeus) Clairville ssp. *flos-cuculi*, Ragged Robin. Native of Europe, introduced and established in ne. North America, as in MD, PA. [= FNA; < *Lychnis flos-cuculi* Linnaeus – C, F, G, K]

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 (GA, NC, SC, VA), Pd (NC, SC, VA), Mt (VA): fields, roadsides; common, introduced from 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; > *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, introduced from Europe. April-June. [= RAB, C, F, FNA, G, K]

* *Spergula morisonii* Boreau, Morison's Spurrey. Fallow fields, disturbed areas. Introduced from 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, introduced from Europe. Naturalized in GA and AL (FNA). [= FNA, K]

* ***Spergularia rubra*** (Linnaeus) J.& K. Presl, Purple Sand-spurrey, Roadside Sand-spurrey. Pd (VA): disturbed areas; rare, introduced from Eurasia. May-September. [= C, F, FNA, G, K; = *Tissa rubra* (Linnaeus) Britton – S]

Spergularia salina J. & K. Presl, Saltmarsh Sand-spurrey. Cp (GA, NC, SC, VA): brackish and salt marsh flats; uncommon. June-October. Widespread on coasts of North America (from Québec south to FL, from British Columbia 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, misapplied; = *Tissa marina* (Linnaeus) Britton – S, misapplied]

* *Spergularia media* (Linnaeus) K. Presl var. *media*. 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, equalling 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; 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), Pd (GA): seepages; rare (NC 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 corei Shinners, Tennessee Starwort. Mt (NC, VA): cove forests and seepages at moderate to high elevations; rare (NC Watch List, VA 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; it seems best to treat these two related taxa 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; = *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, Pd, Cp (NC, SC, VA): fields, roadsides, pastures, disturbed areas; common, introduced from Europe. May-August. [= RAB, C, F, FNA, G, GW, K, W; = *Alsine longifolia* (Muhlenberg ex Willdenow) Britton – S, misapplied]

* ***Stellaria holostea*** Linnaeus, Easter-bell, Greater Stitchwort. Cp? (NC): escaped or persistent from cultivation; rare, introduced from Europe. [= C, F, FNA, G, K]

Stellaria longifolia Muhlenberg, Longleaf Stitchwort. Mt, Pd (VA), Cp (SC): meadows, floodplain forests, freshwater tidal marshes, moist disturbed areas; uncommon. Apparently circumboreal, in North America ranging south to e. SC, w. VA, e. TN, MO, KS, AZ, and CA. [= C, F, FNA, G, W; > *S. longifolia* var. *longifolia* – K]

* ***Stellaria media*** (Linnaeus) Villars, Common Chickweed. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): disturbed areas, gardens, fields; common, introduced from Europe. January-December. [= FNA; < *S. media* – RAB, C, G, W (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, introduced from 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 (NC, SC, VA): disturbed areas, gardens, fields; common, introduced from 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; >< *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 (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; = *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, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): bottomland forests, moist slopes, coves; common (uncommon in Coastal Plain). April-June. NJ west to IL, south to panhandle FL and AL. See *S. corei* for comments. [= RAB, FNA, G, K, W; = *S. pubera* var. *pubera* – C, F; = *Alsine pubera* (Michaux) Britton – S]

Stellaria borealis Bigelow var. *borealis* is a native species which ranges south to Canaan Valley (Tucker County, WV) and sc. PA; it might be sought in our area in cold swamps in w. VA. It will key most closely to *S. alsine* in the key above, but differs in having seeds smooth or weakly sculptured (vs. tuberculate) and in having the lower bracts of the inflorescence leaf-like rather than scarious. [= C; = *S. borealis* ssp. *borealis* – FNA, K; > *S. calycantha* (Ledebour) Bongard var. *floribunda* Fernald – F, G; > *S. calycantha* var. *isophylla* Fernald – F, G, misapplied]

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 1-2 species, herbs, of se. North America. References: Swanson & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: 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.

Stipulicida setacea Michaux *var.* ***setacea***, Wire-plant. Cp (GA, NC, SC, VA): xeric sands of sandhills, dry pine flatwoods, maritime forests; common, rare in VA (VA Rare). May-August. Se. VA south to FL, west to LA. Var. *lacerata* James is endemic to peninsular FL. Var. *filiformis* (Nash) D.B. Ward, also of FL, is sometimes lumped into var. *setacea*. [< *S. setacea* var. *setacea* – FNA, K (in a broader sense, including var. *filiformis*); < *S. setacea* – RAB, C; < *S. setacea* – S, in a narrower sense (not including 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 (SC, VA): fields, disturbed areas; rare, introduced from Europe. May-June. The record from VA (Arlington County) probably represents a waif. [= C, FNA, K; =*? V. pyramidata* Medikus – RAB; = *Saponaria vaccaria* Linnaeus – F; =*? Vaccaria segetalis* Garcke ex Ascherson – G; = *Vaccaria vaccaria* (Linnaeus) Britton – S]

CASUARINACEAE R. Brown 1814 (Casuarina Family)

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 Rumph. ex 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.

* *Casuarina equisetifolia* Linnaeus ssp. *equisetifolia*, Casuarina, Australian-pine, Horsetail Casuarina, Beach She-oak, Coastal She-oak, was reported as planted and persistent on the Outer Banks of NC by Brown (1959). It is probably not established. [= FNA; < *C. equisetifolia* – K, S, Z]

CELASTRACEAE R. Brown 1814 (Bittersweet Family)

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.
    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 ; Simmons in Kubitzki (2004).

1 Flowers in 2-3-flowered axillary cymes; leaves mostly obovate, averaging 1.2-1.7× as long as wide ..... ***C. orbiculatus***
1 Flowers in 6-many-flowered terminal panicles; leaves mostly ovate-lanceolate to elliptic, averaging 1.8-2.6× as long as wide ..... ***C. scandens***

* ***Celastrus orbiculatus*** Thunberg, Oriental Bittersweet. Mt, Pd, Cp (GA, NC, SC, VA): thickets, roadsides, forests; common, introduced from 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. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): mesic forests; common (uncommon in VA Piedmont and VA Coastal Plain, rare south of VA) (GA Special Concern, NC Watch List). May-June; August-September. Québec west to Manitoba 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. Cp (NC): disturbed, acid, peaty soil; rare, introduced from 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; = *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: Voss (1985)=Z; Simmons in Kubitzki (2004). Key adapted in part from Duncan & Duncan (in prep.).

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); flowers 4- or 5-merous; [introduced or native].
  2 Leaves evergreen; flowers 4-merous; [introduced species, rarely naturalized].
    3 Petioles of the larger leaves (8-) 11-17 mm long; trailing shrub or climbing vine ..... ***E. fortunei* var. *radicans***
    3 Petioles of the larger leaves 4-7 (-8) mm long; shrub or small tree to 6 m tall.
      4 Petioles of the larger leaves 6-12 mm long; leaves evergreen, rather thick in texture; inflorescence a dense, few-flowered cyme; shrub or small tree to 6 m tall ..... ***E. japonicus***
      4 Petioles of the larger leaves 4-7 (-8) mm long; leaves semi-evergreen, rather thin in texture; inflorescence a loose, many-flowered cyme; spreading shrub to 3 m tall ..... ***E. kiautschovicus***
  2 Leaves deciduous; flowers 4- or 5-merous; [introduced or native].
    5 Petioles 5-33 mm long; flowers 4-merous; [introduced, rarely naturalized].
      6 Leaf apex long-acuminate; larger leaves with teeth 6-8 per cm ..... ***E. bungeanus***
      6 Leaf apex acute to short-acuminate; larger leaves 8-11 per cm; [section *Euonymus*] ..... ***E. europaeus***
    5 Petioles 1-5 mm long; flowers 4- or 5-merous; [native and introduced].
      7 Twigs and branches with 2-4 corky wings; flowers 4-merous; capsules smooth; [introduced, rarely naturalized]; [section *Melanocarya*] ..... ***E. alatus***
      7 Twigs and small branches lacking corky wings, terete (or nearly so); flowers 5-merous; capsules muricate; [native species]; [section *Echinococcus*].
        8 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***
        8 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. Cp, Pd (NC, SC, VA), Mt (NC, VA): cultivated, rarely naturalized; rare, introduced from e. Asia. Reported for NC (Jackson Co.) by Pittillo & Brown (1988). [= C, F, G; = *Euonymus alata* – K, Z]

Euonymus americanus Linnaeus, Strawberry-bush, Heart's-a-bustin'-(with-love). Mt, Pd, Cp (NC, SC, VA): forests; common. 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; = *Euonymus americana* – K]

Euonymus atropurpureus Jacquin *var.* ***atropurpureus***, American Wahoo, Burning Bush. Mt (NC, SC, VA), Pd (NC, SC, VA), Cp (VA): bottomland forests, riverbanks, mostly on rich alluvial sediments, or on slopes over mafic or calcareous rocks; uncommon (rare south of VA). May; October. NY west to ND, south to panhandle FL and TX. [= K; < *Euonymus atropurpureus* – RAB, C, F, G, S, W; < *Euonymus atropurpurea* – Z]

* ***Euonymus bungeanus*** Maximowicz, Winterberry. Cp (SC): cultivated, rarely naturalized; rare, introduced from n. China. [= *Euonymus bungeanum* – K]

* ***Euonymus europaeus*** Linnaeus, European Spindle-tree. Cp (VA): cultivated, rarely naturalized; rare, introduced from Europe. [= C, F, G; = *Euonymus europaea* – K, Z]

* ***Euonymus fortunei*** (Turczaninow) Handel-Mazzetti *var.* ***radicans*** (Siebold ex Miq.) Rehder, Wintercreeper, Chinese Spindle-tree. Pd (NC, SC), Mt, Cp (VA): cultivated, rarely naturalized, as in bottomlands or swamps, where sometimes climbing into the canopy; rare, introduced from China. [= K; < *E. fortunei* – F, G, Z]

* ***Euonymus japonicus*** Thunberg, Japanese Spindle-tree. Cp (NC, VA): disturbed areas; rare, introduced from Japan. Widely planted on the Outer Banks of NC because of its resistance to salt damage (Brown 1959). [= C; = *E. japonica* – K]

* ***Euonymus kiautschovicus*** Loesener. Pd (NC): cultivated, rarely naturalized; rare, introduced from e. and c. China. [= *Euonymus kiautschovica* – K]

Euonymus obovatus Nuttall, Running Strawberry-bush. Mt (GA, NC): cove forests, northern hardwood forests, other mesic forests, especially in boulderfields, where sometimes quite abundant locally; uncommon. 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 British Columbia and Alberta south to AZ and NM, and ssp. *mexicana* Navaro & Blackwell of mountainous Mexico (Coahuila, Nuevo Leon, 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. Mt (NC*, VA): in VA 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); rare (US Species of Concern, NC Watch List, VA Rare). 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 some 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 (the name not validly published); = *Pachystima canbyi* – G, S (the name not validly published)]

CELTIDACEAE Link 1831 (Hackberry Family)
(see *CANNABACEAE*)

CERATOPHYLLACEAE S.F. Gray 1821 (Hornwort Family)

A peculiar and apparently very primitive family, of a single genus and about 6 species, aquatic herbs, of cosmopolitan distribution. The Ceratophyllaceae "may have actually arisen from early angiosperms that existed prior to the fundamental evolutionary divergence of monocots and dicots (Les 1988c; Les in Kubitzki, Rohwer, & Bittrich 1993). References: Les in FNA (1997); Les (in prep., 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. Cp (GA, NC): ponds, pools, slow-moving streams; rare (NC Watch List). 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. Cp (GA, NC, SC, VA), Mt (GA, VA), Pd (VA): ponds, pools, slow-moving streams; uncommon. May-September. 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. Cp (NC, SC, VA), Mt (GA, VA), Pd (VA): ponds, pools, slow-moving streams; uncommon. May-September. Newfoundland west to Ontario and n. MN, south to c. peninsular FL and e. TX; also in British Columbia, 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]

CHENOPODIACEAE Ventenat 1799 (Goosefoot Family)

A family of over 100 genera and about 1450-1500 species, nearly cosmopolitan, but most diverse in subtropical and temperate regions (Judd & Ferguson 1999). Perhaps better united with the Amaranthaceae. References: Welsh, Crompton, & Clemants in FNA (2003b); Judd & Ferguson (1999)=Z; Kühn in Kubitzki, Rohwer, & Bittrich (1993).

{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}

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) considerably longer than the 2 lateral flowers ..... ***Salicornia***
  2 Perennial from a horizontal rhizome; central flower (of each group of 3) slightly or not at all longer than 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***

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; [of NC northward].....***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; [of NC southward].....***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. 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 (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, Mt (VA): disturbed areas, inland saline areas; rare, introduced from 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 (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 Augustin de Candolle, Thinleaf Orach, Fat-hen. Cp (NC, SC, VA), Mt? (VA?): marsh edges, brackish flats; uncommon. July-frost. Widespread in e. North America, also in w. North America and Eurasia, usually considered to be introduced from 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 littoralis* Linnaeus, Narrow-leaved Atriplex. 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, 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 (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, Mt (VA), Cp (SC, VA): waste ground, particularly along railroad tracks, also in waste areas near wool-combing mill; uncommon, 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, Pd, Mt (NC, SC, VA): commonly cultivated, rarely escaped or persisting, introduced from Eurasia. [= FNA; > *B. vulgaris* var. *vulgaris* – G; > *B. vulgaris* var. *cicla* – G; < *B. vulgaris* – K, Z; *? B. vulgaris* – S]

Chenopodium Linnaeus 1753 (Goosefoot, Lamb's-quarters, Pigweed)
(also see *Dysphania*)

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).

1 Seeds vertical or both horizontal and vertical; leaf blades glabrous or occasionally sparsely farinose; [subgenus *Blitum*].
  2 Perianth segments 5; plants perennial; [subgenus *Blitum*, section *Agathophytum*] ..... ***[Ch. bonus-henricus]***
  2 Perianth segments 3; plants annual.
    3 Leaves lancolate or oblong, glaucous on the lower surface..... ***Ch. glaucum***
    3 Leaves triangular or rhombic, green on the lower surface.
      4 Leaves farinose on the lower surface; [subgenus *Blitum*, section *Degenia*] ..... ***Ch. 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*] ..... ***Ch. 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*] ..... ***[Ch. rubrum]***
1 Seeds all horizontal; leaf blades usually farinose; [subgenus *Chenopodium*].
  6 Flowers individually disposed in panicles; leaf blades glabrous; [subgenus *Chenopodium*, section *Grossefoveata*] ..... ***Ch. simplex***
  6 Flowers in loose or sense 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 *Ch. foggii*); [subsection *Leptophylla*].
      8 Perianth spreading from fruit at maturity; plants strictly erect ..... ***Ch. pratericola***
      8 Perianth enclosing the fruit at maturity; plants erect to spreading.
        9 Plants usually spreading; perienth segments obtuse; leaf blades usually unlobed ..... ***[Ch. desiccatum]***
        9 Plants erect; perianth segments acute; leaf blades often with basal lobes..... ***Ch. foggii***
    7 Primary leaves ovate, rhombic, triangular, or lanceolate, usually with basal lobes and often also with additional teeth on the margins.
      10 Seeds honeycomb-pitted; [subsection *Favosa*].
        11 Seeds 1.2-2.0 mm in diameter.
          12 Style bases with yellow area; seeds 1.2.1.5 mm in diameter ..... ***Ch. berlandieri*** *var.* ***zschackei***
          12 Style bases without yellow area; seeds 1.3-2.0 mm in diameter.
            13 Inflorescences large and drooping; seeds 1.7-2.0 mm in diameter ..... ***Ch. berlandieri*** *var.* ***bushianum***
            13 Inflorescences small and erect; seeds 1.3-1.9 mm in diameter ..... ***Ch. berlandieri*** *var.* ***macrocalycium***
        11 Seeds 1.0-1.3 mm in diameter.
          14 Leaves rhombic-triangular, usually without basal lobes; inflorescences becoming bractless..... ***Ch. berlandieri*** *var.* ***boscianum***
          14 Leaves 3-lobed; inflorescences with or without bracts.
            15 Inflorescences bractless ..... ***[Ch. berlandieri*** *var.* ***berlandieri]***
            15 Inflorescences with leafy bracts..... ***Ch. berlandieri*** *var.* ***zschackei***
      10 Seeds smooth or areolate.
        16 Leaves triangular.
          17 Seeds 1.0-1.5 mm in diameter, the seed margin sharp; leaf blades without basal lobes; [subsection *Undata*] ..... ***Ch. murale***
          17 Seeds 0.8-1.2 mm in diameter, the seed margin rounded; leaf blades often with basal lobes; [subsection *Urbica*] ..... ***[Ch. urbicum]***
        16 Leaves ovate to broadly ovate, rhombic, or lanceolate, variously lobed or toothed.

18 Leaf blades without teeth, except for the often present basal lobes or teeth.
19 Leaves not aromatic; flowers in each glomerule in markedly different stages of development; [subsection *Standleyana*].....***Ch. standleyanum***
19 Leaves strongly malodorous; flowers in each glomerule in similar stages of development; [subsection *Chenopodium*] .....***[Ch. vulvaria]***
18 Leaf blades with lateral teeth and often basal lobes; [subsection *Chenopodium*].
20 Leaves widely ovate, 1× as long as wide; lateral leaf lobes as large as the terminal lobe..... ..... ***Ch. opulifolium***
20 Leaves ovate, rhombic, or lanceolate, >1× as long as wide; lateral leaf lobes smaller than the terminal lobe (or absent).
21 Leaf margins tapering to an acute apex; leaves ovate, rhombic, or lanceolate; inflorescence branched (spicate or cymose) ..... ***Ch. album***
21 Leaf margins more or less parallel below the obtuse apex; leaves lanceolate yo narrowly elliptic; inflorescence generally moniliform, not profusely branched..... ***Ch. strictum***

Chenopodium album Linnaeus, Lamb's-quarters, Pigweed. Cp, Pd, Mt (GA, NC, SC, VA): 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; < *Ch. album* – RAB, in part (also including *Ch. berlandieri* and all vars); > *Ch. album* Linnaeus var. *album* – K; > *Ch. album* Linnaeus var. *missouriense* (Aellen) I.J. Bassett & C.W. Crompton – K; > *Ch. album* – C, in the narrow sense; < *Ch. album* – G; > *Ch. missouriense* Aellen – C, Y; > *Ch. paganum* – F, S, misapplied; < *Ch. album* – FNA, G, in part; > *Ch. album* var. *album* – Y; > *Ch. album* var. *lanceolatum* (Muhlenberg ex Willdenow) Coss. & Germ. – Y; > *Ch. giganteum* Don – Y; > *Ch. lanceolatum* Muhlenberg ex Willdenow]

* ***Chenopodium atrovirens*** Rydberg. Cp (SC): waste areas near wool-combing mills; rare, perhaps merely a waif, introduced from w. North America. [= FNA, K] {not keyed}

*? ***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; < *Ch. album* – RAB]

Chenopodium berlandieri Moquin-Tandon *var. **bushianum*** (Aellen) Cronquist, Soybean Goosefoot. Cp (NC, SC, VA): disturbed areas, alluvial forests; rare. June-November. ME west to ND, south to VA, TN, LA, and KS. [= C, FNA, K; < *Ch. album* – RAB, G; < *Ch. berlandieri* – S; = *Ch. bushianum* Aellen – Y]

Chenopodium berlandieri Moquin-Tandon *var. **macrocalycium*** (Aellen) Cronquist. Cp (NC, SC, VA): coastal sands, beaches; rare. August-October. Nova Scotia south to FL. [= C, FNA, K; < *Ch. album* – RAB, G; = *Ch. 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, introduced from sw. North America. [= FNA, K, Y] {not keyed}

*? ***Chenopodium berlandieri*** Moquin-Tandon *var. **zschackei*** (J. Murr) J. Murr ex Ascherson. Mt (VA), {NC, SC}. Ontario west to AK, south to LA, CA, and Mexico; scattered eastern occurrences may be introduced. [= C, FNA, K, Y; < *Ch. album* – RAB]

Chenopodium foggii H.A. Wahl. Mt (NC, VA): rocky, mountain slopes; rare. July. ME and Ontario south to w. VA and w. NC. [= FNA, K, Y; < *Ch. pratericola* Rydberg – C, in part]

* ***Chenopodium fremontii*** S. Watson. Cp (SC): waste areas near wool-combing mills; rare, perhaps merely a waif, native of w. North America. [= FNA; = *Ch. fremontii* var. *fremontii* – K, Y] {not keyed}

* ***Chenopodium glaucum*** Linnaeus, Oakleaf Goosefoot. Pd (VA), {SC}: disturbed areas; rare, native of ne. North America and Europe. [= FNA, K; < *Ch. glaucum* – C, F, G, in a broad sense; = *Ch. 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; *? Ch. incanum* – Y] {not keyed}

* ***Chenopodium macrospermum*** Hooker f. Cp (NC): disturbed areas; rare, native of South America. Reported for NC (FNA 2003b). [= FNA; > *Ch. macrospermum* Hooker f. var. *farinosum* (S. Watson) J.T. Howell – K; > *Ch. macrospermum* Hooker f. var. *halophilum* (Phil.) Standley – K, Y]

* ***Chenopodium murale*** Linnaeus, Nettleleaf Goosefoot, Sowbane. Cp (GA, NC, SC, VA): 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. Cp (NC): disturbed areas on ship's ballast; rare, introduced from s. Europe. [= RAB, C, FNA, K]

Chenopodium pratericola Rydberg, Narrowleaf Goosefoot. Cp (GA, NC, SC, VA): sandy soils, roadsides, disturbed areas; uncommon. May-November. Maine and Ontario west to Yukon, south to FL, TX, and CA. [= FNA, K; = *Ch. desiccatum* A. Nelson var. *leptophylloides* (J. Murray) H.A. Wahl – RAB, W, misapplied; < *Ch. pratericola* – C (also see *Ch. foggii*); *? Ch. leptophyllum* – F, G, misapplied; = *Ch. pratericola* var. *pratericola* – Y]

Chenopodium simplex (Torrey) Rafinesque, Mapleleaf Goosefoot. Mt (NC, VA), Pd (VA): in shaded situations, generally at cliff bases; rare (NC Rare, VA Watch List). July-October. Nova Scotia west to AK, south to nw. NC, LA, TX, and UT. [= FNA, K; = *Ch. gigantospermum* Aellen – C, W, Y; = *Ch. hybridum* Linnaeus var. *gigantospermum* (Aellen) Rouleau – F; < Ch. hybridum – G; = *Ch. hybridum* Linnaeus ssp. *gigantospermum* (Aellen) Hultén]

Chenopodium standleyanum Aellen, Woodland Goosefoot. Mt, Pd, Cp (VA), {GA, NC, SC}: rock outcrops, steep slopes, shaded disturbed soils; uncommon? Québec west to ND, south to FL and e. TX. [= RAB, C, FNA, G, K, W; < *Ch. boscianum* – F, S, misapplied]

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; < *Ch. capitatum* – C; = *Ch. capitatum* – K, in a narrow sense; *Blitum capitatum* Linnaeus]

* *Chenopodium desiccatum* A. Nelson. (SC?, VA?). (VA Watch List). {Resolve against *Ch. pratericola*}. [= FNA; *Ch. 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; > *Ch. 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]

* *Chenopodium urbicum* Linnaeus, City Goosefoot, occurs as an 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, is introduced at scattered locations in eastern North America, as in MD, PA, DE, FL (FNA 2003b). [= C, FNA, K, 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): sandy fields; uncommon, rare north of SC, native of w. North America, adventive in our area. May-frost. [= RAB, C, F, FNA, G, GW, K, S]

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. Cp, Pd, Mt (GA, NC, SC, VA): disturbed habitats; common, probably native southward. Widespread in North America to South America, the original range unclear. [= FNA; < *Ch. ambrosioides* – RAB, C, G, W, Y (also see *Dysphania anthelminitica*); = *Chenopodium ambrosioides* var. *ambrosioides* – F, in a narrow sense; < *Ch. 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. 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; < *Ch. ambrosioides* – RAB, C, G, W, Y; = *Ch. ambrosioides* var. *anthelminticum* (Linnaeus) A. Gray – F; < *Ch. ambrosioides* var. *ambrosioides* – K; < *Ambrina ambrosioides* (Linnaeus) Spach – S]

* ***Dysphania botrys*** (Linnaeus) Mosyakin & Clemants, Jerusalem-oak, Feather-geranium. Cp (NC, VA): disturbed areas, ship's ballast; rare, introduced from 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, introduced from 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, introduced from 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 (GA, SC, VA): disturbed areas; rare, introduced from Australia. First reported for South Carolina by Hill & Horn (1997). Also known from DC. [= FNA; = *Chenopodium pumilio* R. Brown – C, G, K, Y; < *Ch. carinatum* R. Brown – F, misapplied; = *Teloxys pumilio* (R. Brown) W. A. Weber]

Kochia Roth 1801

(see *Bassia*)

Salicornia Linnaeus 1753 (Glasswort)

(also see *Sarcocornia*)

A genus of about 10-20 species, succulent herbs, of cosmopolitan distribution. References: Judd & Ferguson (1999)=Z; Ball in FNA (2003b); Kühn in Kubitzki, Rohwer, & Bittrich (1993).

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 (GA, NC, SC, VA): salt pannes in coastal marshes; common. July-October. ME (Nova Scotia?) 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 (GA, NC, SC, VA), Mt (VA): salt pannes in coastal marshes; common. July-October. Nova Scotia and Québec 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, suposedly occurs south to MD (Kartesz (1999); FNA (2003b) does not map it south of the Canadian Maritimes. [= FNA, K] {not yet mapped; 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; [of disturbed areas].....***S. tragus***
1 Leaf blades fleshy in fresh material, linear, 1-2 mm wide in dried specimens; leaves with a strong apical spine; [of sea-beaches].
  2 Perianth segments with a weak non-spiny apex and obscure midvein; bracteoles connate at base, swollen..... ..... ***S. caroliniana***
  2 Perianth segments witha subspinose apex and prominent midvein; bracteoles distinct, not swollen .....***S. kali***

*? ***Salsola caroliniana*** Walter, Southern Saltwort. Cp (GA, NC, SC, VA): upper beaches, fore-dunes, and island-end flats; 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, in part; = *S. kali* var. *caroliniana* (Walter) Nuttall – F; < *S. kali* Linnaeus ssp. *pontica* (Pallas) Mosyakin – FNA, K; < *S. kali* var. *kali* – G, in part]

*? ***Salsola kali*** Linnaeus, Northern Saltwort. Cp (NC, SC, VA): upper beaches, fore-dunes, and island-end flats; uncommon. June-frost. 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, in part; = *S. kali* var. *kali* – F; = *S. kali* ssp. *kali* – FNA, K; < *S. kali* var. *kali* – G]

* ***Salsola tragus*** Linnaeus, Russian Thistle, Tumbleweed. Mt (VA), Pd (GA?, NC, SC?, VA): disturbed areas; rare, native of Eurasia. June-frost. [= C, FNA, K; < *S. kali* Linnaeus – RAB, in part; = *S. kali* var. *tenuifolia* Tausch – F, G; = *S. pestifer* A. Nelson – S, Z; = *S. iberica* Sennen & Pau]

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 (GA, NC, SC, VA): coastal salt marshes; common. 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 coast 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, Pd, Cp (NC, SC, VA): commonly grown in gardens, rarely persisting, introduced from 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 (GA, NC, SC, VA): island-end flats, marsh edges, brackish flats; uncommon. August-frost. ME south to FL, west to TX; West Indies. [= C, F, FNA, G, GW, K, Y, Z; = *Dondia linearis* (Eliott) Heller – S]

*? ***Suaeda maritima*** (Linnaeus) Dumortier, White Sea-blite. Cp (VA): salt marsh edges and disturbed saline habitats; uncommon, 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]

CHRYSOBALANACEAE R. Brown 1818 (Coco-plum Family)

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; rare north of GA (SC Rare). 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 1.5 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]

CISTACEAE A.L. de Jussieu 1789 (Rockrose Family)

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 20 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 ..... ***C. nashii***
    3 Ovary and capsule glabrous.
      4 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***
      4 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.

5 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].
- 6 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***
- 6 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***

5 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].
- 7 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***
- 7 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 bicknellii (Fernald) Barnhart, Hoary Frostweed, Plains Frostweed, Plains Sunrose, Bicknell's Hoary Rockrose. Mt (GA, NC, VA), Pd (NC, VA): woodlands, glades, barrens, rock outcrops, and grassy balds, to at least 1500m in elevation; rare (GA Special Concern, NC Rare, VA Rare). June-July (chasm.), July-September (cleist.); August-October. ME and s. Ontario west to MN and s. Manitoba, 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): fields, woodlands, forest edges, roadsides, disturbed areas; common (uncommon in VA Mountains and VA Piedmont) (GA Special Concern). April-May (chasm.), May-August (cleist.); June-October. Nova Scotia 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, Y, Z; > *Helianthemum canadense* var. *canadense* – F; > *Helianthemum canadense* var. *sabulonum* Fernald – F; *Halimium canadense* (Linnaeus) Grosser]

Crocanthemum carolinianum (Walter) Spach, Carolina Sunrose. Cp (GA, NC, SC): fields, savannas, dry pine flatwoods; uncommon (NC Rare). April-May; July-August. E. NC south to s. FL, west to AR and e. TX. [= S; = *Helianthemum carolinianum* (Walter) Michaux – RAB, K, Y, Z; *Halimium carolinianum* (Walter) Grosser]

Crocanthemum corymbosum (Michaux) Britton, Pinebarren Sunrose. Cp (GA, NC, SC): openings in maritime forests; rare (NC Rare). April-May; July-October. E. NC south to s. FL, east to s. MS. [= S; = *Helianthemum corymbosum* Michaux – RAB, K, Y, Z; *Halimium corymbosum* (Michaux) Grosser]

Crocanthemum georgianum (Chapman) Barnhart, Georgia Sunrose, Georgia Frostweed. Cp (GA, NC, SC): openings in maritime forests; rare (NC Rare, SC Rare). April-May; May-October. E. NC south to n. FL, west to c. TX and AR. [= S; = *Helianthemum georgianum* Chapman – RAB, K, Y, Z; *Halimium georgianum* (Chapman) Grosser]

Crocanthemum nashii (Britton) Barnhart, Florida Scrub Sunrose, Nash's Sunrose. Cp (NC): xeric sandhills; rare (NC Rare). Endemic to peninsular FL; disjunct in se. NC (New Hanover County). May-June; July-September. [= S; = *Helianthemum nashii* Britton – K, Y, Z; *Halimium nashii* (Britton) Grosser]

Crocanthemum propinquum (Bicknell) Bicknell, Low Frostweed, Creeping Sunrose. Mt, Pd (NC, VA), Cp (VA): woodlands, rock outcrops, sandy barrens and fields (in VA); rare (NC Rare, VA Rare). 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 (GA, NC, SC): sandy roadsides, fields; common (NC Watch List). 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, 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 (SC): sandy flats in longleaf pine sandhill; rare (SC Rare). May; August. 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 (US Threatened, NC Endangered). 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 (NC, VA): dunes, sand flats, blowouts; common (NC Rare). May-June; August-September. Labrador west to s. Mackenzie and Manitoba, 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, 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; 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 equalling 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, 1-1.1 mm long, frequently thickened dorsiventrally and keeled; calyx in fruit light- to dark-brown, cuneate-obovoid; panicle slenderly ovoid to subcylindric, the principal branches subequal, the ultimate branches greatly reduced, bearing crowded, frequently clustered fruits; fruiting stems to 5.5 dm tall ..... ***L. pulchella* var. *pulchella***
9 Seeds 2 (-3), 1.1-1.25 mm long, compressed dorsiventrally and equilateral; calyx in fruit brownish- to reddish-purple, pyriform, narrow to broad above; panicle subcylindric to subglobose, the branches diminishing upward, the ultimate branches several cm in length, bearing racemes of scattered fruits; fruiting stems to 8 dm tall..... ***L. pulchella* var. *1***
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 0.5-1.0 mm wide; seeds 3; [of sandhills and flatwoods]..... ***L. torreyi* var. *congesta***
11 Leaves 1.5-3.0 (-4.0) mm wide; seeds 2-4 (-5); [of coastal dunes].
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***

Lechea intermedia Leggett ex Britton *var. **intermedia***, Pinweed. Mt, Pd (VA): dry areas; rare (VA Rare). July-August; August-October. *L. intermedia* ranges from New Brunswick west to Ontario, MN, and Saskatchewan, 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. **virginica*** Hodgdon. Cp (NC, VA): sandy dunes, flats, and blowouts, often associated with *Hudsonia tomentosa*; uncommon (NC Rare, VA Watch List). June-August; August-September. *L. maritima* occurs from s. ME south to n. NC, and disjunct in n. New Brunswick (reports of this species south to GA are apparently based on misidentifications); 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, Pd (GA, NC, SC, VA): savannas, sandhills, pine-oak woodlands, sandy disturbed places; common, rare in VA Piedmont. July-August; August-October. MA and VT west to s. Ontario and n. IN, south to FL and LA (primarily Coastal Plain and around the Great Lakes). [= RAB, C, F, G, K, S, W, Y, Z; ? *L. thymifolia* Michaux]

Lechea mucronata Rafinesque. Pd (GA, NC, SC, VA), Mt (GA, NC, SC), Cp (VA): open dry habitats, dunes, woodlands; common (uncommon in VA Coastal Plain, rare in Piedmont and Mountains). June-August; July-October. NH west to MI and OK, south to FL, TX, and n. Mexico. [= C, K, W; = *L. villosa* Elliott – RAB, F, G, S, Y; > *L. villosa* var. *typica* – Z]

Lechea pulchella Rafinesque *var. **pulchella***. Mt, Pd (VA): dry woodlands, disturbed places; uncommon. June-August; August-October. *L. pulchella* was interpreted by Hodgdon (under the name *L. leggettii*) as consisting of 3 varieties. Var. *pulchella* ranges from e. MA west to ne. OH, south to c. VA. A second variety, var. *moniliformis* (Bicknell) Seymour, is not known from our area, occurring on the 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). The third variety, of the Southeastern Coastal Plain, is treated below. [< *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. **1***. Cp (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. This taxon, treated by Hodgdon under the name *L. leggettii* Britton & Hollick var. *ramosissima* Hodgdon apparently currently lacks a valid name, following the adoption of the Rafinesquian *L. pulchella*. Wilbur & Daoud (1961) tacitly accepted the validity of the variety. It ranges from 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]

Lechea racemulosa Michaux. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): dry pine woodlands, other woodlands, forest edges, old fields; common. June-July; 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, Y, Z]

Lechea sessiliflora Rafinesque. Cp (GA, NC, SC): sandhills; common. July-August; August-October. A Southeastern Coastal Plain endemic: s. NC south to s. FL and west to s. MS. [= K; = *L. patula* Leggett – RAB, S, Y, Z]

Lechea tenuifolia Michaux. Pd, Cp (GA, NC, SC, VA): dry oak-pine forests and openings; common. 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, Y; > *L. tenuifolia* var. *tenuifolia* – C, F, G; > *L. tenuifolia* var. *typica* – Z]

Lechea torreyi Leggett ex Britton *var. **congesta*** Hodgdon. Cp (GA, NC, SC): sandhills and pine flatwoods; rare (NC Rare, SC 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, Y]

Lechea deckertii Small, Deckert's Pinweed. Cp (GA): xeric sands of scrub; rare (GA Special Concern). Sc. GA (Jones & Coile 1988) south to s. FL. [= K, S] {not keyed at this time; synonymy incomplete}

Lechea maritima Leggett ex Britton, Sterns, & Poggenburg var. *maritima*, Coastal dunes. S. ME and c. NH south to DE. [= C, F, G, K, Z]

CLEOMACEAE Horaninow 1834 (Cleome Family)

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: Hall, Sytsma, & Iltis (2002); Judd, Sanders, & Donoghue (1994); Sanders & Judd (2000).

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; petals obtuse or acute at the apex; gynophore (stipe of the pistil, above the calyx) 10-60 mm long; leaflets 5-7 ..... ***Cleome***

Cleome Linnaeus 1753 (Cleome, Spiderflower)

A genus of about 250 species, annual and perennial herbs, pantropical and extending into subtropical and warm temperate regions. References: Vanderpool & Tucker in FNA (in prep.); Iltis (1960)=Z; Kers in Kubitzki & Bayer (2003).

1 Bracts subtending the flowers 3-foliolate; leaves lacking stipular spines; corolla in bud minute, not covering the stamens ..... ***C. gynandra***
1 Bracts subtending the flowers simple; leaves subtended by stipular spines; corolla in bud well-developed, the petals overlapping and surrounding the stamens ..... ***C. hassleriana***

* ***Cleome aculeata*** Linnaeus *var. **aculeata***, Prickly Spiderflower. Disturbed areas. Reported for AL. [< *Cleome aculeata* Linnaeus – K; = ***Hemiscola aculeata*** (Linnaeus) Rafinesque *var. **aculeata*** – FNA]

* ***Cleome gynandra*** Linnaeus, Spiderwisp. Cp (GA, NC, SC): fields, disturbed areas; rare, introduced from Africa. June-October. [= RAB, K, S, Z; = ***Gynandropsis gynandra*** (Linnaeus) Briquet – FNA]

* ***Cleome hassleriana*** Chodat, Cleome, Spiderflower. Pd, Cp, Mt (GA, NC, SC, VA): gardens, disturbed areas, persistent and self-seeding from cultivation as an ornamental; rare, introduced from 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. [= C, K; = ***Tarenaya hassleriana*** (Chodat) H.H. Iltis – FNA; *? C. houtteana* Schlechtendahl – RAB, misapplied; *? C. spinosa* Jacquin – F, G, misapplied; *? Neocleome spinosa* (Jacquin) Small – S, misapplied]

* ***Cleome serrata*** Jacquin. Reported as introduced in GA (Kartesz 1999). [= K; = ***Cleoserrata serrata*** (Jacquin) H.H. Iltis – FNA; = *Neocleome serrata* (Jacquin) Small – S] {not keyed at this time; synonymy incomplete}

* ***Cleome viscosa*** Linnaeus, Wild Caia, Yellow Cleome. Cp (GA, SC): disturbed areas; rare, introduced, native of Asia (now pantropical). Reported for sc. GA (Jones & Coile 1988), se. PA (Rhoads & Klein 1993), and recently from Beaufort County, SC (J. Nelson, pers.comm. 2006). [= K; = ***Arivela viscosa*** (Linnaeus) Rafinesque – FNA] {not keyed at this time; synonymy incomplete}

* *Cleome diffusa* Banks ex de Candolle. On ballast , Mobile AL. [= K; = *Hemiscola diffusa* (Banks ex de Candolle) H.H. Iltis – FNA]

* Cleome spinosa Jacquin. []

Polanisia Rafinesque (Clammy-weed)

A genus of about 6 species, of North America. References:

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) Augustin de Candolle *var.* ***dodecandra***, Clammy-weed, Spider-weed. Mt, Pd (VA): sandy or gravelly floodplains along the James River; rare (VA Rare). June-September. VT west to Manitoba, south to MD, w. VA, TN, AR, and OK. Apparently native in our area. [= C; = *P. dodecandra* ssp. *dodecandra* – K; = *P. graveolens* Rafinesque – F, S; = *P. dodecandra* – G; < *P. dodecandra* – W; *Cleome graveolens* (Rafinesque) Sch. & Sch.]

* ***Polanisia dodecandra*** (Linnaeus) Augustin de Candolle *var.* ***trachysperma*** (Torrey & A. Gray) Iltis. Cp (VA): disturbed areas; rare, apparently adventive from w. North America. June-September. [= C; = *P. dodecandra* ssp. *trachysperma* (Torrey & A. Gray) Iltis – K; = *P. trachysperma* Torrey & A. Gray – F, G, S]

Polanisia tenuifolia Torrey & A. Gray, Slenderleaf Clammy-weed. Cp (GA): sandhills; uncommon. E. GA (several counties from the SC border) (Jones & Coile 1988) south to FL. [= K; = *Aldenella tenuifolia* (Torrey & A. Gray) Greene – S]

CLETHRACEAE Klotzsch 1851 (Clethra Family)

A monogeneric family of 65-95 species, shrubs and trees, primarily of tropical America and Asia. Sometimes combined into the Cyrillaceae. References: 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: Sleumer (1967b)=Z ; Schneider & Bayer in Kubitzki (2004).

1 Leaves oblong or elliptic, 8-20 cm long, acuminate; [of the Mountains]..... ***C. acuminata***
1 Leaves obovate or oblong, 4-11 cm long, obtuse to acute; [of the Coastal Plain and rarely lower Piedmont]..... ***C. alnifolia***

Clethra acuminata Michaux, Mountain White-alder. Mt (GA, NC, SC, VA): moist forests, heath balds, margins of rock outcrops at high elevations; common. 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, G, K, S, W, Z]

Clethra alnifolia Linnaeus, Coastal White-alder. Cp (GA, NC, SC, VA), Pd (VA): pocosins, blackwater swamp forests, nonriverine swamp forests; common (rare in Piedmont). June-July; September-October. Primarily a southeastern Coastal Plain species, *C. alnifolia* ranges from Nova Scotia and ME south to FL, west to TX; disjunct in sc. TN (Coffee County) (Chester, Wofford, & Kral 1997). Two taxa are sometimes recognized; they need additional assessment. Var. *alnifolia*, with glabrous to glabrescent undersurface of the leaf occupies the full range of the species. Var. *pubescens* Aiton differs in its persistently white-tomentose undersurface of the leaf, and ranges from e. SC south to FL, and west to e. LA (east of the Mississippi River). If the more pubescent (and more southern) variety is recognized, the correct name is var. *pubescens* Aiton, which predates var. *tomentosa* (Lamarck) Michaux (Sleumer 1967b, Wilbur 1970b). [= C, F, G, GW, K, S; > *C. alnifolia* var. *alnifolia* – RAB, Z; > *C. alnifolia* var. *tomentosa* (Lamarck) Michaux – RAB; > *C. alnifolia* – S; > *C. tomentosa* Lamarck – S; > *C. alnifolia* var. *pubescens* Aiton – Z]

CLUSIACEAE (Mangosteen Family)
(see *HYPERICACEAE*)

CONVOLVULACEAE A.L. de Jussieu 1789 (Morning Glory Family)

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).

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 Plant an upright herb.
- 2 ..... ***C. spithamaea ssp. purshiana***
- 2 ..... ***C. spithamaea ssp. spithamaea***

1 Plant a trailing or climbing vine.
- 3 Leaves about as wide as long, rounded at the tip ..... ***C. soldanella***
- 3 Leaves longer than wide, abtuse , acute, or acuminate at the tip .....
C. catesbiana, C. macounii, C. pubescens, C. sepium sspp., C. silvatica ssp. fraterniflora

Calystegia catesbeiana Pursh, Catesby's Bindweed. (GA, NC, SC, VA): longleaf pine savannas, openings in dry to dry-mesic montane forests; rare (GA Special Concern). [= K; < *Calystegia spithamaea* – C; < *Convolvulus spithamaeus* Linnaeus var. *pubescens* (Gray) Fernald – F; = *Calystegia sericata* (House) Bell – RAB, W; **= *Convolvulus sericatus*** House – S, Z]

Calystegia macounii (Greene) Brummitt. (NC, VA). {R.K. Brummitt says not east of the Mississippi} [= K, Y; **= *Convolvulus macounii*** Greene]

* ***Calystegia pubescens*** Lindley. (NC, VA). [? *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. (GA, NC, VA). [= K; < *Calystegia sepium* – RAB, C, GW, W; < *Convolvulus sepium* Linnaeus var. *repens* (Linnaeus) A. Gray – F, 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. (GA, NC, SC, VA). New Brunswick to British Columbia, 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. (NC, VA). [= K; < *Calystegia sepium* – RAB, C, GW, W; < *Convolvulus sepium* Linnaeus var. *sepium* – F, G, Z]

Calystegia sepium (Linnaeus) R. Brown *ssp.* ***limnophila*** (Greene) Brummitt. (GA, NC, SC, VA). [= 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***. (GA, NC, SC, VA). [= K; < *Calystegia sepium* – RAB, C, GW, W; < *Convolvulus sepium* Linnaeus var. *sepium* – F, Z; > *Convolvulus sepium* var. *sepium* – G; > *Convolvulus sepium* var. *communis* R. Tryon – G; < *Convolvulus sepium* – S]

Calystegia silvatica (Kit.) Grisebach *ssp.* ***fraterniflora*** (Mackenzie & Bush) Brummitt. (GA, NC, SC, VA). Ssp. *silvatica* and ssp. *disjuncta* are European. [= K, Y; < *Calystegia sepium* – C; = *Convolvulus sepium* Linnaeus var. *fraterniflorus* Mackenzie & Bush – F, G, 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 (NC Watch List, VA Watch List). [= RAB, K; **= *Convolvulus soldanella*** Linnaeus]

Calystegia spithamaea (Linnaeus) Pursh *ssp.* ***purshiana*** (Wherry) Brummitt, Shale Bindweed. Mt (GA, NC, SC, VA): shale barrens and woodlands; common. [= 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* – Z]

Calystegia spithamaea (Linnaeus) Pursh *ssp.* ***spithamaea***, Low Bindweed. (VA) [= K; < *Calystegia spithamaea* – RAB, C, W; = *Calystegia spithamaea* var. *spithamaea*; = *Convolvulus spithamaeus* var. *spithamaeus* – F; **= *Convolvulus spithamaeus*** Linnaeus – G, S; < *Convolvulus spithamaeus* – Z]

Convolvulus Linnaeus (Field-bindweed)
(also see *Calystegia*)

A genus of about 100 species, vines, cosmopolitan, especially in tempertae areas.

* ***Convolvulus arvensis*** Linnaeus, Field-bindweed, Creeping Jenny. Mt (NC, SC, VA), Pd (GA, NC, VA), Cp (NC, VA): fields, roadsides, disturbed areas; common (uncommon to rare south of VA), introduced from Europe. June-November. [= RAB, C, F, G, K, W; *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 equalling 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 with a long, beak-like projection at the top; corolla 2.2-3.5 mm long, 2-3 mm wide; seeds ca. 1.5 mm long; [widespread] ..... ***C. gronovii***
          11 Ovary blunt to pointed, but not beaked; 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. New Brunswick west to British Columbia, 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 *var.* ***compacta***, Compact Dodder. Cp, Pd, Mt (GA, NC, SC, VA): wet habitats, on herbaceous and especially on woody hosts; common. August-November. VT, Québec, and NE south to FL and TX. [= K, W, Y, Z; < *C. compacta* – RAB, C, F, G, GW, S, X]

Cuscuta coryli Engelmann, Hazel Dodder. Cp (NC, SC), Mt (NC, VA), Pd (VA): on a wide variety of woody and herbaeous hosts; rare. July-November. MA, NY, and Saskatchewan south to SC, AL, TX, and AZ. [= C, F, G, GW, K, S, V, X, Z; = *C. corylii* – RAB, W, orthographic variant; = *Grammica coryli* (Engelmann) Hadac & Chrtek]

Cuscuta gronovii Willdenow ex J.A. Schultes, Common Dodder. Cp, Pd, Mt (GA, NC, SC, VA): on a very wide variety of herbaceous and woody plants; common. August-October. Québec west to British Columbia, south to FL and AZ. [= RAB, C, F, G, GW, S, W, 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, 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 (GA Threatened). September-November. C. and wc. GA west to nw. AL. [= K, S, V, Z]

Cuscuta indecora Choisy. Cp (GA, NC, SC, VA), Pd (GA, NC, VA), Mt (VA): salt marshes (on *Iva frutescens*), roadsides; rare. NJ, MN, and ID, south to 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, 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): disturbed area; rare, native of e. Asia. Apparently known in our area only from Pickens County, SC, and eradicated. [= K, Z]

Cuscuta obtusiflora Kunth *var.* ***glandulosa*** Engelmann, Glandular Dodder. Cp (GA): on herbs; rare. GA and OK south to FL, TX, Mexico; West Indies. [= G, GW, K, V, X; = *C. glandulosa* Small – S]

Cuscuta pentagona Engelmann. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): on a wide variety of hosts; common. May-November. Throughout the United States and s. Canada. [= RAB, F, GW, S, V, W, Y, Z; < *C. pentagona* – C, G; >< *C. pentagona* var. *pentagona* – K, X; = *Grammica pentagona* (Engelmann) W.A. Weber]

Cuscuta polygonorum Engelmann, Smartweed Dodder. Pd, Mt (VA): on *Polygonum* and other hosts; rare. NY and Ontario 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): high elevation hardwood forests and thickets; common (GA Special Concern). August-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, 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 epilinum* Weihe, Flax Dodder. Primarily on *Linum*. Introduced from Europe, south to DE, MD, and PA (Kartesz 1999). [= G, K, Z]

* *Cuscuta epithymum* Linnaeus, introduced, is known from scattered localities in PA (Rhoads & Klein 1993). Reported for VA by Kartesz (1999), based on Massey (1961). [= G, K, 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. & J.G. Forster (Ponyfoot, Dichondra)

A genus of about 9 species, of tropical subtropical and warm temperate areas. References: Tharp & Johnston (1961).

Dichondra carolinensis Michaux, Carolina Ponyfoot. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): lawns, roadsides, moist pinelands; common (VA Watch List). March-May. Se. VA south to FL, west to AR and TX; also in Bermuda and reported for

the Bahamas. 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; = *D. repens* J.R. Forster var. *carolinensis* (Michaux) Choisy – F, G]

Evolvulus Linnaeus (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; [of calcareous glades and barrens of c. TN] ..... ***[E. nuttallianus]***
1 Leaves densely pilose with appressed (sericeous) hairs below, the upper surface glabrous or looslely pubescent; internodes long, many over 1.5 cm long; [of Altamaha Grit outcrops in the the Coastal Plain of GA]..... ***E. sericeus*** *var.* ***sericeus***

Evolvulus sericeus Swartz *var.* ***sericeus***, Silky Dwarf Morning-glory. Cp (GA): Altamaha Grit outcrops; rare (GA Endangered). Coastal Plain of ec. GA (Appling, Jeff Davis, and Coffee counties) (Bridges & Orzell 1989; Patrick, Allison, & Krakow 1995), westward and southward. [= K; < *E. sericeus* – S, 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; [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 3-9 cm long, lavender to white; flowers open from evening until early morning.
      4 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***
      4 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*]..... ***I. muricata***
    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*].
      5 Leaf blade pinnately divided into 11-31 (or more) linear segments ..... ***I. quamoclit***
      5 Leaf blade entire, or angled or lobed into 3-7 lanceolate or ovate segments.
        6 Calyx (5-) 6-8 (-9) mm long; fruit reflexed ..... ***I. coccinea***
        6 Calyx 4-4.5 mm long; fruits erect..... ***I. hederifolia***
  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.
    7 Pedicels and peduncles with spreading, ascending, or reflexed trichomes; gynoecium 3-parted; [subgenus *Ipomoea,* section *Pharbitis*].
      8 Sepals with slightly narrowed green tips shorter than to slightly longer than the body of the sepal; [series *Pharbitis*] ..... ***I. purpurea***
      8 Sepals with very narrow elongate green tips much longer than the body of the sepal; [series *Heterophyllae*].
        9 Sepals abruptly narrowed, the long subacute tips strongly spreading or curved..... ***I. hederacea***
        9 Sepals gradually narrowed, the long acute tips suberect, straight, scarcely spreading ..... ***[I. nil]***
    7 Pedicels and peduncles glabrous or with short, appressed trichomes; gynoecium 2-parted; [subgenus *Eriospermum*].
      10 Stems trailing, rooting at the nodes; leaf apex emarginate, truncate, or obtuse; [of beaches from se. NC southward]; [subgenus *Eriospermum*, section *Erpipomoea*].
        11 Corolla white with a yellowish or purple eye; larger leaves 3-7-lobed ..... ***I. imperati***
        11 Corolla lavender; larger leaves not lobed (though notched at the apex)..... ***I. pes-caprae*** *var.* ***emarginata***
      10 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*].
        12 Leaf base sagittate; [series *Jalapae*]..... ***I. sagittata***
        12 Leaf base cuneate to cordate.

13 Corolla 1.5-2.3 cm long, white; [series *Batatas*] ..... ***I. lacunosa***
13 Corolla 3-8 cm long, at least partly pink to lavender (sometimes entirely white in *I. batatas*).
14 Sepals ovate to oblong-elliptic; corolla usually white on the limb, the throat purple; anthers 5-7 mm long; [series *Jalapae*] ..... ***I. pandurata***
14 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*].
15 Sepals unequal in length, oblong-ovate, with acute to caudate apices; leaves mostly 10-15 cm wide ..... ***I. batatas***
15 Sepals more-or-less equal in length, oblong-lanceolate, with acuminate apices; leaves 2-5 cm wide ..... ***I. cordatotriloba*** *var.* ***cordatotriloba***

* ***Ipomoea batatas*** (Linnaeus) Lamarck, Sweet Potato. Cp (GA?, NC, SC, VA?): persistent in fields after cultivation, disturbed areas; rare, apparently introduced from tropical America. [= RAB, K, S, Y, Z]

* ***Ipomoea carnea*** Jacquin *ssp.* ***fistulosa*** (Martius ex Choisy) D. Austin, Bush Morning-glory. Cp (SC): barrier island; rare, apparently introduced from the tropics. [= K, Y, Z; = *I. fistulosa* Martius – RAB, S]

Ipomoea coccinea Linnaeus, Scarlet Creeper, Red Morning-glory. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, thickets, streambanks; common (uncommon in VA Mountains). August-December. Native distribution uncertain, but apparently native to se. United States. [= RAB, C, F, GW, K, W, Y, Z; = *Quamoclit coccinea* (Linnaeus) Moench – G, S]

Ipomoea cordatotriloba Dennstedt *var.* ***cordatotriloba***, Coastal Morning-glory. Cp (GA, NC, SC): dunes, sandy areas on barrier islands, other sandy habitats; uncommon. 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* – Y]

Ipomoea hederacea Jacquin, Ivyleaf Morning-glory. Cp, Pd, Mt (GA, NC, SC, VA): fields, disturbed areas; common. July-December. Native distribution obscure, apparently native to temperate North America, including our area. [= C, GW, K, W, 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 (GA): disturbed areas; uncommon. {Distribution in our area uncertain, native of tropical America – Kartesz (1999) says GA only} [= GW, K, Y, Z; = *I. coccinea* Linnaeus var. *hederifolia* (Linnaeus) A. Gray]

Ipomoea imperati (Vahl) Grisebach, Beach Morning-glory. Cp (GA, NC, SC): beaches, dune blowouts, fore-dunes; rare (NC Rare, SC Rare). August-October. Se. NC south to s. FL, west to TX, and extensively distributed in the tropics. [= K, Y; *I. stolonifera* (Cirillo) J.F. Gmelin – RAB, GW, S, Z]

Ipomoea lacunosa Linnaeus, White Morning-glory. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common (rare in VA Mountains). September-December. NJ west to OH, IL, and KS, south to FL and e. TX. [= RAB, C, F, G, GW, K, S, W, Y, Z]

Ipomoea macrorhiza Michaux, Manroot. Cp (GA, NC, SC): hammocks, shell middens, dry sands, disturbed maritime areas; rare (GA Special Concern, NC Watch List, SC Rare). June-July. Se. NC south to FL, west to s. AL. [= RAB, K, S, Y, Z]

* ***Ipomoea muricata*** (Linnaeus) Jacquin, Lilacbell, Purple Moonflower. Cp (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*. [= *Ipomoea turbinata* Lagasca y Segura – K, Y, Z]

Ipomoea pandurata (Linnaeus) G.F.W. Meyer, Wild Sweet Potato, Manroot, Man-of-the-earth. Cp, Pd, Mt (GA, NC, SC, VA): May-July; July-September. CT, NY, and s. Ontario west to OH, s. MI, and KS, south to c. peninsular FL and e. TX. [= RAB, C, F, G, GW, K, S, W, 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 (GA, NC, SC): ocean beaches; rare. 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 Ooststr. – K, Y]

* ***Ipomoea purpurea*** (Linnaeus) Roth, Common Morning-glory. Cp, Pd, Mt (GA, NC, SC, VA): fields, disturbed areas; common, native of tropical America. July-September. [= RAB, C, F, G, GW, K, W, Y, Z; = *Pharbitis purpurea* (Linnaeus) Voigt – S]

* ***Ipomoea quamoclit*** Linnaeus, Cypress-vine. Cp (GA, NC, SC), Pd (NC, SC, VA): fields, hedgerows, disturbed areas; common (rare in VA), introduced from tropical America. September-December. [= RAB, C, F, GW, K, Y, Z; = *Quamoclit vulgaris* Choisy – G; = *Quamoclit quamoclit* (Linnaeus) Britton – S]

Ipomoea sagittata Poiret. Cp (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, Y, Z]

* *Ipomoea cairica* (Linnaeus) Sweet. East to AL, introduced from Africa. [= K, S] {not keyed at this time; synonymy incomplete}

* *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 keyed at this time; synonymy incomplete}

* *Ipomoea wrightii* A. Gray, native of India, has been 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] {not keyed at this time; synonymy incomplete}

* *Ipomoea* ×*multifida* (Rafinesque) Shinners [*I. coccinea* × *quamoclit*], Cardinal Climber, is cultivated and may escape. [= K] {not keyed}

Jacquemontia Choisy (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 (GA, NC, SC, VA), Pd (GA, SC): fields, roadsides, other disturbed areas; uncommon (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, Z; = *Thyella tamnifolia* (Linnaeus) Rafinesque – S]

Merremia Dennst. ex Endlicher

References: Wilson (1960b)=Z.

* ***Merremia dissecta*** (Jacquin) Hallier f., Noyau Vine. Cp (GA): disturbed areas; rare, introduced from South America. Ranges as far north as e. and sw. GA. [= K, Z; =*? Ipomoea sinuata* Ortega; = *Operculina dissecta* (Jacquin) House]

Stylisma Rafinesque (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 (1962)=Y; Wilson (1960b)=X.

1 Bracteoles of the flowers and fruits leaflike, (2-) 10-20 mm long (tending to be deciduous in August or September); styles fused nearly to bases of the stigmas (fused > 5/6 of the total length); stylar branches < 3 mm long; leaves 1-3 mm wide (the very basal sometimes wider), held in a vertical, erect position ..... ***S. pickeringii var. pickeringii***

1 Bracteoles of the flowers and fruits bractlike, 1-3 (-5) mm long; styles free to near the summit of the ovary (fused < ½ of the total length); stylar branches > 5 mm long; leaves 2-28 mm wide, held in a horizontal or ascending position (rarely nearly erect).

  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; inflorescences with (1-) 3-7 (-12) flowers; stems with 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; flowers usually solitary (rarely in 3-5-flowered cymes); stems without tendency to twine.

      5 Surface of sepals moderately to densely villous (rarely nearly glabrous); leaves mostly 4-6× as long as wide; inflorescence of 1 (-5) flowers ..... ***S. patens ssp. patens***

      5 Surface of sepals glabrous (rarely with a few scattered hairs), the margins ciliate; leaves 7-15× as long as wide; inflorescence of 1 (-3) flowers) ..... ***S. patens ssp. angustifolia***

Stylisma aquatica (Walter) Rafinesque, Water Dawnflower. Cp (GA, NC, SC): clay-based Carolina bays and wet savannas; rare (NC Rare). June-July. Se. NC south to 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, 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, Pd (GA, NC, SC, VA): sandhills and other dry woodlands, especially on dryish stream terraces; common (VA Watch List). June-August. Se. VA south to n. FL, west to AR and e. TX, north in the interior to n. AL and w. TN. [= C, K, S, Z; = *Bonamia humistrata* (Walter) A. Gray – RAB, X, Y; = *Breweria humistrata* (Walter) A. Gray – F, G]

Stylisma patens (Desrousseaux) Myint *ssp.* ***angustifolia*** (Nash) Myint, Narrowleaf Dawnflower. Cp (GA, NC, SC): sandhills; uncommon (NC Watch List). May-August. According to Myint (1966), ssp. *angustifolia* is widespread in n. and c. peninsular FL, with relatively sparse occurrences north to se. NC and west to the Panhandle of FL. [= K, Z; = *Bonamia patens*

(Desrousseaux) Shinners var. *angustifolia* (Nash) Shinners – RAB, Y; = ***S. angustifolia*** (Nash) House – S; = *Bonamia angustifolia* (Nash) K.A. Wilson – X]

Stylisma patens (Desrousseaux) Myint *ssp.* ***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. [= K, Z; = *Bonamia patens* (Desrousseaux) Shinners var. *patens* – RAB, Y; = ***S. trichosanthes*** (Michaux) House – S, misapplied; = *Bonamia aquatica* (Walter) A. Gray – X, misapplied]

Stylisma pickeringii (Torrey ex M.A. Curtis) A. Gray *var.* ***pickeringii***, Pickering's Dawnflower. Cp (GA, NC, 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 (GA Threatened, NC Endangered, SC Rare). June-August (-September); July-September. 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. Var. *pickeringii* ranges from s. NC south through SC, GA, AL, and e. MS, with a disjunct area in the Pine Barrens of NJ, sometimes treated as the separate var. *caesariensis* Fernald & Schubert. Var. *pattersonii* ranges from IL and IA south through KS and OK to e. TX, w. LA, and w. MS. Material in MS is equivocal. [= 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* (Torrey ex M.A. Curtis) A. Gray – G; < ***S. pickeringii*** (Torrey ex M.A. Curtis) A. Gray – S]

Stylisma villosa (Nash) House, Hairy Dawnflower. Cp (GA): sandhills; rare. Late April-July. S. GA south to s. peninsular FL, west to e. TX. [= K, S, Z; = *Bonamia villosa* (Nash) K.A. Wilson – X, Y; = *Breweria villosa* Nash]

CORNACEAE (Berchtold & J. Presl) Dumortier 1829 (Dogwood Family)

A family of 2 genera and about 80 species, trees, shrubs, lianas, and subshrubs, semicosmopolitan. 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)
(by Z.E. Murrell & A.S. Weakley)

A genus of about 60 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. At very least, the subgenera are well-marked. References: Godfrey (1988)=Z; Wilson (1965); Murrell (1993); 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. Mt, Pd (GA, NC, SC, VA), Cp (GA, VA): moist forests; common (rare in Coastal Plain, rare in Piedmont south of VA). May-June; August-September. Newfoundland west to MN, south to FL (Gadsden County), AL, s. MS, and AR. [= RAB, C, F, G, K, W, Y, Z; = *Svida alternifolia* – S; = *Swida alternifolia* (Linnaeus f.) Small]

Cornus amomum P. Miller, Silky Dogwood. Mt, Pd, Cp (GA, NC, SC, VA): shores, streams, bottomlands; common. May-June; August-September. NY and MA west to IN, south to GA and MS. [= RAB, F, G, K, W; = *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. Cp (GA, NC, SC), Pd (GA): mesic calcareous forests and thickets, shell middens, calcareous hammocks; uncommon (rare in NC) (NC Significantly Rare). May-June; August-September. Se. NC south to 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. Mt (VA): high elevation forests, in humus or on talus, under *Betula cordifolia*, *Picea rubens*, or *Pinus rigida*; rare (VA Rare). Greenland west to AK, south to NJ, VA, WV, and CA. [= C, F, G, K, W, Y; = *Chamaepericlymenum canadense* (Linnaeus) Ascherson & Graebner]

Cornus drummondii C.A. Meyer, Midwestern Roughleaf Dogwood. Mt (GA): open woodlands and glades over calcareous rocks (limestone, calcareous shale); rare (GA Special Concern). NY, Ontario, 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) Sojak]

Cornus florida Linnaeus, Flowering Dogwood. Mt, Pd, Cp (GA, NC, SC, VA): dry to moist forests and woodlands; common. . March-May; September-October. ME west to MI, south to FL and ne. Mexico (Veracruz and Nuevo Léon). [= RAB, C, F, G, K, W, Y, Z; = *Cynoxylon floridum* (Linnaeus) Rafinesque ex B.D. Jackson – S]

Cornus obliqua Rafinesque, Silky Dogwood. Mt, Pd (VA): . ME and Québec 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. It is 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; = *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 obliqua* (Rafinesque) Moldenke]

Cornus racemosa Lamarck, Northern Swamp Dogwood. Mt (VA), Pd (NC, VA), Cp (VA): wet forests and thickets; uncommon (rare in NC). May; August-September. ME and s. Québec west to s. Manitoba, south to VA, nc. NC, s. IL, and MO. [= RAB, C, F, G, K; = *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. Mt, Pd (VA): at high elevations, usually on talus (greenstone, quartzite, sandstone); rare (VA Rare). Québec to Manitoba, south to NJ, PA, w. VA, OH, IN, and IL. [= C, F, G, K, W]

*? ***Cornus stolonifera*** Michaux, Red Osier Dogwood. Pd, Mt, Cp* (VA): shrub swamps, bottomlands, suburban areas; rare (VA Rare). At least some of the occurrences in VA represent horticultural introductions. In e. KY (Clark et al. 2005). 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. [= G, W; = *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]

Cornus stricta Lamarck, Southern Swamp Dogwood. Cp, Pd, Mt (GA, NC, SC, VA): swamps, streambanks, marshes, alluvial forests; common, rare in Mountains. April-May; July-August. DE south to FL, west to TX, and north in the interior to

TN, s. IN, s. IL, AR, and se. OK. [= RAB, C, G; = *Cornus foemina* P. Miller – F, K, 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]

* *Cornus kousa* Hance, Kousa Dogwood, is sometimes planted as an ornamental and may persist. [= K; = *Cynoxylon kousa* (Hance) Nakai]

CRASSULACEAE DC. 1825 (Stonecrop Family)
(also see *PENTHORACEAE*)

A family of about 35 genera and 1100 species, succulent shrubs and herbs, nearly cosmopolitan. References: Moran in FNA (in prep.).

1 Leaves connate at the base, opposite; flowers solitary in the axils of leaves; flowers 3-4-merous; [subfamily *Crassuloideae*]. ..... ***Crassula***
1 Leaves distinct, opposite, whorled, or alternate; flowers in terminal cymose inflorescences; flowers 4-5 (-8)-merous; [subfamily *Sedoideae*].
  2 Perennials without rosettes, the stems 0.5-10 dm tall; leaves large, relatively thin in texture, usually 5-25 times as wide as thick, often crenate; flowers pink, purple, white, or greenish; [subtribe *Telephiinae*].
    3 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 ..... ***Hylotelephium***
    3 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 ..... ***Rhodiola***
  2 Perennials or annuals with or without rosettes, the stems < 2 dm tall; leaves smaller, flat or terete, relatively thicker, entire; flowers white or yellow; [subtribe *Sedinae*].
    4 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***
    4 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 various habitats, including granitic flatrocks of GA, NC, SC, and VA]..... ***Sedum***

Crassula Linnaeus

A genus of about 250 species, nearly cosmopolitan (centered in Africa). References: Moran in FNA (in prep.).

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. Pd (SC): artificial lake; rare. Introduced? Occuring in tidal marshes and shores, south to MD and se. PA, and also in GA and AL (Kartesz 1999). [= FNA, K; = *Tillaea aquatica* Linnaeus – GW; = *Tillaeastrum aquaticum* (Linnaeus) Britton – S]

* ***Crassula drummondii*** (Torrey & A. Gray) Fedde. Cp (SC): waste area around wool-combing mill; rare, perhaps merely a waif, introduced from sc. United States. [= FNA, K; = *Tillaea drummondii* Torrey & A. Gray]

Crassula longipes (Rose) Bywater & Wickens, in GA. [= K] {not keyed at this time; synonymy incomplete}

Diamorpha Nuttall (Elf-orpine)

A monotypic genus, a succulent annual, endemic to se. North America. References: Wilbur (1988a)=Z; Moran in FNA (in prep.); Clausen (1975)=Y.

Diamorpha smallii Britton ex Small, Elf-orpine. Pd (GA, NC, SC, VA), Mt (GA, NC, SC): in very thin soil (generally less than 2 cm deep) of vernally wet depressions on granite flatrocks and other granitic outcrops; uncommon (rare in Mountains) (VA Rare). April-May; May-June. Primarily limited to granitic flatrocks of the Piedmont, ranging from sc. VA to ec. AL, and locally north into se. TN. 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 (Live-for-ever)

A genus of about 30 species, of temperate Eurasia and North America. References: Moran in FNA (in prep.); Clausen (1975)=Z.

1 Petals 2× as long as the sepals; nectaries wider than long; flowers fertile; [native].....***H. telephioides***
1 Petals 3-4× 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. Pd (GA, NC), Cp (NC): disturbed areas; rare, inroduced from 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. Mt, Pd (NC, SC, VA): rock outcrops, mostly at high to moderate elevations, ascending to 2000m; uncommon. 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, Z; = *Anacampseros telephioides* (Michaux) Haworth – S]

* ***Hylotelephium telephium*** (Linnaeus) H. Ohba, Live-for-ever. Cp (NC): disturbed areas; rare, native of Europe. September-October; October-November. [= FNA; > *Sedum purpureum* (Linnaeus) Link – RAB, C, F, 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 (Roseroot)

A genus of about 40 species, of cold temperate and boreal areas of the northern hemisphere. References: Moran in FNA (in prep.); Clausen (1975)=Z.

Rhodiola rosea Linnaeus, Roseroot. Mt (NC): high elevation rocky summits; rare (NC Endangered). 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 *Sedum telephioides*, with narrow, nearly toothless leaves, have been confused with ***Rh. 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)
(also see *Diamorpha, Hylotelephium*, and *Rhodiola*)

A genus of perhaps 200 species, depending on circumscription. There is considerable controversy about the circumscription of the genus *Sedum*. *Diamorpha* is clearly to be separated; the separation of *Rhodiola* and *Hylotelephium* seem warranted, but are less clear. Other segregates which would affect the species treated below have been proposed, such as *Chetyson*, *Clausenellia*, and *Spathulata* (see synonymy). References: Clausen (1975)=Z; Calie (1981)=Y.

1 Perennials without rosettes, the stems 0.5-10 dm tall; leaves large, relatively thin in texture, usually 5-25 times as wide as thick, often crenate; flowers pink, purple, white, or greenish; [subtribe *Telephiinae*].
  2 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 ..... *[*see ***Hylotelephium****]*
  2 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 ..... *[*see ***Rhodiola****]*
1 Perennials or annuals with or without rosettes, the stems < 2 dm tall; leaves smaller, flat or terete, relatively thicker, entire; flowers white or yellow; [subtribe *Sedinae*].
  3 Carpels united basally (to about 1/3 their length); petals cucullate (hoodlike), 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].....*[*see ***Diamorpha****]*
  3 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 various habitats, including granitic flatrocks of NC, SC, and VA].

4 Leaves primarily opposite ..... ***[S. spurium]***
4 Leaves primarily alternate or in whorls of 3-4.
5 Leaves primarily whorled in 3's or 4's.
6 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] ..... ***S. ternatum***
6 Largest leaves linear-lanceolate, oblanceolate, or elliptic, almost as thick as wide, < 7 mm wide; flowers and fruits 5-merous; petals yellow; [alien].
7 Stems decumbent; leaves linear-lanceolate ..... ***[S. lineare]***
7 Stems long-creeping; leaves oblanceolate to elliptic ..... ***S. sarmentosum***
5 Leaves primarily alternate.
8 Flowers and fruits 5-merous; [plants aliens].
9 Leaves flat, spatulate, 15-50 mm long ..... ***[S. kamtschaticum** ssp. **ellacombianum]***
9 Leaves terete or subterete, 2-15 mm long.
10 Leaves 2-5 mm long; petals yellow ..... ***S. acre***
10 Leaves 6-15 mm long; petals yellow or white.
11 Petals white; flowers 5-merous ..... ***[S. album]***
11 Petals yellow; flowers (5-) 7 (-9) merous ..... ***[S. reflexum]***
8 Flowers and fruits 4-merous; [plants natives].
12 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***
12 Leaves of flower-bearing stems narrowly elliptic, oblanceolate, spatulate, cuneate or short-spurred at the base (not clasping); petals white; perennial or annual.
13 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***
13 Plants perennial; sepals 2-9 mm long; petals 4-9 mm long; [of outcrops of various rocks, not as above]; [section *Ternata*].
14 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***
14 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. Mt (NC, VA), Pd (NC, VA): rock outcrops, gravel parking lots, disturbed areas; commonly cultivated, rarely naturalizing, native of Europe. May-June; June-July. [= RAB, C, F, G, K, S, W, Z]

Sedum glaucophyllum Clausen, Cliff Stonecrop. Mt, Pd (NC, VA): rock outcrops, usually basic and/or sedimentary; common (rare in Piedmont and south of VA) (NC Rare). 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 segregation and probably 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 interesting group. [= C, F, K, W, Y, Z; < *S. nevii* A. Gray – RAB, G, S]

Sedum nevii A. Gray, Nevius's Stonecrop. Pd (GA): gneiss rock outcrops on river bluffs; rare (GA Threatened). 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). [= K, W, Y, Z; < *S. nevii* – S (also see *S. glaucophyllum*)]

Sedum pulchellum Michaux, Widow's-cross. Mt (GA): calcareous rock outcrops; rare. 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, 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. Pd (GA, NC, SC): in very thin soil (generally less than of vernally wet depressions on granite flatrocks, often in mats of the moss *Hedwigia ciliata*; rare (US Species of Concern, GA Threatened, NC Endangered, SC Rare). 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, GW, K, S, Z; = *Tetrorum pusillum* (Michaux) Rose]

* ***Sedum sarmentosum*** Bunge. Pd (GA, NC, SC, VA), Mt (GA, NC, VA), Cp (VA): xeric rock outcrops, disturbed areas; rare, introduced from China. May-June; June-July. [= RAB, C, F, G, K, W, Z]

Sedum ternatum Michaux, Mountain Stonecrop. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): moist forests, coves, bottomlands, shaded rock outcrops; common. April-June; May-July. NJ west to IA and AR, south to nw. GA and AL. [= RAB, C, F, G, K, S, W, Y, Z; = *Clausenellia ternata* (Linnaeus) A. & D. Löve]

* *Sedum album* Linnaeus, White Stonecrop, native of Eurasia, is introduced and naturalized as far south as se. PA. [= C, F, G, K, Z; = *Oreosedum album* (Linnaeus) Grulich]
* *Sedum kamtschaticum* Fischer & C.A. Meyer ssp. *ellacombianum* (Praeger) Clausen, Kamchatka Stonecrop, is introduced and naturalized as far south as se. PA. [= K, Z]
* ***Sedum lineare*** Thunberg. Pd (GA): margin of granitic flatrock; rare, native of e. Asia. Duncan (1985) discusses the establishment of this species in Columbia Co., GA. [= K, Z] {not keyed at this time}
* ***Sedum reflexum*** Linnaeus. Pd (GA): Reported for nc. GA (Jones & Coile 1988). [= C, K; = *Petrosedum reflexum* (Linnaeus) Grulich]
* *Sedum spurium* M. Bieberstein, Caucasian Stonecrop, native of the Caucasus, is introduced and naturalized as far south as se. PA. [= C, F, G, K, Z; = *Spathulata spuria* (M. Bieberstein) A. & D. Löve]

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.

CUCURBITACEAE A.L. de Jussieu 1789 (Gourd Family)

A family of about 120 genera and 775 species, of tropical and subtropical areas, with a few extending to temperate areas.

1 Ovaries and fruits with prickles; fruits 1-5 cm long at maturity; tendrils present, 3-forked.
  2 Corolla 6-lobed; fruit 4-seeded, dehiscent by 2 pores; stems and leaves glabrous or glabrescent ..... ***Echinocystis***
  2 Corolla 5-lobed; fruit 1-seeded, indehiscent; stem and leaves conspicuously viscid-pubescent ..... ***Sicyos***
1 Ovaries and fruits smooth or pubescent, but not prickly; fruits 1-70 cm long at maturity; tendrils absent or present (if present either forked or simple).
  3 Leaves pinnately lobed, the divisions rounded; fruit surface green and white, the flesh red or pink ..... ***Citrullus***
  3 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.
    4 Fruit < 3 cm long; tendrils present, simple; [native, mostly in moist forests or thickets].
      5 Fruit surface red at maturity; pedicel of pistillate flowers and fruits 1-3 mm long ..... ***Cayaponia***
      5 Fruit surface black or dark green at maturity; pedicel of pistillate flowers and fruits > 20 mm long ..... ***Melothria***
    4 Fruit > 5 cm long; tendrils absent or present (if present, forked); [introduced, mostly in gardens, fields, or disturbed places].
      6 Corolla < 3 cm long; [canteloupes and cucumbers] ..... ***Cucumis***
      6 Corolla > 5 cm long; [squashes, gourds, pumpkins].
        7 Corolla campanulate, yellow; [squashes, pumpkins] ..... ***Cucurbita***
        7 Corolla salverform, white or yellow; [bottle gourd, luffa].
          8 Corolla white with green veins; fruit clavate (with a neck) ..... ***Lagenaria***
          8 Corolla yellowish; fruit elongate, cylindric ..... ***Luffa***

Cayaponia Silva Manso

A genus of about 45 species, of tropical, subtropical and warm-temperate America.

Cayaponia quinqueloba (Rafinesque) Shinners. Cp (GA, SC): swamp forests, river banks; rare (GA Special Concern). June-November. E. SC south to GA, west to e. TX, north in the interior to w. TN. [= GW, K; = *C. boykinii* (Torrey & A. Gray) Cogniau – RAB, S]

Citrullus Schrader (Watermelon)

A genus of 4 species, herbaceous vines, of Africa. References: Dane & Lang (2004).

* ***Citrullus lanatus*** (Thunberg) Matsumura & Nakai *var.* ***lanatus***, Watermelon. Cp, Pd, Mt (GA, NC, SC, VA): gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year, introduced from the Old World. [= K; *? Citrullus vulgaris* Schrader – RAB, F, G; *? Citrullus citrullus* (Linnaeus) Karsten – S]

Cucumis Linnaeus (Canteloupe, Muskmelon, Cucumber)

References: Decker-Walters et al. (2002).

1 Fruit more-or-less spherical, the flesh sweet, orange, yellow, or green; [canteloupes and honeydew melons].....***C. melo***
1 Fruit elongate, cylindrical, the flesh not sweet, whitish; [cucumbers] .....***C. sativus***

* ***Cucumis melo*** Linnaeus, Canteloupe, Honeydew Melon. Cp, Pd, Mt (GA, NC, SC, VA): gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year, introduced from w. Africa. See Decker-Walters et al. (2002) for discussion of the origins of wild melons of the southeastern Gulf Coast (in LA, TX, and FL). [= RAB, F, G, K, S]
* ***Cucumis sativus*** Linnaeus, Cucumber. Cp, Pd, Mt (GA, NC, SC, VA): gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year, introduced from s. Asia. [= F, G, K]

* ***Cucumis anguria*** Linnaeus *var*. ***longaculeatus*** J.H. Kirkbride, West Indian Gherkin, reported for GA (Jones & Coile 1988) and FL (Kartesz 1999). [= K] {not keyed at this time; synonymy incomplete}

Cucurbita Linnaeus (Squash, Zucchini, Pumpkin)

* ***Cucurbita maxima*** Duchesne, Hubbard Squash, Pumpkin. Cp, Pd, Mt (GA, NC, SC, VA): gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year, introduced from tropical America. [= F, K]
* ***Cucurbita moschata*** (Duchesne ex Lamarck) Duchesne ex Poiret, Butternut Squash. Cp, Pd, Mt (GA, NC, SC, VA): gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year, introduced from tropical America. [= F, K; = *Pepo moschata* (Duchesne ex Lamarck) Britton – S]
* ***Cucurbita pepo*** Linnaeus, Pumpkin, Zucchini, Pattypan Squash, Yellow Squash, Crookneck Squash, Straightneck Squash, Acorn Squash. Cp, Pd, Mt (GA, NC, SC, VA): gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year, introduced from tropical America. [= RAB, F; > *C. pepo* var. *pepo* – K; = *Pepo pepo* (Linnaeus) Britton ex Small – S]

Echinocystis Torrey & A. Gray (Wild-cucumber)

A monotypic genus of e. North America.

Echinocystis lobata (Michaux) Torrey & A. Gray, Wild Balsam-apple, Wild-cucumber. Mt (GA?, NC), Pd (VA): bottomland forests and thickets; rare (NC Watch List). July-October. New Brunswick west to Saskatchewan, south to GA (?) and TX. [= RAB, C, F, G, GW, K, W; = *Micrampelis lobata* (Michaux) Greene – S]

Lagenaria Seringe (Bottle Gourd)

A genus of 6 species, Old World tropical, centered in Africa.

* ***Lagenaria siceraria*** (Molina) Standley, Bottle Gourd, Calabash Gourd. Cp, Pd, Mt (GA, NC, SC, VA): gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year, introduced from the Old World. [= K; *? L. vulgaris* Seringe – RAB, F; *? L. leucantha* Rusby – G; = *Cucurbita lagenaria* Linnaeus – S]

Luffa P. Miller

A genus of 7 species, vines, of the tropics.

1 Fruits strongly 10-angled; leaves shallowly lobed .....***L. acutangula***
1 Fruits not angled; leaves deeply lobed .....***L. aegyptiaca***

* ***Luffa acutangula*** (Linnaeus) Roxburgh, Angled Luffa. Pd (VA): gardens, fields, trash heaps; cultivated in home gardens, sometimes volunteering from seed the following year, introduced from the Old World. [= K]
* ***Luffa aegyptiaca*** P. Miller, Smooth Luffa, Vegetable Sponge. Cp, Pd, Mt (GA, NC, SC, VA): gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year, introduced from the Old World. [= K; *? L. cylindrica* (Linnaeus) M. Roemer – S]

Melothria Linnaeus (Melonette)

A genus of about 10 species, New World.

Melothria pendula Linnaeus *var*. ***pendula***, Melonette, Creeping Cucumber. Cp, Pd, Mt (GA, NC, SC, VA): bottomland forests, moist roadsides and disturbed areas, marshes; common (rare in Mountains). June-November. DC, MD, and VA west to IN, south to FL and TX. [= K; < *M. pendula* – RAB, C, GW, W; = *M. pendula* – F, G, S]

Melothria pendula Linnaeus var. *aspera* Cogn. AL and FL. [= K; < *M. pendula* – GW; > *M. microcarpa* Shuttleworth – S; > *M. nashii* Small – S] {not keyed at this time; synonymy incomplete}

Sicyos Linnaeus (Bur-cucumber)

A genus of about 50 species, of Australia, Pacific Islands, tropical America.

Sicyos angulatus Linnaeus, Bur-cucumber, Nimble-Kate, Star-cucumber. Mt, Pd, Cp (GA, NC, SC, VA): {habitat}; August-November. S. ME west to MN, south to panhandle FL and c. TX. [= RAB, C, F, G, GW, K, S, W]

CUSCUTACEAE (Dodder Family)

[see CONVOLVULACEAE]

CYRILLACEAE Endlicher 1841 (Ti-ti Family)

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: 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 Gaertner f. (Black Ti-ti, Buckwheat-tree)

A monotypic genus, shrub or small tree, of se. North America. References: Thomas (1960)=Y; Kubitzki in Kubitzki (2004).

Cliftonia monophylla (Lamarck) Britton ex Sargent, Black Ti-ti, Buckwheat-tree. Cp (GA, SC): acid bogs, swamps, and streambanks; common, rare north of GA (SC Rare). Se. SC south to n. FL, west to se. LA. [= GW, K, S, Y]

Cyrilla Garden ex Linnaeus (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: Kurz & Godfrey (1962)=Z; Thomas (1960)=Y; Kubitzki in Kubitzki (2004).

1 Leaves mostly 1-4 cm long, mostly < 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 cm wide; inflorescences mostly > 10 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. Cp (GA): flatwood pond margins and along drains through savannas; rare. 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* – GW, Y]

Cyrilla racemiflora Linnaeus, Ti-ti. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): pocosins, swamps, lake and flatwood pond margins, streambanks, pine flatwoods; common, uncommon in VA, rare in Piedmont. 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* – GW, Y; > *C. racemiflora* var. *racemiflora* – F; > *C. racemiflora* var. *subglobosa* Fernald – F]

DIAPENSIACEAE (Link) Lindley 1836 (Diapensia Family)

A family of 5-6 genera and about 13-15 species, subshrubs and perennial herbs, largely arctic and north temperate. References: Nesom in FNA (in prep.); Scott & Day (1983)=X; Scott in Kubitzki (2004).

1 Leaves cauline, generally < 10 cm 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 (in prep.); Nesom (1983); Soltis, Bohm, & Nesom (1983); Scott in Kubitzki (2004).

Galax urceolata (Poiret) Brummitt, Galax. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): 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*; common (uncommon in the Coastal Plain, absent from n. VA). 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]

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 (in prep.); 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. Cp (NC, SC, VA): 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*; common (uncommon to rare in the inner Coastal Plain and Sandhills) (SC Rare, VA Rare). 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 var. *brevifolia*, var. *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. Cp (NC, SC): 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; rare (US Species of Concern, NC Endangered, SC Rare). December-March; February-May. The variety 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 (in prep.); 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; [native of McDowell County, NC] .... ***Sh. galacifolia*** *var.* ***brevistyla***

1 Style (10-) 12-18 mm long; filaments generally 6-9 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. Mt (NC): 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; rare (NC Endangered). 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. Mt (GA, NC, SC), Pd* (VA*): on moist slopes, creekbanks, and rock outcrops in humid escarpment gorges with high rainfall, generally in deep shade under *Rhododendron maximum* and *Rh. minus*, at elevations (in NC) of 350-650m; rare (GA Endangered, NC Endangered, SC Rare). 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]

DIERVILLACEAE (Rafinesque) Pyck 1998 (Bush-honeysuckle Family)

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 very 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 (NC, VA): rock outcrops and ridges at high elevations; uncommon. June-July; August-October. Newfoundland west to Saskatchewan, south to w. NC, e. TN, IN, and IA. Reported for GA (GANHP). [= RAB, C, G, K, S, W, Y, Z; > *D. lonicera* var. *lonicera* – F; > *D. lonicera* var. *hypomalaca* Fernald – F]

Diervilla rivularis Gattinger, Hairy Southern Bush-honeysuckle. Mt (GA, NC): 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): 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]

DIONAEACEAE (Venus Flytrap Family)

(see *DROSERACEAE*)

DIPSACACEAE A.L. de Jussieu 1789 (Teasel Family)

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 (1997).

1 Principal cauline leaves laciniate-pinnatifid, cut at least halfway to the midrib..... ***D. laciniatus***
1 Principal cauline leaves entire or toothed.
  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 (NC, VA), Pd, Cp (VA): roadsides, pastures, disturbed areas; common (rare in NC and in Coastal Plain of VA), introduced from Europe. July-September; September-October. The inflorescences are frequently collected for crafts and dried arrangements. [= K, W, Z; = *D. sylvestris* Hudson – RAB, C, F, G, S; = *D. fullonum* ssp. *sylvestris* (Hudson) Clapham]

* ***Dipsacus laciniatus*** Linnaeus, Cutleaf Teasel. Mt, Pd (VA): disturbed areas; uncommon, introduced from Europe. July-September; September-October. [= C, F, G, K, Z]

* ***Dipsacus sativus*** (Linnaeus) Honckeny, Fuller's Teasel. Mt (VA): disturbed areas; rare, introduced from Europe. July-September; September-October. I am here following Ferguson (1965), Ferguson & Brizicky (1965), and Stace (1997) 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. Disturbed areas. Naturalized south at least to s. PA (Rhoads & Klein 1993), MD, and WV (Kartesz 1999). June-September. [= C, F, G, K; = *Scabiosa arvensis* Linnaeus]

DROSERACEAE Salisbury 1808 (Sundew Family)

A family of 3 genera (*Drosera, Dionaea, Aldrovanda*) and about 100 species, nearly cosmopolitan. References: Schnell (2002b); Kubitzki in Kubitzki & Bayer (2003).

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 (NC, SC): wet savannas, sandhill seepages; rare (US Species of Concern, NC Rare/Special Concern, SC 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. [= RAB, GW, K, S, 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 Scapes 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 Scapes 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 glabrous; petals white; plants usually with a leafy stem 1-10 cm long; scape arching at base; seeds reddish brown to black and densely papillose ..... ***D. intermedia***
5 Petioles with few to many long trichomes; petals pink (sometimes fading to white); plants scapose; scapes straight at their bases; seeds coarsely corrugated into 14-16 longitudinal ridges ..... ***D. capillaris***

Drosera brevifolia Pursh, Dwarf Sundew. Cp (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) (VA Watch List). April-May. The species ranges from se. VA south to 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, X, Z; = *D. leucantha* Shinners – RAB, Y]

Drosera capillaris Poiret, Pink Sundew. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): pine savannas, other wet sandy or peaty sites; common (rare in Piedmont) (VA Watch List). May-August. Se. VA south to 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, X, Y, Z]

Drosera filiformis Rafinesque, Threadleaf Sundew. Cp (NC): margins of natural pools in pinelands, especially clay-based Carolina bays; rare (NC Rare). June; August. E. MA south to se. NC; disjunct in the FL panhandle (Bay and Washington counties) and in sw. Nova Scotia (Sorrie 1998a). Sorrie (1998a) has clarified the taxonomy and phytogeography of *D. filiformis* and *D. tracyi*. See comments about *D. tracyi* below. [= GW, K, 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 (GA, NC, SC, VA), Pd (NC, SC): savannas, ditches, pocosins, margins of pools or streams, often in standing water; common (rare in Piedmont and n. of NC) (VA Watch List). July-September. *D. intermedia* is circumboreal, in North America ranging from Newfoundland and MN south to FL and TX, and into tropical America. [= RAB, C, F, G, GW, K, S, Q, W, X, Y, Z]

Drosera rotundifolia Linnaeus *var.* ***rotundifolia***, Roundleaf Sundew. Mt (GA, NC, SC, VA), Cp (NC, VA), Pd (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 (GA Special Concern). 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, X, Y, Z]

Drosera tracyi MacFarlane in Bailey, Tracy's Sundew. Cp (GA): savannas; rare (GA Special Concern). 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, Y; = *D. filiformis* Rafinesque var. *tracyi* (MacFarlane in Bailey) Diels – Q]

EBENACEAE Gürcke 1891 (Ebony Family)

A family of 2 genera and 500-600 species, trees and shrubs, distributed in tropical and subtropical (rarely warm temperate) regions. References: 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: 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 7.5 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 virginiana Linnaeus, American Persimmon. Pd, Cp, Mt (GA, NC, SC, VA): dry woods, sandhills, disturbed places, floodplain and mesic forests, fencerows; common. May-June; September-December (and persisting). CT, PA, OH, IN, IL, MO, and e. KS south to 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, GW, K, W; > *D. virginiana* var. *virginiana* – C, F, G, Z; > *D. virginiana* – S; > *D. mosieri* Small – S]

* *Diospyros kaki* Linnaeus f., Kaki, Kaki-plum, Japanese Persimmon, is rarely grown in our area for its fruits, which are much larger than *D. virginiana* (to 9 cm in diameter). [= Z]

ELAEAGNACEAE A.L. de Jussieu 1789 (Oleaster Family)

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; fruiting pedicel 15-25 mm long; hypanthium tube about as long as the separate calyx lobes ..... ***E. multiflora***
    3 Fruit 6-8 mm long; 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. Pd (NC, VA), Mt, Cp (VA): disturbed areas; uncommon, introduced from Eurasia. June-July. [= C, F, G, K]
* ***Elaeagnus multiflora*** Thunberg. Mt (NC, VA): disturbed areas; rare, introduced from Japan and China. April. First reported for NC by Leonard (1971b). [= C, F, G, K; = *E. multiflorus* – S]
* ***Elaeagnus pungens*** Thunberg, Autumn Silverberry. Pd (GA, NC, SC, VA), Cp (NC, SC, VA): forests and woodlands in suburban areas, spread by birds; uncommon, introduced from Japan. October-November; March-April. [= RAB, K]
* ***Elaeagnus umbellata*** Thunberg *var.* ***parvifolia*** (Royle) Schneider, Spring Silverberry. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): forests and woodlands, spread by birds; common, introduced from Japan and China. April-May; August-September. This species is becoming a noxious weed shrub, still unfortunately sometimes promoted for "wildlife plantings." [= K; < *E. umbellata* – RAB, C, F, G, W; *E. umbellatus* – S]

ELATINACEAE Dumortier 1829 (Waterwort Family)

A family of 2 genera and about 35 species, herbs. References: Tucker (1986).

Elatine Linnaeus (Waterwort)

A genus of about 10 species, aquatic, tropical and temperate.

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 3-8 (-10) 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.
    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 (VA), Mt (NC, SC): tidal flats, lakes; rare (NC Watch List, VA Watch List). 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 (broadly interpreted to include *E. americana*); *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 (VA), Pd (NC, SC): tidal flats, lakes; rare (NC Watch List, VA 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]

ERICACEAE A.L. de Jussieu 1789 (Heath Family)

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: 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..... ***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..... ***Hypopitys***
    - 4 Flower solitary; stem glabrous; plant white (rarely pink) when fresh, aging or drying black ..... ***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) ..... ***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) ..... ***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*] ..... ***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*] ..... ***Gaultheria***
    - 7 Plant creeping or sprawling, leaves scattered along the stems.
      - 9 Flowers solitary and axillary; fruit a white berry; [subfamily *Vaccinioideae*; tribe *Gaultherieae*] ..... ***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*] ..... ***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*]..... ***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, 8-12 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, 2-3 mm in diameter; branches often appearing in whorls of 3-7; [subfamily *Ericoideae*; tribe *Empetreae*] ..... ***Ceratiola***

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*].
12 Ovary inferior; fruit indehiscent, a fleshy berry.
13 Ovary 10 locular; seeds 10; leaves glandular-punctate, at least on the lower surface (except *G. brachycera*).... ....***Gaylussacia***
13 Ovary 4-5 locular; seeds numerous; leaves not glandular-punctate.....***Vaccinium***
12 Ovary superior; fruit dehiscent, a dry capsule.
14 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*].
15 Fruit 2-3 (5)-locular; shrub to 1 m tall; leaves, 0.4-1.2 cm long; petals 2-4 mm long; [subfamily *Ericoideae*; tribe *Phyllodoceae*] .....***Kalmia buxifolia***
15 Fruit 4-7-locular; shrub to small tree 1-6 (-9) m tall; leaves 2-12 cm long; petals 12-30 mm long.
16 Fruit 7-locular; leaves evergreen 2-4 cm long; petals 20-30 mm long; shrub 1-2.5 m tall; [subfamily *Ericoideae*; tribe *Bejarieae*] ..... ***Bejaria***
16 Fruit 4-5-locular; leaves deciduous, 4-12 cm long; petals 12-14 mm long; shrub to small tree 2-6 (-9) m tall; [subfamily *Ericoideae*; tribe *Phyllodoceae*]..... ***Elliottia***
14 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.
17 Leaves whorled, < 5 mm long, linear; [subfamily *Ericoideae*, tribe *Ericeae*]..... ***Erica***
17 Leaves alternate or whorled, > 20 mm long.
18 Flowers 4-merous; fruits 4-locular; leaves with a series of fascicles of trichomes on the midrib below; [subfamily *Ericoideae*; tribe *Rhodoreae*] .....***Menziesia***
18 Flowers 5-merous; fruits 5-locular; leaves not as above.
19 Leaves coriaceous, evergreen, shiny and dark green above.
20 Leaves sharply and distinctly serrate.
21 Pedicels slender, 7-10 mm long; filaments strongly curved just below the anthers; pith transversely diaphragmed; [subfamily *Vaccinioideae*; tribe *Lyonieae*] ....***Agarista***
21 Pedicels stout, 2-6 mm long; filaments straight; pith solid; [subfamily *Vaccinioideae*; tribe *Gaultherieae*]..... ***Leucothoe***
20 Leaves entire, or obscurely and finely crenulate-serrulate.
22 Capsules elongate, > 2× as long as broad, 8-18 mm long; [subfamily *Ericoideae*; tribe *Rhodoreae*] ..... ***Rhododendron***
22 Capsules ovoid to globose or subglobose, about as long as broad, 5-8 mm long.
23 Leaves with a prominent vein running parallel to (and about 1 mm in from) the margin; [subfamily *Vaccinioideae*; tribe *Lyonieae*] .....***Lyonia***
23 Leaves without a prominent marginal vein.
24 Corolla saucer-shaped, 20-30 mm across; leaves entire; [subfamily *Ericoideae*; tribe *Phyllodoceae*]..... ***Kalmia***
24 Corolla narrowly urceolate, 4-6 mm across; leaves finely crenulate-serrulate; [subfamily *Vaccinioideae*; tribe *Lyonieae*].....***Pieris***
19 Leaves membranaceous or subcoriaceous, deciduous or evergreen, if subcoriaceous and evergreen, then not shiny and dark green above.
25 Capsules elongate, > 2× as long as broad, 7-23 mm long; [subfamily *Ericoideae*; tribe *Rhodoreae*] .....***Rhododendron***
25 Capsules ovoid to globose or subglobose, about as long as broad, or broader than long, 2-7 mm long.
26 Leaves < 2.5 cm wide.
27 Leaves linear to narrowly lanceolate, 8× or more as long as wide. strongly revolute, strongly whitened beneath; [subfamily *Vaccinioideae*; tribe *Andromedeae*].....***[Andromeda]***
27 Leaves broader, not revolute or slightly so, not strongly whitened below.
28 Leaves whorled or alternate; corolla saucer-shaped, 10-20 mm across; [subfamily *Ericoideae*; tribe *Phyllodoceae*]..... ***Kalmia***
28 Leaves alternate; corolla narrowly urceolate, 2-8 mm across.
29 Pedicels with 2 bracteoles near the summit; [subfamily *Vaccinioideae*; tribe *Gaultherieae*] .....***Chamaedaphne***
29 Pedicels with 2 bracteoles near the base; [subfamily *Vaccinioideae*; [tribe *Lyonieae*].....***Lyonia***
26 Leaves (at least the larger) > 2.5 cm wide.
30 Pedicels with 2 bracteoles.

31 Capsule broader than long; shrub; bracteoles just below the calyx; [subfamily *Vaccinioideae*; tribe *Gaultherieae*] ..... ***Eubotrys***
31 Capsule longer than broad; tree; bracteoles generally near the middle of the pedicel; [subfamily *Vaccinioideae*; tribe *Oxydendreae*] ..... ***Oxydendrum***
30 Pedicels without bracteoles.
32 Leaves entire to minutely serrulate; capsule sutures pale and thickened; [subfamily *Vaccinioideae*; tribe *Lyonieae*] ..... ***Lyonia***
32 Leaves crenate; capsule sutures not thickened and pale; [subfamily *Vaccinioideae*; tribe *Andromedeae*] ..... ***Zenobia***

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); leaves evergreen ..... **Key C**
3 Shrub, > 3 dm tall, or 1-3 dm tall and definitely and obviously clonal by underground rhizomes; leaves evergreen or deciduous ..... **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 fused at base ..... ***Hypopitys monotropa***
2 Plant lavender when fresh; stem glabrous; petals separate at base ..... ***Monotropsis odorata***

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, appearing whorled (at least in part, sometimes also with nodes appearing opposite or alternate).
2 Leaves glabrous; leaves 5-15 mm long; [native]..... ***Ceratiola ericoides***
2 Leaves densely puberulent and ciliate with gland-tipped hairs; leaves 1.5-5 mm long; [exotic, rarely naturalized]..... ***Erica tetralix***

1 Leaves broader, alternate (or whorled or opposite in *Kalmia*).
  3 Leaves (all of them) < 2 cm long.
    4 [**Either** of the Mountains, the Piedmont, **or** the Coastal Plain of ne. SC and se. NC].
      5 Leaves alternate, glabrous, finely serrulate ..... ***Gaylussacia brachycera***
      5 Leaves alternate or opposite, stipitate-glandular or glabrous, entire, or with a few obscure teeth..... .....***Kalmia buxifolia***
    4 [Of the Coastal Plain, from se. SC southward].
      6 Twigs densely hispid; leaves hispid on both surfaces .....***Kalmia hirsuta***
      6 Twigs glabrous to puberulent; leaves glabrous or with scattered inconspicuous hairs.
        7 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***
        7 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***
  3 Leaves (at least the larger) > 3 cm long.
    8 Leaves toothed, at least toward the tip of the leaf (note that fine serrations or crenations can be obscured by revolute margins).
      9 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*).
        10 Leaves lepidote with scales; leaves oblanceolate, widest above the middle.....***Chamaedaphne calyculata***
        10 Leaves with small stipitate glands, otherwise appearing glabrous; leaves elliptic, widest near the middle.
          11 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***
          11 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***
      9 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.
        12 Pith transversely diaphragmed; [pedicels slender, 7-10 mm long]; [filaments strongly curved just below the anthers].....***Agarista populifolia***
        12 Pith solid; [pedicels stout, 2-6 mm long]; [filaments straight].
          13 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***
          13 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***
    8 Leaves entire.
      14 Leaves whitened beneath by a dense mat of white hairs; leaves linear and strongly revolute..... .....***[Andromeda polifolia** var**. glaucophylla]***
      14 Leaves green or brown beneath, glabrous, glabrescent, or lepidote with scales.
        15 Leaves densely lepidote on the under surface with brown scales.
          16 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].
            17 [Corolla mostly 1.5-2 cm long, the corolla tube (0.9–1.3 cm long) shorter than to as long as the corolla lobes (1.2-1.8 cm long)]; [plant flowering early relative to *Rh. minus*, despite occurring at higher elevations and more northern latitudes]; [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***
            17 [Corolla mostly 2.5-3 cm long, the corolla tube (1.6-2.2 cm long) longer than the corolla lobes (0.8-1.2 cm long)]; [plant flowering late relative to *Rh. carolinianum*]; [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].....***Rhododendron minus***
          16 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].
            18 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***
            18 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***

15 Leaves not lepidote beneath (*Lyonia lucida* with scattered minute scales on young leaves).
19 Leaves whorled or rarely opposite.
20 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***
20 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***
19 Leaves alternate.
21 Leaf blades (8-) 10-30 cm long, 3-9 cm wide, rounded to obtuse at the tip.
22 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***
22 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***
21 Leaf blades 2-10 (-12) cm long, 1-5 cm wide, acute, short-acuminate (or obtuse or rounded in *Cyrilla*) at the tip.
23 Leaf with a prominent vein running the length of the margin, about 1 mm in; [shrub to 4 m tall] ..... ***Lyonia lucida***
23 Leaf venation not as above; [shrub to small tree] .... ***Kalmia latifolia, Cyrilla racemiflora, Cliftonia racemosa, Bejaria racemosa***

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; Stevens et al. in Kubitzki (2004).

Agarista populifolia (Lamarck) Judd, Agarista, Pipe-plant. Cp (GA, NC?, SC): blackwater swamps, hydric hammocks, marly spring runs; rare (GA Special Concern, NC Watch List, SC Rare). April-May; September-October. E. SC (or se. NC?) south to n. peninsular FL. 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. [= K, L, Z; = *Leucothoe populifolia* (Lamarck) Dippel – RAB, GW; = *Leucothoe acuminata* (Aiton) G. Don – S; = *Andromeda populifolia* Lamarck]

Andromeda Linnaeus 1753 (Bog-rosemary, Andromeda)

A genus of 1-2 species, shrubs, north temperate. References: Stevens et al. in Kubitzki (2004).

Andromeda polifolia Linnaeus var. *glaucophylla* (Link) Augustin de Candolle, Bog-rosemary, occurs south to ne. PA (Rhoads & Klein 1993) and e. WV (at Cranberry Glades, Pocahontas County), and NJ. [= K; = *A. glaucophylla* Link – C, F, G, L]

Arctostaphylos Adanson 1760 (Bearberry)

A genus of 50-60 species, shrubs, woody vines, or small trees, mostly in w. North America, but with 2 circumboreal species. References: Rosatti (1987b)=Z; Stevens et al. in Kubitzki (2004).

Arctostaphylos uva-ursi (Linnaeus) Sprengel, Bearberry, Kinnikinick. Mt (VA): high elevation granitic outcrop; rare (VA Rare). May-June. Following Rosatti (1987), *A. uva-ursi* is here treated inclusively, as a complex species not readily divisible into infraspecific taxa. *A. uva-ursi* is circumboreal, ranging in North America from Labrador west to AK, south to n. VA, n. IN, NM, and CA. [= C, 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]

Bejaria Mutis in Linnaeus 1771 (Tarflower)

A genus of 15 species, ranging from southeastern 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 Don Bejar. The spelling has now been conserved as '*Bejaria*' (Greuter et al. 2000). References: Stevens et al. in Kubitzki (2004).

Bejaria racemosa Ventenat, Tarflower, Flycatcher. Cp (GA): pine flatwoods; common. E. GA (adjacent to se. SC) south to s. peninsular FL. [= L; = *Befaria racemosa* – GW, K, S, orthographic variant]

Calluna R.A. Salisbury 1802 (Heather)

A monotypic genus, a shrub, of Europe. References: Stevens et al. in Kubitzki (2004).

* ***Calluna vulgaris*** (Linnaeus) Hull, Heather, Ling, Scotch Heather. Mt (NC): roadbanks; native of Europe. July-August. Also known to be naturalized in Tucker County, WV (Luteyn et al. 1996). [= C, F, G, K, L] {not yet keyed}

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. Cp (GA, SC): xeric sandhills, usually in white "sugar sand"; uncommon (GA Threatened). October-November. Ne. SC south to FL and west to s. MS. Its content of aromatic compounds makes it very flammable. [= RAB, K, L, S]

Chamaedaphne Moench 1794 (Leatherleaf, Cassandra)

A monotypic genus, a shrub, circumboreal in distribution. References: Stevens et al. in Kubitzki (2004).

Chamaedaphne calyculata (Linnaeus) Moench, Leatherleaf, Cassandra. Cp (NC, SC), Mt (NC): pocosins in the Coastal Plain, bogs in the Mountains; uncommon (nearly extirpated in the Mountains). March-April; June-October. Circumboreal; in North America from Newfoundland to Alberta to Newfoundland, south to MD, OH, n. IL, WI, n. IA, Alberta, and British Columbia; 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, G, K, L, S, W; = *Cassandra calyculata* (Linnaeus) D. Don – RAB, GW; > *Chamaedaphne calyculata* var. *angustifolia* (Aiton) Rehder – F]

Chimaphila Pursh 1814 (Pipsissewa)

A genus of 4-5 species, subshrubs, of temperate and tropical America, and Eurasia. References: 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. Mt, Pd, Cp (GA, NC, SC, VA): forests and woodlands, mostly rather xeric and acid; common. May-June; July-October. ME west to MI, south to GA and AL. [= RAB, C, F, G, K, L, S, W]

Chimaphila umbellata (Linnaeus) W. Barton *var.* ***cisatlantica*** Blake, Prince's-pine. Pd, Cp (NC, VA), Mt (VA): forests and woodlands, mostly rather xeric and acid; uncommon. May-June; July-October. Circumboreal, extending (in the interpretation of some) south into Central America. Var. *cisatlantica* is widespread in ne. North America, from Nova Scotia and

Québec west to MN, south to NC and IN. [= C, F, G, L; < *Ch. umbellata* – RAB, W; = *Ch. umbellata* ssp. *cisatlantica* (Blake) Hultén – K; *? Ch. corymbosa* Pursh – S]

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*, whether or not considered congeneric (here considered congeneric), 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. References: Stevens et al. in Kubitzki (2004).

Elliottia racemosa Muhlenberg ex Elliott, Elliottia, Southern-plume, Georgia-plume. Cp (GA, SC), Pd (GA): xeric sandy ridges, sandhills, river bluffs; serpentine woodlands; rare (GA Threatened, SC Rare). 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. [= K, L, S]

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: Stevens et al. in Kubitzki (2004).

Epigaea repens Linnaeus, Trailing Arbutus. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): a wide variety of acidic forests, xeric to mesic, sandy, rocky, and loamy; common. Late February-early May; April-June. Newfoundland and Québec west to Saskatchewan, south to FL, 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" (Clay 1983). Ants are strongly attracted to the placental tissue, and in carrying it away disperse the seeds (Clay 1983). [= RAB, C, G, K, L, S, W; > *E. repens* var. *glabrifolia* Fernald – F; > *E. repens* var. *repens* – F]

Erica Linnaeus 1753 (Heath)

A genus of 735-860 species, shrubs and trees, of Africa and Eurasia (mostly s. Africa). References: Stevens et al. in Kubitzki (2004).

* ***Erica tetralix*** Linnaeus, Cross-leaved Heath. Cp (NC): sandy thickets; rare, introduced from Europe. July-August; September-October. [= RAB, C, F, G, K, L]

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*, supporting the views, based on morphological grounds, of many earlier authors (Kron et al. 2002). References: Kron et al. (2002); Stevens et al. in Kubitzki (2004).

1 Anthers with 4 awns; capsule rounded on the sutures; sepals broadly lanceolate; seeds not winged, shaped like a section of an orange..... ***E. racemosa***
1 Anthers with 2 awns; capsule angled on the sutures; sepals ovate; seeds winged, oblanceolate, flat ..... ***E. recurva***

Eubotrys racemosa (Linnaeus) Nuttall, Coastal Fetterbush. Cp, Pd, Mt (GA, NC, SC, VA): swamps, pocosins, streambanks, and other wet places; common (uncommon in Piedmont, rare in Mountains). Late March-early June; September-October. E. MA south to FL and west to LA, primarily on the Coastal Plain; disjunct inland, as in c. TN (Chester, Wofford, & Kral 1997). [= C, G; = *Leucothoe racemosa* (Linnaeus) A. Gray – RAB, GW, K, L, W; > *L. racemosa* var. *projecta* Fernald – F; > *L. racemosa* var. *racemosa* – F; > *Eubotrys racemosa* – S; > *Eubotrys elongata* Small – S]

Eubotrys recurva (Buckley) Britton, Mountain Fetterbush. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): heath balds, high elevation ridges and granitic domes, bogs; common (rare in Piedmont) (GA Special Concern). 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, G, S; = *Leucothoe recurva* (Buckley) A. Gray – RAB, F, K, L, W]

Gaultheria Kalm ex Linnaeus 1754 (Wintergreen, Teaberry)

A genus of 130-135 species, shrubs and subshrubs, of Asia, Australia and New Zealand, South America, Central America, and North America (primarily Asian). References: Stevens et al. in Kubitzki (2004).

1 Stems creeping, the leaves 5-10 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 procumbens Linnaeus, Wintergreen, Teaberry. Mt (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): heath balds, woodlands, and openings, usually acidic and xeric; common (uncommon in Piedmont and Coastal Plains) (SC Rare). June-August; September-November. Newfoundland west to Manitoba, south to e. NC, ne. GA, AL, c. TN, KY, n. IN, and MN. [= RAB, C, F, G, K, L, S, W]

Gaultheria hispidula (Linnaeus) Muhlenberg ex Bigelow, Creeping Snowberry, Moxie, has been attributed to NC by C, F, G, and S; the documentation is unknown. It is known from as far south as e. WV and MD and its occurrence in our area is plausible. [= C, F, G, K; = *Chiogenes hispidula* (Linnaeus) Torrey & A. Gray – S]

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: Sleumer (1967a)=Z; Camp (1935)=Y; Godfrey (1988)=X; Duncan & Brittain (1966)=V; 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 Young twigs, raceme axes, flower stalks, and floral tubes with long, spreading, silvery-silky hairs, minutely glandular at their tips; shrub to 1.5 m (or more) tall; [of the East Gulf Coastal Plain, GA and westward] ..... ***G. mosieri***
3 Young twigs, raceme axes, flower stalks, and floral tubes with short (< 1 mm long), curly hairs and short stipitate-glandular hairs intermixed; shrub to 1.0 m tall; [collectively widespread in our area].
4 Leaf margins entire, ciliate with abundant whitish hairs as well as red-tipped stipitate glands; shrub commonly 5-10 dm tall, well-branched; bracts of the inflorescence slightly to densely stipitate-glandular above as well as below; [of mountain bogs, high elevation peaks, low pocosins, and seepage bogs, in very wet, boggy sites] .....***G. dumosa*** *var*. ***bigeloviana***
4 Leaf margins entire or serrulate, the serrulations gland-tipped, and also ciliate with red-tipped glandular hairs (sometimes with some whitish hairs as well); shrub 1-3 (-4) dm tall, typically rather virgate in above-ground growth form and little branched; bracts of the inflorescence only slightly (if at all) stipitate-glandular above; [of dry to moist Coastal Plain pinelands and sandhills, and (rarely) dry mountain slopes at low to moderate elevations].....***G. dumosa*** *var*. ***dumosa***
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*].
5 Leaves glandular on both surfaces; racemes 0.5-1.5 cm long; [section *Decamerium*, subsection *Baccatae*]..... .....***G. baccata***
5 Leaves glandular on the lower surface only; racemes 1-5 cm long.
6 Leaves membranaceous, medium-green, with acuminate apices; [section *Decamerium*, subsection *Ursinae*]... .....***G. ursina***
6 Leaves subcoriaceous, yellow-green to glaucous, with obtuse to emarginate apices; [section *Decamerium*, subsection *Frondosae*].
7 Young twigs glabrous; leaves glabrous or pubescent beneath, often glaucous; shrub to 20 dm tall; [widespread in our area].....***G. frondosa***
7 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].
8 Larger leaves mostly 2-4 cm long and 1-2 cm wide, the lower surface sparsely short-pubescent with the longer hairs ca. 0.13 mm long, usually strongly glaucous; floral tube and calyx glaucous; shrub 2-6 (-10) dm tall .....***G. nana***
8 Larger leaves mostly 3-6 cm long and 2-3.5 cm wide, the lower surface sparsely to densely short-pubescent with the longer hairs ca. 0.25 mm long, not glaucous; floral tube and calyx not glaucous; shrub to 10 dm tall.....***G. tomentosa***

Gaylussacia baccata (Wangenheim) K. Koch, Black Huckleberry, Crackleberry. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (NC, VA): xeric, acidic forests and woodlands, rock outcrops, to 1600m elevation; common (uncommon in Piedmont and Coastal Plain of NC and SC) (SC Rare). April-June; July-August. Newfoundland and Québec west to Ontario and Manitoba, 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. [= RAB, C, F, G, K, L, V, W, Y, Z; = *Decachaena baccata* (Wangenheim) Small – S]

Gaylussacia brachycera (Michaux) A. Gray, Box Huckleberry. Mt (VA), Pd (NC): dry, acidic ridgetops and upper slopes; uncommon (but locally forming large clones) (VA Rare). 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, G, K, L, W, 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 *var.* ***bigeloviana*** Fernald, Northern Dwarf Huckleberry. Mt (GA, NC), Cp (NC, SC, VA): mountain bogs, high elevation peaks, peat dome pocosins (in NC and VA), sandhill seepage bogs (SC), generally growing in peat, forms transitional to var. *dumosa* in wet pinelands and disturbed pocosins; rare (NC Watch List). April-June; June-October. Var. *bigeloviana* ranges from 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, and in the sw. mountains of NC (Henderson, Transylvania, Macon, and Jackson counties), where found in bogs and wet, high elevation peaks. The montane plants named *Lasiococcus orocola* by Small are closely allied to northern *G. dumosa* var. *bigeloviana*, and occur with other notable northern disjuncts, such as *Myrica gale* and *Chamaedaphne calyculata* (often associated with var. *bigeloviana* in northern peat bogs). They are tentatively assigned here to var. *bigeloviana*, though further study may indicate that they deserve recognition as a third variety. [= C, F, G, Y; < *G. dumosa* – RAB, GW, K, L, W, X, Z; > *Lasiococcus orocola* (Small) Small – S; > *G. orocola* (Small) Camp – Y, Z]

Gaylussacia dumosa (Andrews) Torrey & A. Gray *var.* ***dumosa***, Southern Dwarf Huckleberry. Cp, Pd, Mt (GA, NC, SC, VA): xeric to mesic, acidic forests and woodlands; common (uncommon in Piedmont and Mountains of NC and SC, rare in Piedmont and Mountains of VA). 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). [= C, F, G, Y; < *G. dumosa* – RAB, GW, K, L, V, W, X, Z; = *Lasiococcus dumosus* (Andrews) Small – S]

Gaylussacia frondosa (Linnaeus) Torrey & A. Gray ex Torrey, Dangleberry. Cp, Mt, Pd (NC, SC, VA): mesic, acidic woodlands, especially in sandhill-pocosin and savanna-pocosin ecotones, also in xeric chestnut oak forests in the lower Piedmont; common (uncommon in Piedmont and Mountains). 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, G, K, L, W, V; = *G. frondosa* var. *frondosa* – RAB, GW, X, Y, Z; = *Decachaena frondosa* (Linnaeus) Torrey & Gray – S]

Gaylussacia mosieri Small, Mosier's Huckleberry, Hirsute Huckleberry. Cp (GA): savannas and seepages; rare. 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. dumosa* var. *bigeloviana*. [= GW, K, L, V, X, Y, Z; = *Lasiococcus mosieri* (Small) Small – S]

Gaylussacia nana (A. Gray) Small, Dwarf Dangleberry. Cp (GA, NC, SC): xeric sandhills; rare (NC Rare). 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), and otherwise is known to range from se. SC (Beaufort Co.) south and west to n. and c. peninsular FL, panhandle FL, and sw. AL. It is common in e. GA (such as Glascock and Bryan counties), and may also be found in se. SC. *G. nana* has a diploid chromosome complement (n=12), compared to tetraploid for *G. tomentosa* (n=12) (Luteyn et al. 1996). [= K, L, V, Y; = *G. frondosa* (Linnaeus) Torrey & A. Gray ex Torrey var. *nana* A. Gray – GW, X, Y; = *Decachaena nana* (A. Gray) Small – S]

Gaylussacia tomentosa (A. Gray) Pursh ex Small, Hairy Dangleberry. Cp (GA, SC): pine flatwoods, sandhills, xeric coastal fringe sandhills; rare. 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). [= K, L, V, Y; = *G. frondosa* (Linnaeus) Torrey & A. Gray ex Torrey var. *tomentosa* A. Gray – RAB, GW, X, Z; = *Decachaena tomentosa* (Pursh ex Small) Small – S]

Gaylussacia ursina (M.A. Curtis) Torrey & A. Gray ex A. Gray, Bear Huckleberry, Mountain Huckleberry. Mt (GA, NC, SC): 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. On mountain slopes and summits in that area it is often the dominant shrub, forming large clonal patches. [= RAB, K, L, V, W, Y, Z; = *Decachaena ursina* (M.A. Curtis) Small – S]

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: Stevens et al. in Kubitzki (2004).

Hypopitys monotropa Crantz, Pinesap. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): forests; uncommon. May-October; July-November. Circumboreal, south nearly throughout North America. [= *Monotropa hypopithys* Linnaeus – RAB, C, F, G, K, L, W; > *Hypopitys americana* (Augustin de Candolle) Small – S; > *Hypopitys lanuginosa* (Michaux) Nuttall – S]

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: 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; 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 (rarely opposite); inflorescence an axillary raceme.
    3 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***
    3 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]..... ***K. carolina***
  2 Leaves alternate; inflorescence an axillary fascicle or a terminal panicle.
    4 Leaves 0.5-1.5 cm long, 2-8 mm wide; twigs densely persistently hispid; [of s. SC southward] ..... ***K. hirsuta***
    4 Leaves 2.5-12 cm long, 7-50 mm wide; twigs glabrous or puberulent (glabrescent in age); [collectively widespread in our area].
      5 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***
      5 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. Cp (NC, VA): sandy, xeric to mesic hillsides and moist areas; rare (VA Rare). April-May; September-October. Labrador west to MN, south to se. VA and extreme ne. NC, s. Ontario, and MI, reaching its southern limit in the Coastal Plain of extreme ne. NC and the n. Mountains of VA. See *Kalmia carolina* for discussion of the taxonomy of these two taxa. [= K, S, Z; = *K. angustifolia* var. *angustifolia* – C, F, G, L, Y]

Kalmia buxifolia (P.J. Bergius) Gift, Kron, & Stevens, Sand-myrtle. Mt (GA, NC, SC), Cp (NC, SC), Pd (NC): 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); uncommon (GA Special Concern). 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, the genus therefore monotypic. 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. [= 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. Cp (GA, NC, SC, VA), Mt (GA, NC, VA): 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; common (rare in the Mountains and rare in VA) (GA Special Concern, VA Rare). 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, G, L, Y]

Kalmia cuneata Michaux, White Wicky. Cp (NC, SC): pocosins and pocosin-savanna or pocosin-sandhill ecotones; rare (US Species of Concern, NC Endangered/Proposed Candidate, SC Rare). 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, GW, K, L, S, Y, Z]

Kalmia hirsuta Walter, Hairy Wicky. Cp (GA, SC): pine savannas and pine flatwoods; common (rare in SC). 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, GW, K, L, Y, Z; = *Kalmiella hirsuta* (Walter) Small – S]

Kalmia latifolia Linnaeus, Mountain Laurel, Ivy, Calico-bush. Mt, Pd, Cp (GA, NC, SC, VA): 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; common. April-June; September-October. ME and OH south to 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, K, L, S, W, Y, Z; > *K. latifolia* var. *laevipes* Fernald – F, G; > K. latifolia var. *latifolia* – F, G]

Leiophyllum

(see *Kalmia*)

Leucothoe D. Don 1834 (Fetterbush, Leucothoe)

(also see *Agarista* and *Eubotrys*)

A genus of about 6 species, shrubs, of Japan, Himalayan Asia, and e. North America. References: Stevens et al. in Kubitzki (2004).

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. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): pocosins, blackwater swamp forests, and moist and acid slopes; common (rare in Piedmont, uncommon in VA). Late March-May; September-October. A Southeastern Coastal Plain endemic: se. VA south to FL and west to extreme e. LA. [= C, G, GW, K, L, S; = *L. axillaris* var. *axillaris* – RAB; > *L. axillaris* var. *axillaris* – F; > *L. axillaris* var. *ambigens* Fernald – F]

Leucothoe fontanesiana (Steudel) Sleumer, Mountain Doghobble, Switch-ivy. Mt (GA, NC, SC, VA), Pd (GA, NC, SC): moist slopes, streambanks, ravines, often associated with *Rhododendron maximum* thickets; common (VA Rare). April-May; September-October. A Southern Appalachian endemic: sw. VA south through w. NC and e. TN to nw. GA. [= 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]

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; 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 (-10) 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 naked, or with only a few leafy bracts; [of the Mountains, Piedmont, and (less commonly) Coastal Plain] ..... ***L. ligustrina*** *var.* ***ligustrina***
      5 Inflorescences (at least the lower) with conspicuous bracts; [of the Coastal Plain and lower Piedmont] ..... ***L. ligustrina*** *var.* ***foliosiflora***

Lyonia ferruginea (Walter) Nuttall, Crookedwood, Dragonwood, Staggerbush. Cp (GA, SC): pocosins; common (rare but locally common in spodosolic flatwoods of Jasper and Beaufort counties, SC) (SC Rare). April-May; September-October. Se. SC south to sc. peninsular FL, west to panhandle FL. See discussion under *L. fruticosa*. [= GW, K, L, Z; < *Lyonia ferruginea* – RAB (also see *L. fruticosa*); = *Xolisma ferruginea* (Walter) Heller – S]

Lyonia fruticosa (Michaux) G.S. Torrey, Staggerbush, Poor-grub. Cp (GA, SC): pocosins; common (rare in SC). Se. SC (at least formerly) south to s. peninsular FL, west to 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. [= GW, K, L, Z; < *L. ferruginea* – RAB; = *Xolisma fruticosa* (Michaux) Nash – S]

Lyonia ligustrina (Linnaeus) Augustin de Candolle *var.* ***foliosiflora*** (Michaux) Fernald, Southern Maleberry, He-huckleberry. Cp (GA, NC, SC, VA), Pd (Ga, NC, SC): pocosins, seepage bogs, and other wet habitats; common (rare in the Piedmont) (VA Watch List). 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). [= GW, K, L, W, Z; < *L. ligustrina* – RAB, C, G; > *L. ligustrina* var. *capreaefolia* (Watson) Augustin de Candolle – F; > *L. ligustrina* var. *foliosiflora* – F; > *L. ligustrina* var. *salicifolia* (Watson) Augustin de Candolle – F; = *Arsenococcus frondosus* (Pursh) Small – S]

Lyonia ligustrina (Linnaeus) Augustin de Candolle *var.* ***ligustrina***, Northern Maleberry, He-huckleberry. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (NC, SC): mountain bogs, shrub balds, bottomlands, other moist to wet habitats, "dry" ridges at high elevations; common. May-June; 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, GW, K, L, W, Z; < *L. ligustrina* – RAB, C, G; = *Arsenococcus ligustrinus* (Linnaeus) Small – S]

Lyonia lucida (Lamarck) K. Koch, Shining Fetterbush. Cp (GA, NC, SC, VA), Pd (GA): pocosins, wet woodlands, blackwater swamp forests, other acidic wetlands, especially if peaty; common (uncommon in VA). 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, G, GW, K, L, Z; = *Desmothamnus lucidus* (Lamarck) Small – S; = *Neopieris nitida* (Bartram ex Marshall) Britton]

Lyonia mariana (Linnaeus) D. Don, Staggerbush. Cp, Pd (GA, NC, SC, VA): pine flatwoods, savannas, pocosin-sandhill ecotones, dry rocky woodlands in the lower Piedmont (especially with chestnut oak); common (uncommon in Piedmont). April-May; September-October. RI (formerly) and NY (Long Island) south to c. and w. FL; disjunct in sc. MO, c. AR, nw. LA, se. OK, and e. TX. Readily distinguishable by the broadly elliptic leaves borne at an ascending 45 degree angle, with bright pink axillary buds. [= RAB, C, F, G, GW, K, L, Z; = *Neopieris mariana* (Linnaeus) Britton – S]

Menziesia J.E. Smith 1791 (Minniebush)

A genus of about 7-10 species, shrubs, of e. Asia (mostly), w. North America, and se. North America. *Menziesia ferruginea* J.E. Smith of w. North America is closely related; the other species of the genus are e. Asian. Molecular evidence suggests that *Menziesia* should be included in *Rhododendron*, and is actually closely related within *Rhododendron* to *Rh. vaseyi* (Goetsch, Eckert, & Hall 2005; Kurashige et al. 2001). References: Stevens et al. in Kubitzki (2004).

Menziesia pilosa (Michaux ex Lamarck) Antoine Laurent de Jussieu ex Persoon, Minniebush. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): heath balds, bogs, rocky summits, and rocky woodlands, mostly at high elevations; common (uncommon in NC Mountains, rare in GA Mountains, rare in SC and NC Piedmont) (GA Special Concern). 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 superficially somewhat similar *Rhododendron* and *Vaccinium*. [= RAB, C, F, G, K, L, S, W; **= *Rhododendron species 1***]

Monotropa Linnaeus 1753 (Indian Pipes, Pinesap)
(also see *Hypopitys*)

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: Stevens et al. in Kubitzki (2004).

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. Mt, Pd, Cp (GA, NC, SC, VA): a wide variety of forests; common. June-October; August-November. Widespread in North America, and also in South America 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, G, K, L, W; > ***M. uniflora*** – S; > ***M. brittonii*** Small – S]

Monotropsis Schweinitz in Elliott 1817 (Sweet Pinesap)

A monotypic genus, an herb, of e. North America. References: Stevens et al. in Kubitzki (2004).

Monotropsis odorata Schweinitz ex Elliott, Sweet Pinesap. Pd, Mt (GA, NC, SC, VA), Cp (VA): dry to mesic upland woods under oaks and/or pines (*Pinus virginiana* or *P. echinata*), especially slopes or bluffs with abundant heaths, often *Rhododendron maximum*; rare (GA Special Concern, NC Rare, SC Rare, VA Rare). September-November and February-April; October-November and May-June. Centered in the Appalachians: MD and WV south to GA and AL. The flowers are very fragrant, the odor variously described as similar 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. *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. [= C, F, G, K, L, W; > ***M. odorata*** var. *lehmaniae* (Burnham) Ahles – RAB; > ***M. odorata*** var. *odorata* – RAB; > ***M. lehmaniae*** Burnham – S; > ***M. odorata*** – S]

Orthilia Rafinesque 1840 (One-sided Shinleaf)

A monotypic genus, a subshrub, circumboreal in distribution. The recognition of *Orthilia* as separate from *Pyrola* is supported by molecular data (Freudenstein 1999a). References: Stevens et al. in Kubitzki (2004).

Orthilia secunda (Linnaeus) House, One-sided Shinleaf, One-sided Pyrola. Pd, Cp (VA): forests under *Pinus virginiana*, other forests?; rare (VA Rare). June-July; July-September. Circumboreal, in North America south to VA, IN, MN, and NM. [= K, L; = *Pyrola secunda* Linnaeus – C, G, W; > ***P. secunda*** var. *secunda* – F]

Oxydendrum Augustin 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. References: Stevens et al. in Kubitzki (2004).

Oxydendrum arboreum (Linnaeus) Augustin de Candolle, Sourwood, Sorrel-tree. Mt, Pd, Cp (GA, NC, SC, VA): 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; common (becoming uncommon to rare in n. VA). 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* Linnaeus), sheep sorrel (*Rumex acetosella*), or wood sorrel (*Oxalis*). [= RAB, C, F, G, K, L, S, W]

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 (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. Mt (GA?, NC, VA), Pd (NC, VA): acid wooded slopes, heath balds at high elevations, summits of Piedmont monadnocks; common (uncommon and local in NC, rare in Piedmont). 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, G, K, L, S, W, Z]

Pieris phillyreifolia (Hooker) Augustin de Candolle, Vine-wicky, Climbing Fetterbush. Cp (GA, SC): swamp forests; rare (SC Rare). 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 unique habit. [= GW, K, L, Z; = *Ampelothamnus phillyreifolius* (Hooker) Small – S]

* *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. [= Z] {not keyed}

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: Stevens et al. in Kubitzki (2004).

1 Calyx lobes distinctly longer than broad, 3-4 mm long; leaves coriaceous, more or less glossy .....***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 < 2.5 cm wide; calyx lobes broadly ovate, the apex subacute to obtuse ....***P. chlorantha***
  2 Leaves mostly 3-9 cm long, the blade > 2.5 cm wide; calyx lobes triangular, the apex acute to acuminate .....***P. elliptica***

Pyrola americana Sweet, Rounded Shinleaf. Mt, Pd (NC, VA), Cp (VA): xeric to mesic woodlands and forests; common (uncommon in NC). May-August; July-October. Widespread in ne. North America, south to NC, ne. TN, KY, IN, and MN. [= K, S, W; = *P. rotundifolia* Linnaeus var. *americana* (Sweet) Fernald – RAB, C, F, G, L]

Pyrola chlorantha Swartz. Mt, Pd (VA): dry forests; rare (VA Rare). June-August; August-October. Circumboreal, in North America south to VA, WV, IN, and NE. [= C, K, L, W; > *P. virens* var. *virens* – F, G; > *P. virens* var. *convoluta* (Bart.) Fernald – F, G]

Pyrola elliptica Nuttall, Elliptic Shinleaf. Mt (NC, VA): moist to dry forests, including rich northern hardwood forests; rare (NC Rare, VA Rare). June-August; July-October. Newfoundland and Québec, west to British Columbia, south to WV, nw. NC, and IA. Known in NC only from Ashe County, in Long Hope Valley (McDowell 1984) and on Phoenix Mountain. [= C, F, G, K, L, S, W]

Rhododendron Linnaeus 1753 (Rhododendron, Azalea)

A genus of about 850 species, shrubs and trees, mostly north temperate (centered in Himalayan Asia). References: 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 .....***Rh. 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 .....***Rh. 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 *Rh. 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] ..... ***Rh. 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 *Rh. 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].
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]..... ***[Rh. 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]..... ***Rh. 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*]..... ***Rh. 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; [north of ec. AL and wc. GA] ..... ***Rh. cumberlandense***
9 Twigs glabrous; [south of ec. AL and wc. GA]..... ***Rh. 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 ..... ***Rh. 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..... ***Rh. 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..... ***Rh. flammeum***
7 Corolla white or pink (white marked with yellow in *Rh. eastmanii* and *Rh. alabamense*).
12 Sepals 1.5-5 mm long.
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..... ***Rh. atlanticum***
13 Young stems glabrous (rarely very sparsely pubescent); nonclonal shrub or small tree, to 7 m tall ..... ***Rh. arborescens***
12 Sepals 0.1-1 mm long.
14 Leaves glabrous beneath, except for strigose bristles along the midrib and major veins.
15 Pedicels densely stipitate-glandular; flowers appearing after the leaves ..... ***Rh. viscosum***
15 Pedicels strigose to puberulent, not stipitate-glandular; flowers appearing with or before the leaves. ..... ***Rh. periclymenoides***
14 Leaves densely and softly pubescent beneath.
16 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] ..... ***Rh. prinophyllum***
16 Corolla lobes much shorter than the corolla tube; capsule sparsely pubescent, the pubescence not glandular (or with some of the hairs glandular in *Rh. eastmanii* and *Rh. alabamense*); [of southern distribution, from c. SC and se. TN southward].
17 Corolla pale to deep pink, without yellow markings; scales of the winter buds pubescent on the outer surface ..... ***Rh. canescens***
17 Corolla white, with a blotch of yellow on the upper lobe; scales of the winter buds glabrous on the outer surface.
18 Flowers opening before the leaves have expanded; flower buds with non-glandular margins ..... ***Rh. alabamense***
18 Flowers opening after the leaves have expanded; flower buds with margins glandular along their lower 2/3s ..... ***Rh. eastmanii***

Alternate Key to Azaleas

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 *Pentanthera*, section *Rhodora*].....***Rh. 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 *Pentanthera*, 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 *Rh. viscosum*).

3 Capsule ovoid, 2-3 (-4)× as long as broad (if capsules absent, try both leads).

4 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].....***Rh. flammeum***

4 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].

5 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) .....***Rh. viscosum***

5 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).

6 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] .....***Rh. atlanticum***

6 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].....***Rh. prinophyllum***

3 Capsule cylindroid, (3-) 4-5× as long as broad.

7 Corolla yellow-orange to orange-red; upper corolla lobe with a contrasting blotch; [of s. GA west to se. MS] .....***Rh. austrinum***

7 Corolla white to pink; upper corolla lobe uniform in color (lacking a contrasting blotch); [collectively widespread in our area].

8 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] .....***Rh. canescens***

8 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].....***Rh. prinophyllum***

2 Outer (abaxial) surface of the vegetative bud scales glabrous or sparsely pubescent.

9 Capsule cylindric, (3-) 4-5 × as long as broad; corolla white to pink; 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].....***Rh. alabamense***

10 Corolla deep pink (rarely white or nearly so), lacking a contracting blotch on the upper lobe; [widespread in our primary and secondary area].....***Rh. periclymenoides***

9 Capsule ovate, 2-3.5× as long as broad; corolla yellow, orange, or orange-red (except white or pink in *Rh. arborescens* and *Rh. viscosum*); flowers appearing before, with, or after the leaves.

11 Corolla white to pink.....***Rh. arborescens, Rh. eastmanii, Rh. viscosum***

11 Corolla yellow, orange, or orange-red.....***Rh. calendulaceum, Rh. flammeum, Rh. cumberlandense, [Rh. prunifolium]***

Rhododendron alabamense Rehder, Alabama Azalea. Cp, Pd, Mt (GA): moist slopes, blufs, streambanks; uncommon. March-April. W. GA and Panhandle FL west through AL to e. MS. *Rh. alabamense* is reported by RAB to occur Calhoun County, SC; this record actually represents *Rh. eastmanii*. [= K, L, Z; = *Azalea alabamensis* (Rehder) Small – S]

Rhododendron arborescens (Pursh) Torrey, Sweet Azalea, Smooth Azalea. Mt, Pd (GA, NC, SC, VA), Cp (GA, NC, SC): rocky riversides, wooded stream banks, swamps, high elevation forests, shrub balds; common (rare in VA) (VA Rare). 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, G, K, L, W, Z; = *Azalea arborescens* Pursh – S]

Rhododendron atlanticum (Ashe) Rehder, Dwarf Azalea. Cp (GA, NC, SC, VA): pocosins, savannas, pine flatwoods, sandhill-pocosin ecotones; common. 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, G, GW, K, L, Z; = *Azalea atlantica* Ashe – S]

Rhododendron austrinum (Small) Rehder. Cp (GA): {habitat}; rare. Sc. GA west to se. MS (Kron 1993), and reported for e. GA (Jones & Coile 1988). [= K, L, Z; = *Azalea austrina* Small – S]

Rhododendron calendulaceum (Michaux) Torrey, Flame Azalea. Mt (GA, NC, SC, VA), Pd (GA, NC, SC): deciduous forests, particularly on mountain slopes, grassy balds; common (rare in Piedmont, absent from n. VA). May-June; June-September. Largely Appalachian: s. PA and s. OH to c. GA and e. TN. This is the only species of azalea in our area with a tetraploid chromosome number; 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 *Rh. calendulaceum*, involving hybridization between ancestors of *Rh. cumberlandense* and *Rh. prinophyllum*. [= RAB, C, F, G, K, L, W, Z; = *Azalea calendulacea* Michaux – S]

Rhododendron canescens (Michaux) Sweet, Piedmont Azalea, Southern Pinxterbloom Azalea, Wild Azalea. Cp, Pd (GA, NC, SC), Mt (GA): swamps, pocosins, and savannas; uncommon. March-early May; September-October. Se. and sc. NC, n. TN, se. KY, s. IL, and e. OK, south to c. peninsular FL and se. TX. [= RAB, C, F, G, GW, L, W, Z; > *Rh. canescens* var. *canescens* – K; > *Rh. canescens* var. *candidum* (Small) Rehder – K; > *Rh. canescens* var. *subglabrum* Rehder – K; > *Azalea candida* Small – S; > *Azalea canescens* Michaux – S]

Rhododendron carolinianum Rehder, Carolina Rhododendron, Punctatum. Mt (NC, SC): rocky summits, heath balds, high elevation forests, moist slopes; uncommon. 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. *Rh. carolinianum* is phenologically separated from *Rh. minus*, flowering earlier than *Rh. 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 *Rh. carolinianum* and *Rh. minus* as distinct. Gensel (1988 and pers.comm.) did detailed studies of the complex and supported the recognition of 3 taxa (*Rh. carolinianum*, *Rh. minus*, and *Rh. chapmanii*). [= D, K, S; < *Rh. minus* – RAB, W; < *Rh. minus* var. *minus* – L, Q, V]

Rhododendron catawbiense Michaux, Pink Laurel, Catawba Rhododendron, Mountain Rosebay. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): rocky summits, shrub balds, acid ridges and slopes (mostly at high elevations), north-facing bluffs in the Piedmont; common (rare in Piedmont and Coastal plain) (SC Rare). 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." *Rh. catawbiense* is apparently most closely related to *Rh. macrophyllum* D. Don ex G. Don of nw. North America (Milne 2004). [= RAB, C, F, G, K, L, S, W, X]

Rhododendron cumberlandense E.L. Braun, Cumberland Azalea. Mt (GA, NC, VA), Pd (SC): balds and exposed or moist slopes; rare (NC Rare, VA Rare). 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). [= F, G, K, L, W, Z; = *Rh. bakeri* (Lemmon & McKay) Hume – C, misapplied]

Rhododendron eastmanii Kron & Creel, May White Azalea, Eastman's Azalea. Pd (SC): rich slopes, rare. Early-mid May. This species is known only from Calhoun, Laurens, Newberry, Orangeburg, Richland, Union counties, South Carolina (Kron & Creel 1999; C. Horn pers. comm. 2000). It is locally fairly common, in the Broad River drainage (C. Horn, pers. comm. 2000). It should be sought in NC and GA. The RAB reference to *Rh. alabamense* in SC is probably based on this species. [< *Rhododendron alabamense* Rehder – RAB, misapplied]

Rhododendron flammeum (Michaux) Sargent, Oconee Azalea. Cp, Pd (GA, SC), Mt (GA): sandhills, upland forests on slopes, ridges, stream bluffs; rare (SC Rare). April. W. SC west to w. GA. [= K, L, Z; = *Azalea speciosa* Willdenow – S; = *Rhododendron speciosum* (Willdenow) Sweet]

Rhododendron maximum Linnaeus, Great Laurel, White Rosebay, Great Rhododendron. Mt, Pd (GA, NC, SC, VA), Cp (VA): moist slopes, wet flats, bogs, swamps, north-facing bluffs in the Piedmont; common (uncommon in Piedmont, rare in VA Coastal Plain). Apparently most closely related to *Rh. ponticum* Linnaeus of Turkey and vicinity (Milne 2004). June-August; September-October. Largely Appalachian: Nova Scotia and s. Ontario south to GA and AL, primarily in the mountains. [= RAB, C, F, G, K, L, S, W, X]

Rhododendron minus Michaux, Gorge Rhododendron, Punctatum. Mt, Pd, Cp (GA, NC, SC): rocky slopes, escarpment gorges, rocky areas in the Piedmont, sandhill bluffs in the Coastal Plain; common (rare in Piedmont and 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; < *Rh. minus* – RAB, W (also see *Rh. carolinianum)*; < *Rh. minus* var. *minus* – L, Q, V]

Rhododendron periclymenoides (Michaux) Shinners, Wild Azalea, Pinxterflower, Pinxterbloom Azalea, Election Pink. Mt, Pd, Cp (GA, NC, SC, VA): moist to dry slopes and streambanks; common. 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 *Rh. nudiflorum*. [= C, K, L, W, Z; = *Rh. nudiflorum* (Linnaeus) Torrey – RAB, F, G, GW; = *Azalea nudiflora* Linnaeus – S]

Rhododendron prinophyllum (Small) Millais, Election Pink, Early Azalea, Roseshell Azalea. Mt (NC, VA), Pd (VA): upland forests (especially under *Quercus montana* and *Quercus rubra*), xeric pine and oak woodlands; common in VA, rare in NC, rare in VA Piedmont (NC Rare). 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 *Rh. roseum*. [= C, K, L, W, Z; = *Rh. roseum* (Loiseleur) Rehder – RAB, F, G; = *Azalea prinophylla* Small – S]

Rhododendron prunifolium (Small) Millais, Plumleaf Azalea. Cp, Pd (GA): mesic ravine forests and streambanks; rare (GA Threatened). Endemic to a small area along the AL-GA border, in se. AL (Kron 1993) and sw. and wc. GA (Jones & Coile 1988). [= K, L, Z; = *Azalea prunifolia* Small – S]

Rhododendron vaseyi A. Gray, Pinkshell Azalea. Mt (GA?, NC): moist slopes, bogs, high elevation rocky summits, cliffs, high elevation heath balds; rare (NC Rare). 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; *Rh. 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 *Rh. vaseyi* and *Rh. canadense* (Linnaeus) Torrey (of ne. North America) as the only two members of section *Rhodora*. When not in flower, *Rh. vaseyi* is readily distinguished from our other azaleas by its distinctive foliage (see key). [= RAB, F, K, L, W, Y; = *Biltia vaseyi* (A. Gray) Small – S]

Rhododendron viscosum (Linnaeus) Torrey, Swamp Azalea, Clammy Azalea. Cp, Mt, Pd (GA, NC, SC, VA): bogs, pocosins, moist streambanks, shrub balds, and other moist habitats; common (uncommon in VA Piedmont and VA Mountains). Late May-July; July-October. ME and OH south to FL and LA. *Rh. serrulatum* (*Rh. viscosum* var. *serrulatum*) may well deserve recognition at some taxonomic level. [= GW, K, L, W, Z; > *Rh. viscosum* var. *serrulatum* (Small) Ahles – RAB; > *Rh. viscosum* var. *viscosum* – RAB; > *Rh. serrulatum* (Small) Millais – C, F, G; > *Rh. viscosum* – C, F, G; > *Azalea viscosa* Linnaeus – S; > *Azalea serrulata* Small – S]

Rhododendron chapmanii A. Gray, Chapman's Rhododendron. Endemic to Panhandle FL, with an isolated disjunction in ne. FL (Clay County). [= D, K, S; = *Rh. minus* Michaux var. *chapmanii* (A. Gray) Duncan & Pullen = L, V; = *Rh. minus* var. *champanii* – Q, orthographic error]

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 & 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 (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 (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, 2-5 (-10) dm 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, 3-50 dm tall, 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* – K; > *Cyanococcus subcordatus* Small – S; > *Cyanococcus liparis* Small – S, as to type]

Vaccinium angustifolium Aiton, Northern Lowbush Blueberry, Sugarberry, Low Sweet Blueberry. Mt (VA): acidic forests and woodlands, cliffs and talus (especially sandstone and quartzite), usually at high elevations; common. Labrador and Newfoundland west to Manitoba, south to NJ, PA, sw. VA, IL, and MN. [= C, K, W, Y, Z; > *V. angustifolium* var. *angustifolium* – F; > *V. angustifolium* var. *laevifolium* House – F; > *V. angustifolium* var. *hypolasium* Fernald – F; > *V. angustifolium* var. *nigrum* (Wood) Dole – F; > *V. angustifolium* – G, X; > *V. lamarckii* Camp – G, X; > *V. brittonii* Porter ex Bicknell – X]

Vaccinium arboreum Marshall, Farkleberry, Sparkleberry. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC): 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; common (uncommon in Piedmont, rare in Mountains). 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 30 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 occurs mainly south and west of our area, but is known in our area from SC and s. NC (Coastal Plain and Piedmont). 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, G, K, L, W, 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. Cp (GA, NC, SC, VA), Pd (GA?, SC): swamps, bogs, moist ground; rare. Late February-May; June-August. S. ME south to n. FL. This species is diploid. [= C, F, G, K, X, Y; < *V. corymbosum* – RAB, L, Z]

Vaccinium corymbosum Linnaeus, Smooth Highbush Blueberry. Mt (GA, NC, SC, VA), Pd (NC): bogs, wet swamp forests, moist high elevation bogs, balds, and forests; common (rare in Piedmont). May; August. Nova Scotia 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, G, L, W, Z (also see *V. simulatum*); > *V. corymbosum* var. *corymbosum* – F; > *V. corymbosum* var. *albiflorum* (Hooker) Fernald – F; > *V. corymbosum* var. *glabrum* Gray – F; < *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. Cp (GA, NC, SC, VA), Pd (NC): savannas, pine flatwoods, pocosin-sandhill ecotones, upland sandhills over clay pans; common (rare in VA, rare in lower Piedmont only of NC and SC) (VA Rare). 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* – L, Z (also see *V. sempervirens*)]

Vaccinium darrowii Camp, Darrow's Blueberry. Cp (GA): pine flatwoods; uncommon. S. GA south to s. peninsular FL and west to se. TX. [= K, L, X, Z; = *V. darrowi* – GW, orthographic variant; = *Cyanococcus myrsinites* (Lamarck) Small var. *glaucum* A. Gray – S]

Vaccinium elliottii Chapman, Mayberry. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): bottomlands, slopes, sandy river terraces, natural levees; common (rare in Piedmont, uncommon in VA). 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* – L, Z]

Vaccinium erythrocarpum Michaux, Bearberry, Highbush Cranberry, Mountain Cranberry. Mt (GA, NC, VA): rocky ridges, shrub or grassy balds, bogs, spruce-fir forests, usually at high elevations; uncommon. 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, Y, Z; = *Hugeria erythrocarpa* (Michaux) Small – S]

Vaccinium formosum H.C. Andrews, Southern Highbush Blueberry, Swamp Highbush Blueberry. Cp (GA, NC, SC, VA), Mt (VA): bogs, swamps (especially blackwater, or at least where away from strong alluvial influence), seepages, depression ponds (dolines), other moist ground; common (rare in Mountains). Late February-May; June-August. Apparently ranging from NJ south to n. FL and e. TX, 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, L, Z; = *V. australe* Small – G, GW, X; = *Cyanococcus virgatus* (Aiton) Small – S, misapplied]

Vaccinium fuscatum Aiton, Hairy Highbush Blueberry, Black Highbush Blueberry. Cp, Pd, Mt (GA, NC, SC, VA): bogs, pocosins, swamps, also in uplands; common. 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, L, Z; *? V. marianum* S. Watson – G; > *Cyanococcus fuscatus* (Aiton) Small – S; > *Cyanococcus atrococcus* (A. Gray) Small – S]

Vaccinium hirsutum Buckley, Woollyberry, Hairy Blueberry. Mt (GA, NC): mountain slopes, primarily in pine-oak and oak forests; rare (NC Rare). 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, K, L, W, X, Z; = *Cyanococcus hirsutus* (Buckley) Small – S]

Vaccinium macrocarpon Aiton, Cranberry, Large Cranberry. Mt, Cp (NC, VA): mountain bogs, low pocosins with deep peat, interdunal swales; rare (NC Rare, VA Rare). 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 Newfoundland west and south to s. Ontario, 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, G, GW, K, L, W, Y, Z; = *Oxycoccus macrocarpus* (Aiton) Persoon – S]

Vaccinium myrsinites Lamarck, Southern Evergreen Blueberry. Cp (GA, SC): pine flatwoods; common (rare in SC, but locally dominant in spodosolic flatwoods in Beaufort and Jasper counties, SC and very locally common as far north as Horry County); common. 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, GW, K, L, X, Z; = *Cyanococcus myrsinites* (Lamarck) Small var. *myrsinites* – S]

Vaccinium myrtilloides Michaux, Velvetleaf Blueberry, Sourtop, Canada Blueberry. Mt (NC, VA): acidic, high elevation slopes and cliffs; rare (VA Rare). May-July. Labrador west to British Columbia, 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.. 2006). 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, G, K, W, X, Y, Z]

Vaccinium pallidum Aiton, Hillside Blueberry, Dryland Blueberry. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): forested slopes, usually rather xeric; common. 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, 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; > *Cyanococcus pallidus* (Aiton) Small – S; > *Cyanococcus vacillans* (Kalm ex Torrey) Rydberg – S]

Vaccinium sempervirens Rayner & Henderson, Rayner's Blueberry. Cp (SC): seepage bogs in the fall-line Sandhills, longleaf pine woodlands over sandstone and gravel outcrops; rare (US Species of Concern, SC Rare). 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* – L, Z]

Vaccinium simulatum Small, Mountain Highbush Blueberry. Mt (GA, NC, SC, VA): forested slopes (northern hardwoods, spruce-fir forests), ridges, and shrub balds, at moderate and high elevations; common. 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, L, W, Z; = *Cyanococcus simulatus* (Small) Small – S]

Vaccinium stamineum Linnaeus *var.* ***1***, Dwarf Deerberry. Cp (GA, NC, SC): pinelands; common. 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, K, L, W, Y, Z; = *Polycodium arenicola* W.W. Ashe – V]

Vaccinium stamineum Linnaeus *var.* ***2***, Appalachian Deerberry. Mt, Pd (GA, NC, SC, VA): xeric to submesic woodlands and forests, including pine-oak/heath and shrub balds; common. April-June; August-October. PA south to GA, in the Appalachians and adjacent provinces. [< *V. stamineum* var. *stamineum* – RAB, F; < *V. stamineum* – C, 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. Cp (GA, NC, SC): xeric woodlands; rare. 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, K, L, W, 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.* ***sericeum*** (C. Mohr) D.B. Ward, Southern Deerberry. Cp (GA, SC), Mt (GA, NC), Pd (GA): xeric woodlands; rare. 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, K, L, W, 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. Mt, Pd, Cp (GA, NC, SC, VA): xeric to submesic woodlands, forests, and rock outcrops (unlike most *Vaccinium*, often on mafic, ultramafic, or calcareous rocks); common. April-June; August-October. MA, NY, s. Ontario, and MO south to Panhandle FL and TX. [= Q; < *V. stamineum* var. *stamineum* – RAB; < *Vaccinium stamineum* – C, K, L, W, Y, Z; > *V. stamineum* var. *stamineum* – F; > *V. stamineum* var. *interius* (Ashe) Palmer & Steyermark – F; > *V. stamineum* var. *neglectum* (Small) Deam – F; > *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. Cp, Pd (GA, NC, SC, VA): sandhills, pine flatwoods, other xeric woodlands; common (uncommon in Piedmont and VA Coastal Plain, rare in VA Piedmont). 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 an range extension (where it is scattered and rare) south and west to n. FL, s. AL, and se. MS. [= RAB, C, F, G, K, L, X, Y, Z; = *Cyanococcus tenellus* (Aiton) Small – S]

Vaccinium virgatum Aiton, Swamp Blueberry, Rabbiteye Blueberry. Cp (GA, NC, SC): pocosins and *Chamaecyparis* swamps, also in various drier habitats, including turkey oak sandhills; uncommon in SC, rare in NC (NC Watch List). 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, Z; > *V. virgatum* – X; > *V. amoenum* – X; > *V. ashei* Reade – X]

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 this record. [= C, G, K; > *V. oxycoccos* Linnaeus var. *ovalifolium* – F; = *Oxycoccus palustris* Persoon; > *Oxycoccus palustris* Persoon var. *ovalifolius* (Michaux) Seymour; > *Oxycoccus ovalifolius* (Michaux) Porsild]

Vaccinium stamineum Linnaeus var. *glandulosum* (Ashe) D.B. Ward. Supposedly endemic to the FL Panhandle, probably in GA. [= *Polycodium glandulosum* Ashe; < *Vaccinium stamineum* – L] {not keyed at this time; synonymy incomplete}

Some of the hybrids known to occur in our area are listed below. Nearly every combination of co-occurring species in section *Cyanococcus* may be expected to form hybrids.

V. ×***atlanticum*** Bicknell (pro sp.) [*angustifolium* × *corymbosum*]
V. ×***dobbinii*** Burnham (pro sp.) [*angustifolium* × *pallidum*]
V. ×***margarettiae*** Ashe (pro sp.) [*fuscatum* × *pallidum*]
V. ×***marianum*** S. Watson (pro sp.) [*formosum* × *fuscatum*]

Zenobia D. Don 1834 (Zenobia, Honey-cups)

A monotypic genus, a shrub, of se. North America (endemic to the flora area). References: Stevens et al. in Kubitzki (2004).

Zenobia pulverulenta (Bartram ex Willdenow) Pollard, Zenobia, Honey-cups. Cp (GA, NC, SC, VA): pocosins, margins of pineland ponds; common (rare in GA and VA) (VA Rare). 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, G, GW, K, L; > *Z. pulverulenta* – S; > *Z. cassinefolia* (Ventenat) Pollard – S]

EUPHORBIACEAE A.L. de Jussieu 1789 (Spurge Family)
(also see *PHYLLANTHACEAE*)

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).

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 crenate or serrate; [subfamily *Euphorbioideae*] ..... ***Stillingia***
    4 Leaves palmately lobed.
      5 Inflorescence a panicle; petals absent; [subfamily *Acalyphoideae*] ..... ***Ricinus***
      5 Inflorescence a dichasium; petals present; [subfamily *Crotonoideae*] ..... ***Vernicia***
1 Herb.
  6 Leaves palmately or ternately lobed or divided.
    7 Plant with stinging trichomes; calyx petaloid, white; leaves cordate at base; [subfamily *Crotonoideae*] ..... ***Cnidoscolus***
    7 Plant glabrous; calyx green or purple; leaves peltate; [subfamily *Acalyphoideae*] ..... ***Ricinus***
  6 Leaves generally not lobed, entire or serrate (rarely pinnately lobed in *Euphorbia*).
    8 Plant with copious white latex; flowers enclosed in a cyathium; [subfamily *Euphorbioideae*].
      9 Leaves strictly opposite, oblique or inequilateral at base; branches often prostrate ..... ***Chamaesyce***
      9 Leaves alternate or opposite, not oblique or asymmetric at base; branches usually erect ..... ***Euphorbia***
    8 Plant without white latex (the sap clear), or slightly milky in Stillingia; flowers not enclosed in a cyathium.
      10 Pubescence of stellate trichomes and/or scales; [subfamily *Crotonoideae*] ..... ***Croton***
      10 Pubescence of simple trichomes, or glabrous.
        11 Flowers in terminal spikes; stout perennial with several to many stems arising from a subterranean crown [subfamily *Euphorbioideae*] ..... ***Stillingia***
        11 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.
          12 Ovules and seeds 2 per locule (the capsule thus 6-seeded); flowers in small axillary clusters of 2-4.. ..... ***[see Phyllanthus – PHYLLANTHACAE]***
          12 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*].
            13 Pistillate flowers subtended by a conspicuous leafy bract; plant lacking stinging trichomes ..... ***Acalypha***
            13 Pistillate flowers lacking a leafy bract; plant with stinging trichomes ..... ***Tragia***

Acalypha Linnaeus 1753 (Copperleaf, Three-seeded Mercury)

A genus of about 430-462 species, shrubs and herbs, of tropical, subtropical, and warm temperate regions. References: Levin (1999b)=Z; Levin (1999a); Govaerts, Frodin, & Radcliffe-Smith (2000)=Y.

1 Pistillate flowers all or chiefly in terminal spikes, the staminate flowers in axillary clusters.
  2 Leaves cordate at base; fruit tuberculate, but not pubescent ..... ***A. ostryifolia***
  2 Leaves rounded to widely cuneate at base; fruit pubescent with pustular-based trichomes ..... ***A. setosa***
1 Pistillate and staminate flowers all in axillary inflorescences, the staminate flowers above and pistillate flowers below in each inflorescence.
  3 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.
    4 Fruit 2-seeded; seeds 2.2-3.2 mm long ..... ***A. deamii***

4 Fruit 3-seeded; seeds 1.2-2.0 mm long..... ***A. rhomboidea***

3 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.

5 Bracts subtending the pistillate flowers usually stipitate-glandular, the bract lobes ovate to deltoid, the longest 2 mm long or less..... ***A. gracilens***

5 Bracts subtending the pistillate flowers usually with non-stipitate, pointed hairs, the bract lobes linear to oblong, the longest usually > 3 mm long ..... ***A. virginica***

Acalypha deamii (Weatherby) Ahles, Big-seeded Copperleaf, Two-seeded Copperleaf. Pd (VA): alluvial forests, especially on sandy levees; rare (VA Watch List). 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 (Chesterfield, Powhatan, Buckingham, Fluvanna, and Cumberland counties on the James River; Pittsylvania, Halifax, and Campbell counties on the Staunton River; Rappahannock River), but perhaps only overlooked elsewhere. This plant is up to a meter tall and occurs in moist bottomland forests. [= C, K, Z; = *A. rhomboidea* var. *deamii* (Weatherby) Weatherby – F; = *A. virginica* Linnaeus var. *deamii* Weatherby – Y] {G?}

Acalypha gracilens A. Gray, Shortstalk Copperleaf. Cp, Pd, Mt (GA, NC, SC, VA): woodlands, disturbed ground; common. Late June-November. ME west to WI, south to FL and TX. The related *A. monococca* (Engelm. ex A. Gray) Lill. W. Miller & Gandhi is of 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, 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, Rough-pod Copperleaf. Pd (GA, NC, SC, VA), Mt (GA, NC, VA), Cp (GA, SC): disturbed ground; uncommon (VA Watch List). Late June-November. NJ west to IN and NE, south to FL, TX, Mexico, and the West Indies. [= K, W, Y; = *A. ostryaefolia* – RAB, C, F, G, S, orthographic variant]

Acalypha rhomboidea Rafinesque, Rhombic Copperleaf. Cp, Pd, Mt (GA, NC, SC, VA): woodlands, disturbed ground; common. Late June-November. Nova Scotia and ME west to ND, south to panhandle FL and e. TX. [= RAB, C, G, GW, K, S, W, Z; *A. rhomboidea* var. *rhomboidea* – F; = *A. virginica* Linnaeus var. *rhomboidea* (Rafinesque) Cooperrider – Y]

* ***Acalypha setosa*** A. Richard, Cuban Copperleaf. Cp (GA, SC): disturbed ground; rare, introduced from Cuba. June-November. [= RAB, K, S, Y]

Acalypha virginica Linnaeus, Virginia Copperleaf. Mt, Pd (GA, NC, SC, VA), Cp (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, G, GW, K, S, W, Z; = *A. virginica* Linnaeus var. *virginica* – Y]

Aleurites

(see *Vernicia*)

Chamaesyce S.F. Gray 1821

In our area, *Chamaesyce* is largely weedy and the original distributions of some of the species are difficult to assess. Only 3 of our species are definitely native, occurring characteristically in natural habitats: *Ch. bombensis* and *Ch. polygonifolia* of dunes, and *Ch. cordifolia* of sandhills. Other species are often found in shallow soils of rock outcrops, cliffs, glades, and barrens, perhaps reflecting their pre-Columbian habitats. References: Herndon (1993)=Z; Govaerts, Frodin, & Radcliffe-Smith (2000)=Q.

1 Young stems and leaves glabrous; leaves 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..... ***[Ch. glyptosperma]***

3 Seeds 0.8-1.0 mm long, with 2-3 (-4) transverse ridges..... ***Ch. 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 ..... ***[Ch. serpens]***

4 Stipules separate, lacerate, appearing as 4 stipules at each node.

5 Leaves 1.5-2× as long as wide, not fleshy; mature seeds 1.0-1.2 (-1.4) mm long, angled; [of inland sandhills]. ..... ***Ch. cordifolia***

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].

6 Mature seeds (1.3-) 1.5-1.9 mm long; cyathia terminal on the stems and also axillary..... ***Ch. bombensis***

6 Mature seeds (2.0-) 2.2-2.6 mm long; cyathia terminal on the stems..... ***Ch. polygonifolia***

1 Young stems and leaves pubescent (at least in lines along the stems); leaves serrulate, at least at the apex (use 10× magnification).

7 Ovary and capsule glabrous.
8 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 ..... ***Ch. hyssopifolia***
8 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.
9 Stems ascending or suberect, puberulent when young ..... ***Ch. nutans***
9 Stems prostrate or widely spreading, spreading-hirsute ..... ***Ch. vermiculata***
7 Ovary and capsule pubescent.
10 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 ..... ***Ch. hirta***
10 Stems with 1 type of trichome, these < 2 mm long; cyathia solitary or several in axils, the peduncles < 5 mm long.
11 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..... ***Ch. prostrata***
11 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.
12 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.. ..... ***Ch. humistrata***
12 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 ..... ***Ch. maculata***

Chamaesyce bombensis (Jacquin) Dugand, Southern Seaside Spurge, Dixie Sandmat. Cp (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 *Ch. polygonifolia*; uncommon (VA Rare). 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 *Ch. polygonifolia*; *Ch. bombensis* prefers areas behind the foredune, while *Ch. polygonifolia* prefers the pioneer situation on the upper beach and foredune front. [= K, Z; = *Euphorbia ammannioides* Kunth – RAB, C, F, G; > *Ch. ingallsii* Small – S; **= *Euphorbia bombensis*** Jacquin – Q]

Chamaesyce cordifolia (Elliott) Small, Heartleaf Sandmat. Cp (GA, NC, SC): open sands of very dry sandhills; rare (NC Rare). July-October. Se. NC south to s. FL and west to s. TX. [= K, S, Z; **= *Euphorbia cordifolia*** Elliott – RAB, Q]

Chamaesyce hirta (Linnaeus) Millspaugh, Pillpod Sandmat. Cp (GA, SC), Pd (GA): fields, disturbed ground; rare. June-October. SC south to FL, west to TX, and south into Central and South America. [= K, S, Z; **= *Euphorbia hirta*** Linnaeus – RAB, C, G, Q]

* ***Chamaesyce humistrata*** (Engelmann) Small, Spreading Sandmat. Cp, Mt (VA), Pd (GA, VA): exposed river shores, rocky riverside gravel bars, disturbed areas; rare, apparently adventive from further west, but possibly native in some areas. [= GW, K, S, Z; **= *Euphorbia humistrata*** Engelmann – C, F, G, Q]

Chamaesyce hyssopifolia (Linnaeus) Small, Hyssopleaf Sandmat. Cp (GA, SC): disturbed ground; uncommon? May-October. SC south to 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 *C. nutans*. [= GW, K, Z; **= *Euphorbia hyssopifolia*** Linnaeus – Q]

Chamaesyce maculata (Linnaeus) Small, Milk-purslane, Spotted Spurge. Pd, Cp, Mt (GA, NC, SC, VA): gardens, fields, disturbed places, crevices in pavement or sidewalks; common. January-December. Québec west to ND, south to FL and TX; introduced in various places worldwide. [= GW, K, S, Z; > *Euphorbia supina* Rafinesque – RAB, F; **= *Euphorbia maculata*** Linnaeus – C, G, Q, W]

Chamaesyce nutans (Lagasca y Segura) Small, Eyebane. Pd, Cp, Mt (GA, NC, SC, VA): fields, gardens, waste places, disturbed ground; common. May-October. NH west to MI and ND, south to FL and TX; introduced in various places worldwide. [= GW, K, Z; = *Euphorbia maculata* Linnaeus – RAB, F, misapplied; **= *Euphorbia nutans*** Lagasca y Segura – C, Q, W; = *Euphorbia preslii* Guss. – G; = *Ch. hyssopifolia* (Linnaeus) Small – S, in part, misapplied]

Chamaesyce polygonifolia (Linnaeus) Small, Northern Seaside Spurge, Northern Sandmat. Cp (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 *Ch. bombensis*; common. May-October. Québec to ne. FL along the Atlantic Ocean; disjunct to the Great Lakes. See *Ch. bombensis* for discussion of the habitats of these related species. [= K, S, Z; **= *Euphorbia polygonifolia*** Linnaeus – RAB, C, F, G, Q]

* ***Chamaesyce prostrata*** (Aiton) Small, Prostrate Sandmat. Pd (GA, NC, SC, VA), Cp, Mt (NC, SC, VA): crevices of pavement or sidewalks, disturbed places; rare, naturalized from tropical America. January-December. Probably native to South America, introduced and naturalized in se. United States. [= C, K, S, Z; = *Euphorbia chamaesyce* Linnaeus – RAB, F, G, misapplied; **= *Euphorbia prostrata*** Aiton – Q]

Chamaesyce vermiculata (Rafinesque) House. (VA). Widespread and common in PA (Rhoads & Klein 1993). [= K; = ***Euphorbia vermiculata*** Rafinesque – C, F, G, Q]

Chamaesyce glyptosperma (Engelmann) Small, Ridge-seed Spurge, east to sc. TN (Chester, Wofford, & Kral 1997). In VA, WV, LA (Q). [= K; **= *Euphorbia glyptosperma*** Engelmann – C, F, G, Q]

Chamaesyce hypericifolia (Linnaeus) Millspaugh, reported for SC (Kartesz 1999), FL, GA, LA (Q). {Investigate} [= K, S; = ***Euphorbia hypericifolia*** Linnaeus – Q] {not keyed at this time}

Chamaesyce ophthalmica (Persoon) Burch. GA and PA (Kartesz 1999), but not in North America (Q). [= K; **= *Euphorbia ophthalmica*** Persoon – Q] {not keyed at this time}

Chamaesyce serpens (Kunth) Small. Cp (GA): In se. PA (Rhoads & Klein 1993) and e. GA. [= K; **= *Euphorbia serpens*** Kunth – C, F, G, Q]

Chamaesyce serpyllifolia (Persoon) Small ***ssp. serpyllifolia***. In GA, PA, and DE (Kartesz 1999). In NC, GA, SC (Q) {Investigate} [= K; **= *Euphorbia serpyllifolia* var. *serpyllifolia*** – Q] {not keyed at this time}

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 (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 FL, west to e. LA, mostly on the Coastal Plain, but further inland southward. Beset with stinging trichomes. Allied to *Cn. urens* of Mexico, central America, and n. South America, and sometimes treated as a variety of it. [= RAB, C, F, G, K, W, Y; = *Bivonea stimulosa* (Michaux) Rafinesque – S; = *Cn. urens* (Linnaeus) Arthur var. *stimulosus* (Michaux) Govaerts – Z]

Croton Linnaeus 1753 (Croton, Doveweed, Rushfoil)

A genus of about 750-1225 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 is followed here. References: Webster (1992)=Z; Webster (1993)=Y; Govaerts, Frodin, & Radcliffe-Smith (2000).

1 Evergreen shrub, (1-) 2-3 m tall; pistillate flowers with petals; [section *Lamprocroton*] ..... ***[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.

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* var. *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 capitatus*** Michaux ***var. capitatus***, Woolly Croton, Hogwort, Capitate Croton. Pd, Mt (GA, NC, SC, VA), Cp (GA, NC, SC): fields, disturbed areas; uncommon, adventive from further west (VA Watch List). July-October. [= C, G, K; < *Croton capitatus* – RAB, W; = *Croton capitatus* - F, S]

Croton elliottii Chapman, Pondshore Croton, Elliott's Croton. Cp (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]

* ***Croton glandulosus*** Linnaeus ***var. septentrionalis*** Müller of Aargau, Doveweed, Tooth-leaved Croton, Sand Croton. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common. 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 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 (GA, SC, VA?): sandhills, disturbed sandy soils; rare (SC Rare). June-October. SC south to 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, Z; = *Crotonopsis linearis* Michaux – RAB, C, F, G, S]

Croton monanthogynus Michaux, Prairie-tea, One-seed Croton. Mt (GA, NC, VA), Pd (GA, SC, VA), Cp (GA, VA): limestone outcrops, blackland prairies, disturbed dry soil; rare (NC Rare, VA 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]

Croton punctatus Jacquin, Silverleaf Croton, Beach-tea, Gulf Croton. Cp (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]

Croton willdenowii Webster, Glade Rushfoil, Outcrop Rushfoil, Willdenow's Croton. Pd, Cp (GA, NC, SC, VA), Mt (GA, NC, SC): granitic flatrocks, diabase barrens, thin soils around other rock outcrops, disturbed sandy soil; common (uncommon in VA). June-October. CT, se. PA (Rhoads & Klein 1993), IL, and se. KS, south to FL and TX. [= K, Z; = *Crotonopsis elliptica* Willdenow – RAB, C, F, G, S, W]

Croton alabamensis E.A. Smith ex Chapman var. *alabamensis*, Alabama Croton, is 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 argyranthemus Michaux. Cp (GA): sandhills; common. [= K, S] {not keyed at this time}

Croton capitatus Michaux ***var. lindheimeri*** (Engelmann & A. Gray) Müller of Aargau. In GA and westward. [= K; *C. engelmannii* Ferguson – S] {not keyed at this time}

Crotonopsis
(see *Croton*)

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. Cp (GA, NC, SC): swamp forests, other wet to moist, mostly shaded, habitats; uncommon (NC Rare). May-June; July-October. Se. NC south to c. peninsular FL, west to e. TX. [= Z; = *Sebastiania fruticosa* (W. Bartram) Fernald – GW, K; = *Sebastiania ligustrina* (Michaux) Müller of Aargau – RAB; = *Sebastiana ligustrina* – S (orthographic error)]

Euphorbia Linnaeus 1753 (Spurge)
(also see *Chamaesyce*)

An extremely large and polymorphic genus. References: Huft (1979)=Z; Park (1998)=Y; Bridges & Orzell (2002)=X; Govaerts, Frodin, & Radcliffe-Smith (2000)=Q.

1 Bracteal leaves lobed or toothed (rarely linear), usually marked with red or white at the base; glands of the cyathia usually 1 (rarely more), bilabiate, lacking petaloid appendages; [subgenus *Poinsettia*].

2 Principal stem leaves alternate, either lobed or linear; plant usually glabrous ..... ***E. cyathophora***
2 Principal stem leaves opposite, dentate, neither lobed nor linear; plant pubescent ..... ***E. dentata***
1 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.
2 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; [subgenus *Tithymalopsis*].
4 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***
4 Upper stem leaves and bracteal leaves entirely green, obovate, elliptic, narrowly elliptic, or oblanceolate, the apex rounded or obtuse; [native]; [section *Tithymalopsis*].
5 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.
6 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; [plants (in our area) of the Mountains, upper Piedmont of NC, lower Piedmont and Coastal Plain of VA] ..... ***E. corollata***
6 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; [plants (in our area) nearly throughout, except sw. VA].
7 Leaves 1.9-7.2 cm long, 0.1-0.5 cm wide, averaging > 10× as long as wide; primary inflorescence rays usually 3; [plants south of our area, and possibly in SC] ..... ***E. discoidalis***
7 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; [widespread in our area] ..... ***E. pubentissima***
5 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.
8 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***
8 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].
9 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***
9 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.
10 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***
10 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***
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; [subgenus *Esula*].
11 Principal stem leaves finely serrulate (especially toward the apex); [subgenus *Esula*, section *Tithymalus*].
12 Ovary and capsule smooth ..... ***E. helioscopia***
12 Ovary and capsule verrucose-roughened.
13 Seeds smooth or very obscurely reticulate, 2-2.5 mm long..... ***E. obtusata***
13 Seeds distinctly alveolate, 1.5-1.8 mm long..... ***E. spathulata***
11 Principal stem leaves entire.
14 Stem leaves opposite, decussate (each succeeding pair turned by 90 degrees); seeds 4-6 mm long; [subgenus *Esula*, section *Lathyris*]..... ***E. lathyris***
14 Stem leaves alternate (or mostly so); seeds 1-3 mm long.

15 Stem leaves linear to narrowly oblong, averaging ca. 10× as long as wide; [subgenus *Esula*, section *Esula*].
16 Stem leaves 1-3 cm long, 1-3 mm wide ..... ***E. cyparissias***
16 Stem leaves 3-8 cm long, 4-8 mm wide ..... ***E. esula***
15 Stem leaves oblanceolate, obovate, elliptic, or oblong, 1-10 cm long, 5-30 mm wide, averaging 1-5× as long as wide.
17 Principal stem leaves elliptic to oblong, (5-) 7-10 cm long; rhizomatous perennial to 1 m tall; seeds smooth, 3-4 mm long; rays of the umbel usually 5-8; [subgenus *Esula*, section *Tithymalus*] .... ***E. purpurea***
17 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*].
18 Seeds pitted only on one face, the inner face furrowed ..... ***E. peplus***
18 Seeds pitted on both the inner and outer faces.
19 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***
19 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 commutata Engelmann ex A. Gray, Woodland Spurge, Tinted Spurge. Mt (GA, NC, VA), Pd (GA, NC, SC, VA), Cp (GA, VA): rich forests and rock outcrops, over calcareous or mafic rocks; uncommon, rare in Coastal Plain (NC Rare). March-May. 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; > *Eu. commutata* var. *commutata* – C, G; > *Eu. commutata* var. *erecta* J.B.S. Norton – C, G; = *Galarhoeus commutatus* (Engelmann) Small – S]

Euphorbia corollata Linnaeus, Eastern Flowering Spurge. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp (VA): woodlands and forests; common. June-September. NH and MA west to s. Ontario, 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, 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 curtisii Engelmann, White Sandhills Spurge, Curtis's Spurge. Cp (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, Y, Z; > *Tithymalopsis curtisii* (Engelmann) Small – S; > *Tithymalopsis eriogonoides* Small – S]

Euphorbia cyathophora Murray, Painted Leaf, Fire-on-the-mountain. Cp, Pd (GA, NC, SC, VA): disturbed habitats, dunes; uncommon. June-October. Ranging from se. United States, 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, Pd (GA, NC, SC, VA), Cp (VA): roadbanks, graveyards, waste places; common, introduced from Europe. March-May (occasionally later). [= RAB, C, F, G, K, Q, W; = *Galarhoeus cyparissias* (Linnaeus) Small ex Rydberg – S; = *Tithymalus cyparissias* (Linnaeus) Lamarck]

* ***Euphorbia dentata*** Michaux, Painted Leaf, Wild Poinsettia, Toothed Spurge. Mt (GA, NC, VA), Pd (NC, SC, VA), Cp (VA): disturbed areas, hedgerows, thickets, railroad cinders; common, introduced from further west. July-October. [= RAB, C, F, G, Q, W; *Eu. dentata* var. *dentata* – K; = *Poinsettia dentata* (Michaux) Klotzsch & Garcke – S]

Euphorbia discoidalis Chapman, Summer Spurge. Cp (GA): sandhills. 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, with a stated type locality is e. SC. [= K, Y; = *Tithymalopsis discoidalis* (Chapman) Small – S; < *Eu. corollata* var. *corollata* – Q] {augment}

* ***Euphorbia esula*** Linnaeus *var. **esula***, Wolf's-milk, Leafy Spurge Pd (VA): disturbed areas; rare, introduced from Eurasia. [= K; < *Eu. esula* – C, F, G; = *Eu. esula* ssp. *esula* – Q; < *Tithymalus esula* (Linnaeus) Scopoli]

Euphorbia exserta (Small) Coker, Maroon Sandhills Spurge, Coastal Sand Spurge. Cp (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, Z; = *Eu. gracilior* Cronquist – RAB; > *Tithymalopsis exserta* Small – S; > *Tithymalopsis gracilis* (Boissier) Small – S; > *Eu. exserta* – Y; > *Eu. gracilior* – Y]

* ***Euphorbia falcata*** Linnaeus. Mt, Pd (VA): disturbed areas; rare, introduced from Europe. [= C, F, G, K; > *Eu. falcata* ssp. *falcata* – Q]

* ***Euphorbia helioscopia*** Linnaeus, Wartweed. Pd (GA, NC, SC, VA), Mt (VA), Cp (VA): cultivated ground; rare, introduced from Europe. Late March-June. [= RAB, C, F, G, K; = *Galarhoeus helioscopia* (Linnaeus) Haworth – S; > ***Eu. helioscopia*** ssp. ***helioscopia*** – Q]

Euphorbia ipecacuanhae Linnaeus, Carolina Ipecac. Cp (GA, NC, SC, VA): sandhills; common. 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), Pd (VA), Cp (VA): roadsides, disturbed areas; rare, introduced from Europe. June-August. [= RAB, F, K, Q, W; = ***Eu. lathyrus*** – C, G, an orthographic variant; = *Galarhoeus lathyrus* – S]

* ***Euphorbia marginata*** Pursh, Snow-on-the-mountain. Cp (GA, NC, SC, VA), Pd (GA, VA), Mt (VA): roadsides, disturbed areas; uncommon, introduced from further west. July-November. [= RAB, C, F, G, K, Q; = *Lepadena marginata* (Pursh) Nieuwland – S; = *Agaloma marginata* (Pursh) A. & D. Löve]

Euphorbia mercurialina Michaux, Cumberland Spurge, Mercury Spurge. Pd (GA, NC, VA*): rich slope over gabbro; rare (NC Rare). May-June. S. KY south through e. TN to nw. GA and n. AL; disjunct in c. NC, where found in 1992. Apparently introduced in VA. [= C, F, G, K, Q, W, Y, Z; = *Tithymalopsis mercurialina* (Michaux) Small – S]

Euphorbia obtusata Pursh, Woodland Spurge. Pd, Cp, Mt (NC, SC, VA): 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; < ***Eu. spathulata*** Lamarck – K, Q; = *Galarhoeus obtusatus* (Pursh) Small – S]

* ***Euphorbia peplus*** Linnaeus, Petty Spurge. Mt (VA): disturbed areas; rare, introduced from Eurasia. [= C, F, G, K; = *Galarhoeus peplus* (Linnaeus) Haworth – S; > ***Eu. peplus*** var. *minima* Augustin de Candolle – Q; > ***Eu. peplus*** var. ***peplus*** – Q; = *Tithymalus peplus* (Linnaeus) Hill]

Euphorbia pubentissima Michaux, Southeastern Flowering Spurge. Cp, Pd, Mt (GA, NC, SC, VA): dry woodlands, sandhills; common. March-July. C. MD, VA, and c. and sw. TN south to ne. FL, 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; > ***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): rich moist forests in bottomlands or on slopes, in rich soil around rock outcrops, especially over calcareous rocks (such as dolomite) or mafic rocks (such as amphibolite); rare (US Species of Concern, NC Rare, VA Rare). May-August. NJ, PA, and OH south to w. NC. [= RAB, C, F, G, K, Q, W; = *Galarhoeus darlingtonii* (A. Gray) Small – S]

Euphorbia spathulata Lamarck, Prairie Spurge, Warty Spurge. Mt (NC?, VA): rocky woodlands; rare? May-June. MN and WA south to w. VA, AL, LA, TX, and Mexico. [= C, W; *? Eu. dictyosperma* Fischer & Meyer – F, G; < ***Eu. spathulata*** – K, Q (also see ***Eu. obtusata***); *? Galarhoeus arkansanus* (Engelmann & A. Gray) Small ex Rydberg – S]

* *Euphorbia davidii* Subils, introduced in se. TN (Chester, Wofford, & Kral 1997). Also in our area according to Kartesz (1999). {investigate} [= K, Q; ***Eu. dentata*** var. *gracillima* Millspaugh] {not keyed at this time}

Euphorbia exigua Linnaeus, Dwarf Spurge, in PA and WV (Kartesz 1999). [= K; ***Eu. exigua*** ssp. ***exigua*** – Q] {not keyed at this time}

Euphorbia floridana Chapman, Florida Spurge. Cp (GA): In sw. GA (Bridges & Orzell 2002, Jones & Coile 1988). [= K, Q, X; = *Galarhoeus floridanus* (Chapman) Small - S] {not keyed at this time}

Euphorbia heterophylla Linnaeus, in GA (Kartesz 1999). [= K, Q] {not keyed at this time}

Euphorbia inundata Torrey ex Chapman *var. **inundata***. Cp (GA): In se. GA (Bridges & Orzell 2002). [= X; < ***Eu. inundata*** – K, Q] {not keyed at this time}

Euphorbia tetrapora Engelmann. In GA (Kartesz 1999). GA west to TX. [= K, Q] {not keyed at this time}

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.

* ***Manihot grahamii*** Hooker, Graham's Cassava. Cp (GA): disturbed areas; grown as an ornamental, rarely naturalizing. Introduced in sw. GA (Jones & Coile 1988) and FL west to LA. [= K, Z] {add to genus key}

* *Manihot esculenta* Crantz, Manioc, Tapioca, is naturalized on the Gulf Coast, as in AL and FL. [= K; = *Jatropha manihot* Linnaeus – S] {not keyed; add to synonymy}

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, has been reported as a rare "ballast weed" from Charleston, SC and Mobile, AL(Wiggins 1932). It is presumably not established in our area. [= C, F, G, K, S, Z] {not 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. Cp (GA, NC, SC, VA), Pd (NC, SC): waste places, gardens; rare, 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, Z]

Sapium P. Browne (Chinese Tallow-tree)
(see *Triadica*)

Sebastiania Sprengel (Sebastian-bush)
(see *Ditrysinia*)

Stillingia Garden ex Linnaeus (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. Cp (GA, SC): ponds in pine flatwoods; rare (SC Rare). May-September. Se. SC south to s. FL, west to sw. AL. [= RAB, K, S, Z]

Stillingia sylvatica Garden ex Linnaeus ***ssp. sylvatica***, Queen's-delight. Cp (GA, NC, SC, VA), Pd (GA): sandhills, dryish coastal plain woodlands; common (VA Rare). May-July; June-September. Se. VA south to 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; > *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..... ***T. cordata***
1 Plant not vining, erect; larger leaf blades on a plant < 3.5 cm wide and < 8 cm long.
  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. Cp (GA): rocky calcareous woodlands, calcareous prairies; rare (GA Rare). 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, Z; = *T. macrocarpa* Willdenow – S]

Tragia smallii Shinners, Gulf Coast Noseburn. Cp (GA): sandhills; uncommon. Sw. GA west to e. TX. Reports of *T. betonicifolia* from GA are based on misapplication of that name to material representing *T. smallii*. [= K, Z; = *T. betonicaefolia* Nuttall – S, misapplied; *T. betonicifolia* Nuttall, misapplied]

Tragia urens Linnaeus, Southeastern Noseburn, Wavyleaf Noseburn. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (SC): sandhills, sandy woodlands, other woodlands; common (rare in Piedmont and Mountains). May-October. Se. VA south to FL and west to TX, mostly on the Coastal Plain, but ranging into the mountains southward. [= RAB, C, F, G, K, S, W, Z; = *T. linearifolia* Elliott – S]

Tragia urticifolia Michaux, Nettleleaf Noseburn. Pd (GA, NC, SC, VA), Cp (GA, SC), Mt (SC): dry woodlands and rock outcrops, particularly over mafic or calcareous rocks; common (VA Rare). May-October. Sc. VA west to MO, KS, and CO, south to FL and AZ. [= RAB, F, G, K, W; = *T. urticaefolia* – S, orthographic variant]

Triadica Loureiro 1790 (Chinese Tallow-tree)

A genus of 2-3 species, native to tropical and subtropical Asia. The most recent monographers of *Sapium* and related genera (Kruijt 1996; Esser 2002) place our single 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. Cp (GA, NC, SC): marsh edges, shell deposits, disturbed areas; uncommon. May-June; August-November, native of e. Asia. With *Euphorbia, Chamaesyce*, and *Cnidoscolus*, one of our few Euphorbiaceous genera with milky sap. *Triadica* 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]

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. Cp (GA, NC): planted for the oil and for ornament, rarely naturalizing; rare, introduced from central and western China. Naturalized in GA, 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]

FABACEAE Lindley 1836 ***or LEGUMINOSAE*** A.L. de Jussieu 1789 (Legume Family)

A family of about 730 genera and 20,000 species, trees, shrubs, and herbs, cosmopolitan. References: Isely (1990)=SE (throughout the family treatment); Wojciechowski, Lavin, & Sanderson (2004); Wilbur (1963); Isely (1998)=I; 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*].....***Dioclea***
      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; [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×-paripinnate; [subfamily *Mimosoideae*]
12 Stamens connate at the base; inflorescence pink, 2.5-5 cm in diameter; [tribe *Ingeae*] ..... ***Albizia***
12 Stamens free; inflorescence orange or yellowish-white, 1.0-2.2 cm in diameter.
13 Inflorescence yellowish-white, 1.8-2.2 cm in diameter; stamens 10; [tribe *Mimoseae*] ..... ***Leucaena***
13 Inflorescence orange, 1.0-1.3 cm in diameter; stamens many; [tribe *Acacieae*] ..... ***Vachellia***
11 Leaves otherwise.
14 [subfamily *Papilionoideae*].
15 Leaves glandular-punctate; corolla of only 1 petal; inflorescence a spike; shrubs; [tribe *Amorpheae*] ..... ***Amorpha***
15 Leaves not glandular-punctate; corolla of 5 petals; inflorescence a raceme or panicle; trees or shrubs.
16 Leaflets alternate on the rachis; leaflets 4-15 (-20) cm long; [tribe *Sophoreae*] ..... ***Cladrastis***
16 Leaflets opposite on the rachis, leaflets (1-) 2-5 (-6) cm long.
17 Leaflets with persistent linear stipels; native and cultivated, collectively widespread in our area; [tribe *Robinieae*] ..... ***Robinia***
17 Leaflets lacking stipels; cultivated, perhaps not established; [tribe *Sophoreae*] ..... ***[Styphnolobium]***
14 [subfamily *Caesalpinioideae*].
18 Leaves all 2-pinnate, or a mixture of 2-pinnate and 1-pinnate on the same plant; shrub or tree; [tribe *Caesalpineae*].
19 Leaves a mixture of 1-pinnate and 2-pinnate..... ***Gleditsia***
19 Leaves all 2-pinnate.
20 Leaves petiolate; leaflets 20-70 mm long ..... ***Gymnocladus***
20 Leaves subsessile (the pinnae simulating 1-pinnate leaves); leaflets 1-5 mm long..... ***Parkinsonia***
18 Leaves all 1-pinnate (or appearing so in *Parkinsonia*); herb, shrub or tree.
21 Shrub with prominent glands on the leafstalk; [tribe *Cassieae*] ..... ***Senna***
21 Tree or shrub (if a shrub, then lacking prominent glands on the leafstalk); [tribe *Caesalpineae*].
22 Leaflets 13-45 mm long; tree; leaves 1-pinnate..... ***Gleditsia***
22 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 Petiole with 1-several glands; stems ascending to erect; flowers greenish-white ..... ***Desmanthus***
1 Petiole without glands; stems prostrate to weakly arching; flowers pink-purple, yellow, or greenish-yellow.
2 Flowers pink-purple; legume ribbed, the ribs with prickles ..... ***Mimosa***
2 Flowers yellow to greenish-yellow; legume not ribbed or prickly ..... ***[Neptunia]***

Key D – pinnate plus

Aeschynomene, Apios, Arachis, Astragalus, Clitoria, Dalea, Galactia, Glottidium, Glycyrrhiza, Lathyrus, Lotus, Pisum, Securigera, Sesbania, Tephrosia, Vicia

Key E – unifoliolate

Alysicarpus, Baptisia, Crotalaria, Lupinus, Orbexilum, Pediomelum, Rhynchosia

Key F – palmately trifoliolate

Baptisia, Crotalaria, Kummerowia, Lotus, Medicago, Orbexilum, Psoralidium, Thermopsis, Trifolium

Key G – pinnately trifoliolate

Amphicarpaea, Centrosema, Clitoria, Cullen, Dalea, Desmodium, Erythrina, Galactia, Glycine, Indigofera, Lablab, Lespedeza, Lotus, Macroptilium, Medicago, Melilotus, Mucuna, Orbexilum, Pediomelum, Phaseolus, Rhynchosia, Stylosanthes, Strophostyles, Trifolium, Vigna

Abrus Adanson (Precatory Bean)

A genus of about 15 species, woody vines and shrubs, pantropical. References: Isely (1998)=I.

* *Abrus precatorius* Linnaeus, Precatory Bean, Rosary Pea, Crab's Eye. 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 FL, near the GA border and might be expected in s. GA. [= I, K; = *Abrus abrus* (Linnaeus) L.F. Wight – S]

Acacia P. Miller (Acacia)
[see *Vachellia*]

Acmispon Rafinesque (American Bird's-foot-trefoil)

Annual and perennial herbs, of temperate North 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).

Acmispon helleri (Britton) A.A. Heller, Carolina Prairie-trefoil. Pd (GA, NC, SC, VA): 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; rare (US Species of Concern, GA Special Concern, NC Rare, VA Rare). June-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 have chosen to "reasonably maintain it as a species." [= *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; = *Acmispon helleri* (Britton) Heller – S; = *L. purshianus* F.E. & E.G. Clements var. *helleri* (Britton) Isely – C, I, SE, Z]

Aeschynomene Linnaeus (Joint-vetch)

A genus of about 130 species, herbs, 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 3-7 (-9) leaflets; [of dry sandy habitats] ..... ***Ae. viscidula***
1 Erect or ascending annual; leaves with 20-50 or more leaflets; [of moist to wet habitats].
  2 Leaflets with 2-4 longitudinal nerves; mature fruit stipe 1.5-3 mm long ..... ***Ae. americana*** *var*. ***americana***
  2 Leaflets with 1 longitudinal nerve; mature fruit stipe 4-25 mm long.

3 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 ..... ***Ae. virginica***

3 Mature fruit stipe 4-8 (-10) mm long; corolla 7-13 (-15) mm long; fruit segments 4-6 mm wide, 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.

4 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..... ***Ae. indica***

4 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..... ***Ae. rudis***

Aeschynomene americana Linnaeus *var.* ***americana***, Shyleaf. Cp (GA): moist, disturbed sites; rare (GA Watch List). s. GA southward (Jones & Coile 1988, SE). [= I, SE, Y; < *Ae. americana* – K, S]

Aeschynomene indica Linnaeus, Southern Joint-vetch Cp (GA, NC, SC, VA): marshes, ditches, disturbed wetlands; uncommon. July-October. Apparently native to se. North America, from NC west to AR, south to 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, Y, Z; < *Ae. virginica* – S, in large part]

* ***Aeschynomene rudis*** Bentham, Frisolillo. Cp (GA, NC, SC): roadside ditches, rice fields, disturbed wetlands; rare, introduced from South America. July-October. Native to South America, introduced in se. United States, recently becoming a weed. [= I, K, SE, Y, Z]

Aeschynomene virginica (Linnaeus) Britton, Sterns, & Poggenburg, Northern Joint-vetch, Sensitive Joint-vetch. Cp (NC, VA): fresh to brackish tidal marshes and adjacent ditches, fields, and disturbed areas; rare (US Threatened, NC Endangered, VA Rare). 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; < *Ae. virginica* – S (also see *Ae. indica*)]

Aeschynomene viscidula Michaux, Sticky Joint-vetch. Cp (GA): dry sandy areas, such as sandhills, dry pinelands, and barrier islands; rare (GA Special Concern). From s. GA southward (Jones & Coile 1988, SE). [= I, K, SE, Y; = *Secula viscidula* (Michaux) Small – S]

Albizia Durazzini (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. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas, suburban woodlots, escaped and persistent in forests and woodlands; common, 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, Z; = *Albizzia julibrissin* – F, G, S, orthographic variant]

* ***Albizia kalkora*** (Roxburgh) Prain, Kalkora Mimosa. Pd (NC): naturalizing in suburban areas; rare, introduced from e. Asia (Japan, Korea, Taiwan). Documented by herbarium specimens at DUKE and NCU.

Alysicarpus Necker ex Desvaux (Alyce Clover)

A genus of about 25 species, herbs, native of the Old World tropics. References: Isely (1998)=I.

* ***Alysicarpus vaginalis*** (Linnaeus) Augustin de Candolle, Alyce Clover. Cp (GA), Pd (GA, NC): planted as a forage crop (at least formerly), and rarely naturalized; introduced from the Old World tropics. [= I, K, SE]

Amorpha Linnaeus (Indigo-bush, Leadplant)

References: 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. georgiana* var. *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. georgiana* var. *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* var. *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 fruticosa Linnaeus, Tall Indigo-bush. Pd, Mt, Cp (GA, NC, SC, VA): forests, woodlands, marsh edges, sometimes in disturbed sites; uncommon (rare in VA Mountains). April-June; June-October. [= RAB, C, G, GW, I, K, SE, W, 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 ***var. confusa*** Wilbur, Savanna Indigo-bush. Cp (NC, SC): pine savannas; rare (NC Threatened). (May-) June-July; August-October. The varietal epithet is rather unfortunate; it refers to nomenclatural, rather than taxonomic, confusion. In fact, the two varieties of *A. georgiana* seem so distinct that they warrant specific status. Var. *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. [= I, K, SE, Y, Z; < *A. georgiana* – RAB, GW; ? *A. cyanostachya* auct. non M.A. Curtis – S, in part]

Amorpha georgiana Wilbur *var.* ***georgiana***, Georgia Indigo-bush. Cp (GA, NC, SC): pine savannas, sandy river terraces; rare (GA Special Concern, NC Endangered). Late April-June; July-October. As mentioned above, the two varieties of *A. georgiana* probably deserve specific recognition. Var. *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. [= I, K, SE, Y, Z; < *A. georgiana* – RAB, GW]

Amorpha glabra Desfontaines ex Poiret, Appalachian Indigo-bush, Mountain Indigo. Mt, Pd (GA, NC, SC): dry to dry-mesic ridgetop and slope forests, primarily in the Blue Ridge escarpment; uncommon (SC Rare). 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. Cp (GA): pine flatwoods and sandy river terraces; rare (GA Special Concern). Se. GA (Echols County) south into FL (Sorrie 1998b). [= Y, Z; < *A. herbacea* var. *herbacea* – I, K, SE; = *A. floridana* Rydberg – S]

Amorpha herbacea Walter *var.* ***herbacea***, Dwarf Indigo-bush. Cp (GA, NC, SC), Pd (GA, SC), Mt (NC): pine savannas, pine flatwoods, sandhills, other open forests and disturbed sites; common (rare in Mountains). May-July; July-October. Endemic to FL, GA, SC, and NC, mostly limited to the Coastal Plain. [= Y, Z; < *A. herbacea* – RAB, W; = *A. herbacea* – S; < *A. herbacea* var. *herbacea* – I, K, SE]

Amorpha nitens Boynton, Dark Indigo-bush. Cp (SC), Pd, Mt (GA): sandy woodlands, rocky slopes, bottomland forests; rare (GA Special Concern). 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. Pd (GA, NC, SC): forests and woodlands, primarily rather xeric and rocky (though not exclusively so); rare (GA Special Concern, NC Rare, SC Rare). 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 (Hog-peanut)

A genus of 3-5 species, of Asia, North America, and 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.

1 Petiole 3.5-5.3 cm long; 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 (GA, NC, SC, VA): dry to moist forests, thickets; common. July-September; August-October. Producing inflorescences of 2 types, one with chasmogamous flowers and aerial legumes, the other with cleistogamous flowers and subterranean legumes. 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; < *Amphicarpa bracteata* – RAB, orthographic variant; < *Falcata comosa* (Linnaeus) Kuntze – S]

Amphicarpaea bracteata (Linnaeus) Fernald ***var. comosa*** Fassett, Hog-peanut. {Mt, Pd, Cp (GA, NC, SC, VA): dry to moist forests, thickets; common. July-September; August-October. Producing inflorescences of 2 types, one with chasmogamous flowers and aerial legumes, the other with cleistogamous flowers and subterranean legumes. 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; < *Amphicarpa bracteata* – RAB, orthographic variant; < *Falcata comosa* (Linnaeus) Kuntze – S]

Apios Fabricius (Groundnut)

A genus of about 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. Cp, Pd, Mt (GA, NC, SC, VA): marshes, wet thickets, streambanks; common. June-August; July-September. Nova Scotia, New Brunswick, and Québec west to MN and SD, south to s. FL and TX. [= RAB, C, GW, I, K, SE, W, 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. It is a rare species. [= C, F, G, I, K, SE, Z; = *Glycine priceana* (B.L. Robinson) Britton – S]

Arachis Linnaeus (Peanut)

A genus of 9-60 species, annual and perennial herbs, native of South America (especially Brazil). References: Isely (1998)=I.

* ***Arachis hypogaea*** Linnaeus, Peanut. Cp (GA, NC, SC, VA), Pd (NC): fields; commonly cultivated, rarely persistent, introduced from 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, K, S, SE]

Astragalus Linnaeus (Milkvetch)

Astragalus is a massive genus, usually considered to include over 2000 species, and 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 hairs ca. 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 decumbent or ascending, stems 1-5 dm long; legume either dry and strongly curved (about 90 degrees), or globose and initially fleshy.

4 Legume globose, 1.3-2 cm in diameter, initially fleshy; corolla 18-25 mm long; [of calcareous glades of c. TN]..... ..... ***[A. bibullatus]***

4 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].

5 Leaflets mostly 2-3.5× as long as wide; mature legume lacking a reticulately textured surface; corolla 10-15 mm long; [of shaley habitats from w. VA northward]..... ***A. distortus* var. *distortus***

5 Leaflets mostly 1-2× as long as wide; mature legume reticulately textured; corolla 8-11 mm long; [of dry sandy sites in FL and possibly adjacent GA]..... ***[A. obcordatus]***

3 Plants erect, stems (3-) 4-15 dm long; legume straight to moderately curved.

6 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***

6 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].

7 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***

7 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***

Astragalus canadensis Linnaeus *var.* ***canadensis***, Canada Milkvetch. Mt (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): forests, woodlands, streambanks, rocky slopes and bluffs; uncommon, rare in VA Piedmont, rare in Coastal Plain (GA Special Concern). June-August; July-October. Ranging through much of North America, from Québec and Hudson Bay west to British Columbia, 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 Southern 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 a Southern (and Central) Appalachian endemic. 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. Mt, Pd (VA): shale barrens and other dry, shaley places; rare (VA Rare). 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 michauxii (Kuntze) F.J. Hermann, Sandhills Milkvetch, Michaux's Milkvetch. Cp (GA, NC, SC): sandhills; rare (GA Special Concern, NC Proposed Threatened). Late April-June; June-October (and persisting). Sc. NC south through SC to GA, a Southeastern Coastal Plain endemic. "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. Mt (VA): dry calcareous woodlands and barren, over dolostone and limestone; rare (US Species of Concern, VA Rare). June-September. Se. Ontario west to se. Saskatchewan 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 villosus Michaux, Bearded Milkvetch, Southern Milkvetch. Cp (GA, SC): sandhills and other dry, sandy places; rare (SC Rare). 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 as "a lowly but delightful little astragalus." [= RAB, I, K, SE, Z; = *Phaca intonsa* (Sheldon) Rydberg ex Small – S]

Astragalus bibullatus Barneby & E.L. Bridges, Pyne's Ground-plum. Endemic to calcareous glades of c. TN (Barneby & Bridges 1987). [= I, K, SE; = *Geoprumnon crassicarpum* (Nuttall) Rydberg ex Small – S, misapplied; = *A. crassicarpus* Nuttall, misapplied]

Astragalus obcordatus Elliott, Florida Milk-vetch. Cp (GA?): sandhills; rare. S. MS south to c. peninsular FL. Reported for s. GA, but no specimen documentation is known (Barneby 1964). [= I, K, SE, Z; = *Phaca obcordata* (Elliott) Rydberg ex Small – S]

Astragalus tennesseensis A. Gray ex Chapman. Calcareous glades. C. TN, n. AL, s. KY (and formerly IL and 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]

Baptisia Ventenat 1808 (Wild Indigo)

A genus of about 15 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.

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.
  - 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] ..... ***[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] ..... ***[B. calycosa]***
    - 6 Plant tomentose to hirsute; [of FL Panhandle] ..... ***[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 glades and barrens] ..... ***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..... ***[B. leucophaea]***
  - 4 Flowering pedicels 3-10 mm long, subtended by caducous bracts 4-7 mm long and 1-2 mm wide; flowers white.
    - 6 Calyx 4.5-6.5 mm long; corolla 13-16 (-18) mm long; petioles 5-10 (-20) mm long..... ***B. albescens***
    - 6 Calyx 7-8 mm long; corolla 20-25 mm long; petioles (of the lower leaves at least) 10-20 mm long.
      - 7 Legume usually 15-20 (-30) mm in diameter, thin-walled and brittle; [of NC south through GA to FL and AL] ..... ***B. alba***
      - 7 Legume usually 10-12 (-15) mm in diameter, rigid and tough; [of c. TN, c. KY, and MS westward] .... ***[B. leucantha]***
- 3 Flowers yellow.
  - 8 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).
    - 9 Petioles of median leaves 4-10 mm long..... ***B. bracteata***
    - 9 Petioles of median leaves 2-4 mm long..... ***[B. leucophaea]***
  - 8 Flowering pedicels 2-10 mm long, subtended by caducous bracts 2-10 mm long and 1-2 mm wide; flowers bright yellow.
    - 10 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***

10 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*).
- 11 Inflorescences of many-flowered cylindrical racemes; stipules persistent or caducous.
  - 12 Plant persistently cinereous-pubescent stipules (some of them at least) persistent.....***B. cinerea***
  - 12 Plant puberulent when young, soon glabrate to glabrous; stipules caducous; [of MS westward]..... .....***[B. sphaerocarpa]***
- 11 Inflorescence of solitary axillary flowers or flowers in clusters of 2-4 in axils or terminal racemes; stipules caducous.
  - 13 Petiolules 2-3 mm long; leaflets 1-2.5× as long as wide; [of LA, AR, TX, and OK] .... ***[B. nuttalliana]***
  - 13 Petiolules 4-10 mm long; leaflets 1.7-5× as long as wide; [of SC, GA, FL, and AL].
    - 14 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***
    - 14 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), not glaucous.
    - 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]***
    - 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], B. australis var. australis, B. australis var. aberrans***

{add *B. nuttalliana* to fruiting key}

Baptisia alba (Linnaeus) Ventenat, Thick-pod White Wild Indigo. Pd, Cp (GA, NC, SC): dry woodlands, roadsides; rare (NC Rare). May-July; June-October. AL, FL, GA, SC, and NC. *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; = *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. Pd, Mt (GA, NC, SC), Cp (GA, NC, SC, VA): dry woodlands, roadsides; uncommon (NC Rare, VA Rare). 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; = *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. Cp (GA): sandhills; rare (US Endangered, GA Endangered). With simple leaves and unmistakable for its dense "cobwebby" pubescence, this species is endemic to GA (Wayne and Brantley counties). [= I, K, Q, SE, X, Y]

Baptisia australis (Linnaeus) R. Brown *var.* ***aberrans*** (Larisey) M. Mendenhall, Eastern Prairie Blue Wild Indigo, Glade Wild Indigo. Pd (NC), Mt (GA): 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; rare (GA Special Concern, NC Rare). April-May; June-August. C. and se. TN, nw. GA, c. NC, and (possibly) 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 midwestern North America. RAB apparently (though tacitly) include *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*), *Oligoneuron album*, *Oligoneuron rigidum* ssp. *glabratum* (an eastern sibling of *O. rigidum* ssp. *rigidum*), *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, var. *aberrans* Larisey. Mendenhall (1994a, 1994b) found that *B. minor* var. *aberrans* 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. Mt (GA, NC*?, VA), Pd (NC*?, VA): riverbank scour areas, gravel bars, and disturbed areas (where persisting from cultivation); rare (GA Special Concern, VA Watch List). April-May; 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 (also see *B. minor*); < *B. australis* var. *australis* – I, Q, SE (also see *B. australis* var. *aberrans*)]

Baptisia bracteata Elliott, Creamy Wild Indigo. Pd (GA, NC, SC), Mt (GA, SC), Cp (SC): sandhills, other dry woodlands; uncommon (NC Rare). 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 cinerea (Rafinesque) Fernald & Schubert, Carolina Wild Indigo. Cp (NC, SC, VA), Pd (VA): sandhills, other dry sandy woods; common, rare in VA (VA Rare). 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 lanceolata (Walter) Elliott *var.* ***lanceolata***, Gopherweed. Cp (GA, SC): sandhills; rare (SC Rare). April-May; June-November. Var. *lanceolata* ranges from 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; = *B. lanceolata* – Z]

Baptisia lecontei Torrey & A. Gray, Leconte's Wild Indigo. Cp (GA): sandhills; rare (GA Special Concern). Sc. GA south to e. Panhandle FL and s. peninsular FL. [= I, K, Q, S, SE, X, Y, Z]

Baptisia megacarpa Chapman ex Torrey & A. Gray, Apalachicola Wild Indigo, Bigpod Wild Indigo. Cp (GA): moist florests of floodplains and lower slopes; rare (GA Special Concern). Late April-early June; June-July. E. Panhandle FL and sw. GA west to se. AL. [= I, K, Q, S, SE, X, Y; > *B. megacarpa* – Z; > *B. riparia* Larisey var. *riparia* – Z; > *B. riparia* var. *minima* – Z]

Baptisia perfoliata (Linnaeus) R. Brown ex Aiton f., Catbells, Gopherweed. Cp (GA, SC): sandhills; uncommon. April-May; May-July. S. SC through e. GA to peninsular FL, a Southeastern Coastal Plain endemic. [= RAB, I, K, Q, S, SE, X, Y, Z]

Baptisia tinctoria (Linnaeus) Ventenat, Honesty-weed, Rattleweed. Cp, Pd, Mt (GA, NC, SC, VA): sandhills, pine flatwoods, xeric woodlands, ridges, woodland edges, and roadbanks; common. 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]

Baptisia calycosa Canby, Florida Wild Indigo. Dry pinelands. Endemic to ne. FL (Clay and St. Johns counties). [= Q, S, Z; = *B. calycosa* var. *calycosa* – I, K, SE, Y] {synonymy incomplete}

Baptisia hirsuta Small, Hairy Wild Indigo, Panhandle Wild Indigo. Dry pinelands. Endemic to FL Panhandle (Escambia, Holmes, Okaloosa, Santa Rosa, and Walton counties). May; June-September. [= Q, S, Z; = ***B. calycosa*** Canby var. *villosa* Canby – I, K, SE, Y] {synonymy incomplete}

Baptisia lanceolata (Walter) Elliott var. *tomentosa* (Larisey) Isely. Var. *tomentosa* (Larisey) Isely occurs in 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. elliptica*** var. *elliptica* – Z; > ***B. elliptica*** var. *tomentosa* Larisey – Z]

Baptisia leucantha Torrey & A. Gray. East to s. MS, ne. MS, c. TN, c. KY, and s. OH; alleged by S to occur in NC, probably based on misinterpreted material of ***B. alba***. [= S, X; = *Baptisia alba* var. *macrophylla* (Larisey) Isely – I, K, SE; = ***B. lactea*** (Rafinesque) Thieret var. *lactea* – C, Q, Y; > ***B. leucantha*** var. *leucantha* – Z; > ***B. pendula*** Larisey var. *macrophylla* Larisey – Z] {keyed}

Baptisia leucophaea Nuttall. Nw. IN west to s. MN and e. NE, south to w. KY, c. MS, c. LA, se. LA (Turner 2006), and e. TX. [= F, G, Q; = ***B. bracteata*** Muhlenberg ex Elliott var. *leucophaea* (Nuttall) Kartesz & Gandhi – K; = ***B. bracteata*** var. *glabrescens* (Larisey) Isely – C, I, SE, Y; = ***B. leucophaea*** var. *glabrescens* Larisey – Z]

Baptisia nuttalliana Small. Woodlands and prairies. S. AR and se. OK south to se. LA (Florida parishes) and se. TX. [= I, K, Q, S, SE, Y, Z] {not yet fully keyed; synonymy incomplete}

Baptisia simplicifolia Croom. Flatwoods. Endemic to Panhandle FL. [= I, K, Q, S, X, Y, Z] {synonymy incomplete}

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}

Many of our species hybridize; hybrids known in our area include the following, listed in alphabetic order by hybrid formulae. Others may certainly occur. Additional hybrids have been created by plant breeders and may be found in cultivation.

B. albescens × ***cinerea***. Known from SC.
B. albescens × ***perfoliata*** [***B.*** ×*fulva* Larisey]. Known from GA and SC. [***B.*** ×*fulva* Larisey – Z]
B. albescens × ***tinctoria*** [***B.*** ×*serenae* M.A. Curtis (pro sp.); ***B.*** ×*pinetorum* Larisey]. Known from GA, NC, SC, and VA.
B. cinerea × ***tinctoria***. Known from NC (Brunswick County).
B. perfoliata × ***tinctoria*** [***B.*** ×*microphylla* Nuttall (pro sp.) – Z]. Known from SC.

Cassia

(see *Chamaecrista*, *Senna*)

Centrosema (Augustin de Candolle) Bentham (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 virginianum* is easily confused with *Clitoria mariana*. The following key summarizes the differences:

1 Calyx 10-16 mm long, the calyx lobes 7-11 mm long, distinctly longer than the calyx tube; legume 7-12 cm long, 3-4 mm broad ..... ***Centrosema virginianum***
1 Calyx 15-20 mm long, the calyx lobes 5-7 mm long, distinctly shorter than the calyx tube; legume 3-5 cm long, 5-7 mm broad ..... ***Clitoria mariana*** *var.* ***mariana***

Centrosema virginianum (Linnaeus) Bentham, Spurred Butterfly Pea. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): dry woodlands and openings; common. June-August; July-October. S. NJ south to FL, west to KY, AR, and TX. [= RAB, C, G, K, SE, W; > ***C. virginianum*** var. *virginianum* – F; > ***C. virginianum*** var. *ellipticum* Fernald – F; = *Bradburya virginiana* (Linnaeus) Kuntze – S]

Cercis Linnaeus (Redbud)

A genus of about 6 species, trees of north temperate areas. References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Isely (1998)=I.

1 Flowering pedicels 6-8 mm long; flowers 8-11 mm long ..... ***C. canadensis*** *var.* ***canadensis***
1 Flowering pedicels 10-20 mm long; flowers (11-) 12-14 mm long ..... ***[C. chinensis]***

Cercis canadensis Linnaeus *var.* ***canadensis***, Eastern Redbud. Pd, Mt, Cp (GA, NC, SC, VA): moist to dry forests and woodlands, especially over calcareous or mafic rocks, also commonly planted as an ornamental; common (uncommon in Coastal Plain south of VA, uncommon in Mountains). March-May; June-November. 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]

* *Cercis chinensis* Bunge, native to China, is sometimes cultivated. [= I]

Chamaecrista (Linnaeus) Moench (Partridge-pea)

A genus of about 265 species, shrubs and herbs, of primarily tropical and warm temperate areas. 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 ..... ***Ch. 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 ..... ***Ch. 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 ..... ***Ch. 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] ..... ***Ch. 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] .... ***[Ch. 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..... ***Ch. fasciculata*** *var.* ***brachiata***
      - 6 Petiolar gland not depressed, <1.5 mm wide; pods 4-6 cm long; plant usually pubescent, to 10 dm tall .... ***Ch. fasciculata*** *var.* ***fasciculata***

Chamaecrista deeringiana Small & Pennell, Florida Senna. Cp (GA): sandhills, dry longleaf pine woodlands, disturbed sandy areas; rare (GA Special Concern). 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]

Chamaecrista fasciculata (Michaux) Greene var. ***brachiata*** (Pollard) Isely. Cp (GA): fields, disturbed areas; uncommon. 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; < *Ch. fasciculata* – Y]

Chamaecrista fasciculata (Michaux) Greene *var.* ***fasciculata***, Common Partridge-pea. Cp, Pd, Mt (GA, NC, SC, VA): fields, disturbed areas, fencerows, and a wide range of other habitats; common. June-September; July-November. MA west to MN, south to FL and Mexico. See discussion of the *Chamaecrista fasciculata* complex under var. *macrosperma*. [< *Cassia fasciculata* Michaux – RAB, W; < *Chamaecrista fasciculata* – C, 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. Cp (VA): freshwater tidal marshes; rare (US Species of Concern, VA Rare). Endemic to e. VA and MD. Isely (1975) did not recognize it formally, but treated it informally as "variant 1," commenting (incorrectly) that it is "apparently a local, saline-adapted ecotype." Irwin & Barneby (1982) treated *Ch. 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 *Ch. 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 seems clearly to warrant 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. Cp (GA, SC): savannas, pinelands, disturbed sandy soils; uncommon. June-October; July-November. Var. *aspera* ranges from se. SC south to s. FL. [= I; = *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. Cp, Pd, Mt (GA, NC, SC, VA): forests, woodlands, disturbed areas, pine savannas, and a wide variety of other habitats; common. June-October; July-November. *Ch. 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; < *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]

Chamaecrista fasciculata (Michaux) Greene var. *1*. Dunes, sandy disturbed areas. s. AL west to e. and s. TX. [= I; < *Ch. fasciculata* var. *fasciculata* – K; > *Chamaecrista littoralis* Pollard – S; > *Chamaecrista mississipiensis* (Pollard) Pollard ex Heller – S; < *Ch. fasciculata* – Y; = *Cassia fasciculata* Michaux var. *puberula* (Greene) J.F. Macbride (variants 1, 2, and 3) – SE, Z; > *Chamaecrista puberula* Greene] {synonymy incomplete}

Cladrastis Rafinesque (Yellow-wood)

A genus of about 6 species, trees, of the se. United States and montane regions of Japan and China. References: Duley & Vincent (2003)=X; Isely (1981)=Z; Isely (1998)=I; Rudd (1972)=Y.

Cladrastis kentukea (Dumont de Courset) Rudd, Yellow-wood. Mt (GA, NC), Pd (NC*, SC): mountain forests, Piedmont bluffs, especially on calcareous or mafic rocks (introduced only in the Piedmont of NC); uncommon (NC Watch List, SC Rare). 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. *Cladrastis* is the only member of the tribe Sophoreae in our area, with the exception of the cultivated (and weakly, if at all, established) *Sophora*. [= K, W, X, Y; = *C. lutea* (Michaux f.) K. Koch – RAB, C, F, G, I, S, SE, Z]

Clitoria Linnaeus (Butterfly Pea)

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 virginianum* is easily confused with *Clitoria mariana*. See key under *Centrosema*.

1 Leaves 3-foliolate ..... ***C. mariana* var. *mariana***
1 Leaves 5-7-foliolate ..... ***C. ternatea* var. *ternatea***

Clitoria mariana Linnaeus *var. **mariana***, Butterfly Pea. Cp, Pd, Mt (GA, NC, SC, VA): dry woodlands and openings; common. June-August; July-October. NY (Long Island), NJ west to s. OH, s. IL, MO, and OK, south to FL, TX, and South America; disjunct in s. AZ; also in se. Asia. [= Z; < *C. mariana* – RAB, C, F, G, I, K, SE, W; < *Martiusia mariana* (Linnaeus) Small – S]

* ***Clitoria ternatea*** Linnaeus *var. **ternatea***, Blue-pea. Cp (GA): disturbed areas; rare, introduced and weakly naturalized. In s. GA (Isely 1998). [= Z; < *C. ternatea* – I, K, S, SE]

Coronilla Linnaeus (Crown-vetch)
(see *Securigera*)

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; 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. rotundifolia* var. *rotundifolia***
9 Stem pubescence spreading..... ***C. rotundifolia* var. *vulgaris***

* ***Crotalaria incana*** Linnaeus, Shake-shake. Cp (SC): disturbed areas; rare, introduced from Africa. [= I, K, S, SE]

* ***Crotalaria lanceolata*** E. Meyer, Lanceleaf Rattlebox. Cp (GA, NC, SC): sandy fields, roadsides, other disturbed areas; rare, introduced from Africa. July-October; August-November. [= RAB, I, K, SE]

* ***Crotalaria ochroleuca*** G. Don, Slenderleaf Rattlebox. Cp (GA, NC, SC): roadsides and sandy fields; rare, introduced from Africa. July-August; August-October. [= I, K, SE; *? C. intermedia* – RAB, misapplied; *? C. brevidens* Bentham var. *intermedia* (Kotschy) Polhill, misapplied]

* ***Crotalaria pallida*** Aiton *var.* ***obovata*** (G. Don) Polhill, Smooth Rattlebox. Cp, Pd (GA, NC, SC): roadsides and fields; common, introduced from Africa. July-September; August-October. [= I, K, SE; *? C. mucronata* – RAB; *? C. striata* Augustin de Candolle – S]

Crotalaria purshii Augustin de Candolle, Coastal Plain Rattlebox, Pursh's Rattlebox. Cp (GA, NC, SC, VA), Pd?, Mt? (GA): mesic to dry pinelands, sandy openings, roadsides; common (VA Watch List). 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; > *C. purshii* var. *purshii* – F; > *C. purshii* var. *bracteolifera* Fernald – F]

* ***Crotalaria retusa*** Linnaeus, Rattleweed. Cp (GA, NC, SC), Pd (NC): disturbed areas; rare, introduced from the Old World tropics. July-September; August-October. [= RAB, F, G, I, K, S, SE]

Crotalaria rotundifolia Walter ex J.F. Gmelin *var.* ***rotundifolia***, Low Rattlebox, Rabbitbells. Cp (GA, SC): sandy forests and woodlands, roadsides; rare. E. SC south to s. FL, and west to e. LA, endemic to the Southeastern Coastal Plain. [= Z; < *C. rotundifolia* – C, I, K, SE, Y; < *C. angulata* – RAB, F, G, apparently misapplied; = *C. maritima* Chapman – S]

Crotalaria rotundifolia Walter ex J.F. Gmelin *var.* ***vulgaris*** Windler, Low Rattlebox, Rabbitbells. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA): sandy forests and woodlands, roadsides; common (VA Rare). Se. VA south to c. peninsular FL, west to se. LA; also widespread in Mexico. [= Z; < *C. rotundifolia* – C, I, K, SE, Y; < *C. angulata* – RAB, F, G, misapplied; = *C. rotundifolia* – S]

Crotalaria sagittalis Linnaeus, Common Rattlebox. Cp (NC, SC, VA), Pd, Mt (GA, NC, SC, VA): woodlands, woodland edges, openings, fields; common. 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; > *C. sagittalis* var. *sagittalis* – F; > *C. sagittalis* var. *oblonga* Michaux – F]

* ***Crotalaria spectabilis*** Roth, Showy Rattlebox. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): fields, roadsides, disturbed areas; common, introduced from s. Asia. July-September; August-October. [= RAB, C, F, G, I, K, SE; *? C. retzii* A. Hitchcock – S]

Cullen Medikus

A genus of ca. 35 species, herbs, of the Old World. References: Isely (1998)=I.

* ***Cullen americanum*** (Linnaeus) Rydberg, Scurf-pea. Cp (SC): waste areas around wool-combing mill; rare, perhaps only a waif, native of the western Mediterranean region (a misnomer). There are other (older) reports from other southeastern states, including FL and MS. [= I, S; = *C. americana* – K, SE, orthographic variant]

Cytisus Linnaeus (Broom)

References: Isely (1998)=I.

* ***Cytisus scoparius*** (Linnaeus) Link, Broom, Scotch Broom, Besom, Ginster. Cp (NC, SC, VA), Pd, Mt (GA, NC, SC, VA): roadbanks, woodland borders, disturbed areas; common (rare in Mountains), introduced from Europe. April-May; May-July. [= RAB, C, F, G, I, S, SE, W; > *C. scoparius* var. *scoparius* – K]

Dalea Linnaeus 1758 (Prairie-clover)

A genus of about 160 species, of temperate and tropical America, especially dry areas. The inclusion of *Petalostemon* in *Dalea* is controversial; recent evidence suggests that the recognition of *Petalostemon* may be warranted. If *Petalostemon* is recognized, only *D. leporina* is retained in *Dalea*. 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 pucescence 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.
        7 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***
        7 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].
          8 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***
          8 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.
            9 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***
            9 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].
              10 Leaflets of primary stem leaves mostly 5; corolla white ..... ***D. albida***
              10 Leaflets of primary stem leaves mostly 7-9; corolla pink (rarely white) ..... ***D. carnea***

Dalea albida (Torrey & A. Gray) D.B. Ward, White-tassels. Cp (GA): pinelands; uncommon. July-November. E. GA (near the SC border) west to se. AL, south ne. FL, n. peninsular FL, and e. FL Panhandle. [= Y; = *Dalea carnea* (Michaux) Poiret var. *albida* (Torrey & A. Gray) Barneby – I, K, SE, Z; = *Petalostemon albidus* (Torrey & A. Gray) Small – S]

Dalea candida Michaux ex Willdenow, White Prairie-clover. Mt (GA): limestone glades and barrens; rare (GA Special Concern). Late May-August. WV, KY, IN, WI, MN, and Saskatchewan 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. Cp (GA): dry sandy pinelands; rare (GA Special Concern). June-November. Se. GA south to s. peninsular FL. [= Y; = *Dalea carnea* (Michaux) Poiret var. *carnea* – I, K, SE, Z; = *Petalostemon carneus* Michaux – S]

Dalea feayi (Chapman) Barneby, Feay's Prairie-clover. Cp (GA): sandhills; rare (GA Special Concern). June-October. E. GA (vicinity of the Altamaha River); FL peninsula; Panhandle FL (vicinity of the Altamaha River). [= I, K, SE, Z; = *Petalostemon feayi* Chapman – S]

Dalea gattingeri (A. Heller) Barneby, Gattinger's Prairie-clover. Mt (GA): limestone glades and barrens; rare (GA Special Concern). 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. Cp (GA): wet pine savannas; rare (GA Special Concern). August -September. Sc. and sw. GA west to se. LA. [= Y; = *Dalea carnea* (Michaux) Poiret var. *gracilis* (Nuttall) Barneby – I, K, SE, Z; = *Petalostemon gracilis* Nuttall – S]

* ***Dalea leporina*** (Aiton) Bullock, Hare's-foot Dalea. Mt (VA): {habitat not known}; rare, introduced from farther west. [= I, K, SE, Z; *? Parosela alopecuroides* (Willdenow) Rydberg – S]

Dalea pinnata (J.F. Gmelin) Barneby *var. **pinnata***, Summer Farewell, Eastern Prairie-clover. Cp (GA, NC, SC): sandhills and other dryish pinelands, especially in loamy sands; uncommon (NC Watch List). August-November. Sc. and se. NC south through SC and GA to c. peninsular FL and e. panhandle FL. [= I, K, SE, 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. Cp (GA): sandhills, dry to moist longleaf pine flatwoods; uncommon. September-November. E. GA (near the Savannah River) south and west to w. Panhandle FL, s. AL, and s. MS. [= I, K, SE, Z; < *Kuhnistera pinnata* (J.F. Gmelin) Kuntze – S; = *Petalostemon pinnatus* (J.F. Gmelin) Blake ssp. *trifoliatus* (Chapman) Wemple]

Dalea cahaba J. Allison, Cahaba Prairie-clover. Dolomitic Ketona glades. May-June; June-September. C. AL (Bibb County) (Allison & Stevens 2001).

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 purpurea Ventenat var. *purpurea*, Purple Prairie-clover. Prairies, glades, and open woodlands. NY and Ontario west to British Columbia, 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]

Daubentonia
(see *Sesbania*)

Desmanthus Willdenow (Bundleflower)

A genus of about 25 species, mostly herbs, 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. Pd (NC, SC), Cp (GA, SC, VA), Mt (GA): disturbed areas; rare, introduced from west of the Appalachians. June-July; August-November. Native primarily west of the Mississippi River (but probably also on limestone through much of TN), with scattered occurrences to the east, most of these adventive. The species is probably not native in our primary area. [= RAB, C, F, G, I, K, SE, W, 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. The three species in Key A form a group quite distinct from the others in our area. It may be that these two groups warrant recognition as two genera, in which case *D. nudiflorum*, *D. glutinosum*, and *D. pauciflorum* are retained in *Desmodium*, and the rest of our taxa would be in *Meibomia* (which is the older genus name, but *Desmodium* is conserved against it when the two are united). References: Isely (1998)=I. Key based on SE, C, RAB, and F. Some parts adapted with little change from SE. Some parts, especially Key E, will likely be substantially revised, based on additional herbarium and field testing.

1 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.....**Key A**

1 Calyx lobes equal to or longer than the calyx tube (at least the lower 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 B**

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.....**Key C**
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 D**
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 E**

Key A

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 .....***D. 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. .....***D. 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 ..... ***D. pauciflorum***

Key B (*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 C (*Desmodium* with trailing stems)

1 Stipules ovate, persistent, slightly to strongly clasping at the base, 6-12 mm long.
2 Leaflets ovate, 1.2-1.9× as long as wide; flowers white to yellowish; loment uncinate-puberulent only along the sutures .....***D. ochroleucum***
2 Leaflets ovate, 0.8-1.1× as long as wide; flowers blue-purple; loment uncinate-puberulent over the surface ....***D. rotundifolium***
1 Stipules lanceolate to linear (or deltate in *D. humifusum*), usually quickly deciduous, not clasping at the base, 2-8 mm long.
3 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]***
3 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 D

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 the Coastal Plain of NC and SC].....***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..... .....***D. cuspidatum*** *var.* ***cuspidatum***

Key E

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 Stem usually pilose; leaflets sub-appressed pubescent (to glabrate)..... ***D. ciliare***
6 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) Augustin de Candolle, Showy Tick-trefoil, Canadian Tick-trefoil. Mt (NC?, VA), Pd (VA): {insert habitat}; rare (VA Rare). July-September; August-October. Québec and Nova Scotia west to Alberta, south to n.

VA, sw. VA, NC (?), MO, and OK. Small (1933) reports this species for NC; the documentation is not known. [= C, F, G, I, K, SE, W; = *Meibomia canadensis* (Linnaeus) Kuntze – S]

Desmodium canescens (Linnaeus) Augustin de Candolle, Hoary Tick-trefoil. Pd, Mt, Cp (NC, SC, VA): fields, woodland borders, disturbed areas; common. June-August; August-October. MA west to WI and NE, south to FL and TX. [= RAB, C, F, G, I, K, SE, W; = *Meibomia canescens* (Linnaeus) Kuntze – S]

Desmodium ciliare (Muhlenberg ex Willdenow) Augustin de Candolle. Cp, Pd, Mt (NC, SC, VA): fields, woodland borders, disturbed areas; common. June-September; August-October. MA west to IN, MO, and se. KS, south to FL and TX; also in Cuba. [= RAB, C, G, I, SE, W; > ***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) Augustin de Candolle ex Loudon *var.* ***cuspidatum***, Toothed Tick-trefoil. Mt, Pd, Cp (NC, SC, VA): fields, woodland borders, disturbed areas; uncommon (VA Rare). June-August; August-October. VT and MA west to MI and WI, south to GA and OK. [= C, F, G, K, SE; < ***D. cuspidatum*** – RAB, I, W; = *Meibomia grandiflora* (Augustin de Candolle) Kuntze – S]

Desmodium fernaldii Schubert, Fernald's Tick-trefoil. Cp (NC, SC, VA), Pd? (SC): sandhills, dry flatwoods, woodland borders; common (VA Watch List). June-September; August-October. Se. VA south to s. SC (and maybe e. GA); 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; < *Meibomia rhombifolia* Vail – S (also see ***D. floridanum***)]

Desmodium floridanum Chapman, Florida Tick-trefoil. Cp (GA, SC): sandhills, other dry sandy habitats; uncommon. June-September; August-October. Se. SC south to FL. [= RAB, I, K, SE; < *Meibomia rhombifolia* Vail – S (also see ***D. fernaldii***)]

Desmodium glabellum (Michaux) Augustin de Candolle. Cp, Pd, Mt (NC, SC, VA): fields, woodland borders, disturbed areas; common. June-September; August-October. ME west to WI and NE, south to FL and TX. [= RAB, F, I, K, SE; < ***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 glutinosum (Muhlenberg ex Willdenow) A. Wood, Heartleaf Tick-trefoil, Clusterleaf Tick-trefoil. Mt, Pd, Cp (NC, SC, VA): moist forests, especially nutrient-rich; uncommon. June-August; August-October. Nova Scotia west to Saskatchewan, south to FL and Mexico. [= RAB, C, F, G, I, K, SE, W; = *Meibomia acuminata* (Michaux) Blake – S]

{Desmodium humifusum (Muhlenberg ex Bigelow) Beck. MA (Nova Scotia?) 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 laevigatum (Nuttall) Augustin de Candolle. Cp, Pd, Mt (NC, SC, VA): fields, woodland borders, disturbed areas; common. June-September; August-October. S. NY west to IN and MO, south to FL and TX. [= RAB, C, F, G, I, K, SE, W; = *Meibomia laevigata* (Nuttall) Kuntze – S]

Desmodium lineatum Augustin de Candolle, Matted Tick-trefoil. Cp (NC, SC, VA), Pd (NC): sandhills and other dry forests and woodlands; common (VA Watch List). June-August; August-October. Se. MD south to FL, west to TX. [= RAB, C, F, G, I, K, SE, W; > *Meibomia arenicola* Vail – S; > *Meibomia polymorpha* (A. Gray) Small – S]

Desmodium marilandicum (Linnaeus) Augustin de Candolle. Mt, Pd, Cp (NC, SC, VA): fields, woodland borders, disturbed areas; common. June-September; August-October. MA west to MI and MO, south to FL and TX. [= RAB, C, F, G, I, K, SE, W; = *Meibomia marilandica* (Linnaeus) Kuntze – S]

Desmodium nudiflorum (Linnaeus) Augustin de Candolle, Naked Tick-trefoil. Cp, Pd, Mt (NC, SC, VA): moist to dry forests; common. July-August; August-October. ME west to MN, south to FL and TX. [= RAB, C, F, G, I, K, SE, W; = *Meibomia nudiflora* (Linnaeus) Kuntze – S]

Desmodium nuttallii (Schindler) Schubert. Cp, Pd, Mt (NC, SC, VA): fields, woodland borders, disturbed areas; common. July-September; August-October. NY west to IN, south to n. FL, AL, and AR. [= RAB, F, I, K, SE, W; < ***D. viridiflorum*** – C, G; < *Meibomia viridiflora* (Linnaeus) Kuntze – S (also see ***D. viridiflorum***)]

Desmodium obtusum (Muhlenberg ex Willdenow) Augustin de Candolle. Mt, Pd, Cp (NC, SC, VA): dry pine woodlands, fields, woodland borders, disturbed areas; common. June-September; August-October. MA west to s. MI, south to FL and TX. [= RAB, I, K, SE, W; = ***D. rigidum*** (Elliott) Augustin de Candolle – C, F, G; = *Meibomia rigida* (Elliott) Kuntze – S]

Desmodium ochroleucum M.A. Curtis ex Canby, White Tick-trefoil, Creamflower Tick-trefoil. Pd (NC, VA), Cp (VA), Mt (GA, NC): dry woodlands, especially over calcareous soils; rare (GA Special Concern, NC Rare, VA Rare). June-August; August-October. NJ (?), DE, and MD south to sc. and sw. NC, GA, TN, AL, FL, MS, and MO. [= RAB, C, F, G, I, K, SE, W; = *Meibomia ochroleuca* (M.A. Curtis ex Canby) Kuntze – S]

Desmodium paniculatum (Linnaeus) Augustin de Candolle *var.* ***epetiolatum*** Schubert. Cp (NC, SC?, VA): pine savannas and flatwoods, bogs; uncommon? (VA Watch List). 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) Augustin de Candolle *var.* ***paniculatum***. Mt, Pd, Cp (NC, SC, VA): fields, woodland borders, disturbed areas; common. June-September; August-October. S. ME west to s. Ontario, MI, and NE, south to FL and TX. [= F, I, K, SE; < ***D. paniculatum*** – RAB, C; > *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 pauciflorum (Nuttall) Augustin de Candolle, Few-flowered Tick-trefoil. Cp, Pd (NC, SC, VA), Mt (VA): moist forests; common (NC Watch List). June-August; August-October. NY west to OH and IA, south to FL and TX. [= RAB, C, F, G, I, K, SE, W; = *Meibomia pauciflora* (Nuttall) Kuntze – S]

Desmodium perplexum Schubert. Mt, Pd, Cp (NC, SC, VA): fields, woodland borders, disturbed areas; common. July-September; August-October. [= RAB, F, I, K, SE; < *D. glabellum* – C; *? Meibomia dillenii* (Darlington) Kuntze – S; < *D. paniculatum* var. *dillenii* (Darlington) Isely – W]

Desmodium rotundifolium Augustin de Candolle, Roundleaf Tick-trefoil. Mt, Pd, Cp (NC, SC, VA): dry forests and woodlands; common. June-August; August-October. VT and MA west to s. MI, south to GA, LA, and MO. [= RAB, C, F, G, I, K, SE, W; *? Meibomia michauxii* Vail – S]

Desmodium sessilifolium (Torrey) Torrey & A. Gray, Sessile-leaf Tick-trefoil. Pd (NC, SC, VA), Mt (VA), Cp (GA, SC?): dry woodlands; rare (NC Rare, VA Rare). July-August; August-October. RI west to s. MI and KS, south to NC, MS, and TX. [= RAB, C, F, G, I, K, SE, W; = *Meibomia sessilifolia* (Torrey) Kuntze – S]

Desmodium strictum (Pursh) Augustin de Candolle, Pineland Tick-trefoil, Pinebarren Tick-trefoil. Cp (NC, SC, VA), Pd (NC, SC): sandhills, other dry wodlands; common (VA Rare). July-August; August-October. NJ south to FL, west to LA. [= RAB, C, F, G, I, K, SE, W; = *Meibomia stricta* (Pursh) Kuntze – S]

Desmodium tenuifolium Torrey & A. Gray, Slimleaf Tick-trefoil. Cp (NC, SC, VA), Pd? (NC?): bogs, pine savannas, wet pine flatwoods; common (VA Rare). July-August; August-October. Se. VA south to FL, west to LA. [= RAB, C, F, G, I, K, SE; = *Meibomia tenuifolia* (Torrey & A. Gray) Kuntze – S]

Desmodium tortuosum (Swartz) Augustin de Candolle. Cp (NC, SC): fields, woodland borders, disturbed areas; common. July-August; August-October. E. NC south to FL, west to TX. [= RAB, I, K, SE; = *Meibomia purpurea* (P. Miller) Vail – S]

Desmodium viridiflorum (Linnaeus) Augustin de Candolle. Pd, Cp, Mt (NC, SC, VA): fields, woodland borders, disturbed areas; common. June-September; August-October. DE south to FL, west to TX, and inland to w. VA, w. NC, n. TN, and AR. [= RAB, F, I, K, SE, W; < *D. viridiflorum* – C, G (also see *D. nuttallii*); < *Meibomia viridiflora* (Linnaeus) Kuntze – S (also see *D. nuttallii*)]

Desmodium cuspidatum (Muhlenberg ex Willdenow) Augustin de Candolle ex Loudon *var.* ***longifolium*** (Torrey & A. Gray) Schubert, in GA. Var. *longifolium* (Torrey & A. Gray) Schubert, differing in its pubescent stem, leaves, stipules, and calyx (vs. nearly glabrous), is generally more western, ranging from OH west to MN and NE, south to GA and ne. TX. [= C, F, G, K, SE; < *D. cuspidatum* – RAB, I] {not keyed at this time}

Desmodium incanum Augustin de Candolle. Cp (GA): lawns, disturbed areas; rare, presumably introduced or adventive from further south. A pantropical weedy species. [= I, SE; > *D. incanum* var. *incanum* – K; = *Meibomia cana* (J.F. Gmelin) Blake – S, illegitimate basionym; = *D. canum* (J.F. Gmelin) Schinz & Thellung, illegitimate basionym] {not keyed at this time}

Dioclea Kunth

A genus of about 30 species, perennial to woody vines, of tropical (rarely temperate) regions of the Old and New World. References: Isely (1998)=I.

Dioclea multiflora (Torrey & A. Gray) C. Mohr. Cp (GA): alluvial forests; rare. S. GA and FL Panhandle west to e. TX, north in the interior to w. TN and w. KY. [= C, G, I, K, S, SE; = *Galactia mohlenbrockii* R.H. Maxwell]

Erythrina Linnaeus (Coral Bean)

A genus of about 100 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. Cp (GA): cultivated, disturbed areas, roadside ditches; rare, introduced from South America. [= I, K, SE; = *Micropteryx crista-galli* (Linnaeus) Walpers – S]

Erythrina herbacea Linnaeus, Coral Bean, Cardinal-spear. Cp (GA, NC, SC): maritime forests, dry sandy woodlands, sandhills in the outer Coastal Plain; uncommon (rare in NC). 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; > *E. herbacea* – S; > *E. arborea* (Chapman) Small – S]

Galactia P. Browne (Milkpea)
(also see *Dioclea*)

A genus of about 50 species, 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. Cp (GA, SC): moist forests; uncommon. July-September; August-October. S. SC south to s. FL. [= RAB, I, K, S, SE, Y, Z]

Galactia erecta (Walter) Vail, Erect Milkpea. Cp (GA, NC, SC): sandhills; common. May-July; July-September. Se. NC south to Panhandle FL, west to e. TX. [= RAB, I, K, S, SE, Y, Z]

Galactia floridana Torrey & A. Gray, Florida Milkpea. Cp (GA): sandhills and other xeric sands; rare (GA Special Concern). 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]

Galactia minor Duncan, Little Milkpea. Cp (GA, NC, SC): sandhills; uncommon. 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]

Galactia mollis Michaux. Cp (GA, NC, SC): sandhills; uncommon (rare in NC and SC). May-July; July- September. Se. NC south to c. peninsular FL, west to Panhandle FL and se. AL. [= RAB, I, K, S, SE, Y, Z]

Galactia regularis (Linnaeus) Britton, Sterns, & Poggenburg. Cp, Pd, Mt (GA, NC, SC, VA): dry forests and woodlands; common. 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, misapplied; > *G. macreei* M.A. Curtis – RAB, C, F, G; = *G. volubilis* – I, K, S, SE, misapplied]

Galactia volubilis (Linnaeus) Britton *var*. ***volubilis***. Cp (GA, NC, SC, VA), Pd?, Mt? (VA): sandhills, other dry forests and openings; common. 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 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, misapplied; > *G. regularis* – S, misapplied; > *G. brevipes* Small – S; < *G. glabella* Michaux – Z]

Genista Linnaeus (Dyer's Greenweed)

A genus of about 80 species, shrubs and small trees, native to Eurasia. References: Isely (1998)=I.

* *Genista tinctoria* Linnaeus, Dyer's Greenweed. Cp (VA): disturbed areas; rare, introduced from 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 (Honey Locust, Water Locust)

A genus of 13-14 species, scattered in the Old and New Worlds. References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Isely (1998)=I; Schnabel & Wendel (1998).

1 Legume ovate, 3-5 (-8) cm long and 1-3-seeded; foliage glabrous (or slightly puberulent when young); [trees of frquently 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. Cp (GA, SC): swamp forests; common. 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, Y, Z]

Gleditsia triacanthos Linnaeus, Honey Locust. Pd, Mt, Cp (GA, NC, SC, VA): woodlands, forests (generally bottomland), fencerows, often planted as a street tree; common (uncommon in Mountains). April-May; July-November. NY west to SD, south to panhandle FL and TX. Its occurrence over much of our region appears to be as an adventive; the native range is poorly known. *G. triacanthos* is more likely to be native in the western part of our region, particularly in the Mississippi drainage. 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, Y, Z]

The hybrid *Gleditsia* ×*texana* Sargent (pro sp.) [*G. aquatica* × *triacanthos*] occurs occasionally in the area of range overlap of its parents. Isely (1975) reports its occurrence in SC. It is intermediate between its parents. [= I, K]

Glottidium Desvaux (Bladderpod)

A genus of a single species, a coarse annual herb, of se. North America. References: Isely (1998)=I.

Identification notes: See key under *Sesbania* for distinctions.

Glottidium vesicarium (Jacquin) Harper, Bladderpod, Bagpod. Cp (GA, NC, SC), Pd (GA): ditches, marshes, disturbed wet areas; common. The native status of *G. vesicarium* 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. Its weedy habit suggests that it may have expanded its distribution northward into our area from the deeper South. July-September; August-November. [= RAB, I, K, S, SE; = *Sesbania vesicaria* (Jacquin) Elliott – GW]

Glycine Linnaeus (Soybean, Soya)

A genus of about 10 species, annual and perennial herbs, of Asia and Australia. References: Isely (1998)=I.

* ***Glycine max*** (Linnaeus) Merrill, Soybean. Cp, Pd, Mt (GA, NC, SC, VA): abundantly cultivated, rarely persisting as a waif, introduced from e. Asia. July-October. One of the most important legume crops in the world. [= RAB, F, I, K, SE]

Glycyrrhiza Linnaeus (Licorice)

References: Isely (1998)=I.

* ***Glycyrrhiza lepidota*** Pursh, Wild Licorice, American Licorice. Cp (VA): disturbed areas; rare, introduced from w. North America. Not cited in Harvill et al. (1992), but 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 (Kentucky Coffee-tree)

A genus of 5 species, all trees, ours in e. North America and four species in e. Asia. References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Lee (1976)=X; Isely (1998)=I.

Gymnocladus dioicus (Linnaeus) K. Koch, Kentucky Coffee-tree. Mt (GA*, VA), Pd* (GA*, NC*): native in rich bottomland and slope forests, also in disturbed areas, persistent and weakly spreading from horticultural plantings; rare (VA Watch List), also rare east of the Appalachians as an introduction. April-May; 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, X, Y, Z]

Indigofera Linnaeus (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 Stem pubescence hirsute or pilose with long brownish hairs ..... ***I. hirsuta***
1 Stem pubescence strigose-appressed.
2 Legume 7-9 mm long, ovoid, not falcate, indehiscent, with 2-3 seeds; corolla 6-9 mm long; [native species] ..... ***I. caroliniana***
2 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].
3 Corolla 15-18 mm long; legume 30-40 mm long, straight; leaflets 2.5-4 cm long ..... ***I. decora***
3 Corolla 5-6 mm long; legume 15-36 mm long, slightly to strongly falcate; leaflets (0.5-) 1-3 cm long.
4 Legume 15-20 mm long, strongly falcate ..... ***I. suffruticosa***
4 Legume 28-36 mm long, slightly falcate ..... ***I. tinctoria***

Indigofera caroliniana P. Miller, Wild Indigo, Carolina Indigo. Cp (GA, NC, SC): sandy forests and woodlands, including sandhills and sandy maritime forests; common (uncommon in NC and SC). June-August; July-October. E. NC south to FL, west to se. LA, a Southeastern Coastal Plain endemic. [= RAB, I, K, S, SE]

* ***Indigofera decora*** Lindley, Chinese Indigo. Pd (GA): planted horticulturally and spreading to nearby roadbanks; rare (but potentially invasive), native of China. June-July (-September). In GA (Oglethorpe County).

* ***Indigofera hirsuta*** Linnaeus, Hairy Indigo. Cp (GA, SC): sandy disturbed areas, such as wildlife "food fields"; rare, introduced from 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.). [= I, K, SE]

* ***Indigofera suffruticosa*** P. Miller, West Indian Indigo. Cp (GA, NC, SC): disturbed areas, dry sandy woodlands; rare, formerly commonly cultivated, locally established as a weed at that time, perhaps no longer present in our area, introduced from native range in the New World tropics, including s. FL. [= I, K, S, SE]

* ***Indigofera tinctoria*** Linnaeus, African Indigo. Cp (GA, NC, SC): formerly commonly cultivated, locally established as a weed at that time, perhaps no longer present in our area, introduced from 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, K, S, SE]

Kummerowia Schindler (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 distinct at the generic level. 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. Mt, Pd, Cp (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, introduced from e. Asia. July-September; August-November. [= I, K, SE, Z; = *Lespedeza stipulacea* Maximowicz – RAB, C, F, G, W]

* ***Kummerowia striata*** (Thunberg) Schindler, Japanese-clover, Common Lespedeza. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disurbed areas; common, introduced from e. Asia. July-September; August-November. [= I, K, SE, Z; = *Lespedeza striata* (Thunberg) Hooker & Arnott – RAB, C, F, S, G, W]

Lablab Adanson (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, is 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]

Lathyrus Linnaeus 1753 (Wild-pea, Vetchling)

A genus of about 150 species, annual and perennial herbs, of nearly cosmopolitan distribution. References: Isely (1998)=I. Key adapted in part from C.

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. maritimus** var**. pellitus]***

2 Foliaceous stipules asymmetrical, oblique at the base, the basal lobe well-developed only on one side.
3 Basal lobe of stipule broadly rounded at tip; flowers whitish ..... ***[L. ochroleucus]***
3 Basal lobe of stipule acute to acuminate at tip; flowers purplish (rarely whitish, or faded in old specimens).
4 Racemes with 2-6 (-9) flowers; leaflets 4-8 (-10) per leaf; [plants of marshes, bottomlands, and other wet habitats]..... ***L. palustris***
4 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*].
5 Leaflets absent (but with foliaceous stipules) ..... ***[L. aphaca]***
5 Leaflets 2.
6 Stems with wings 0-1 (-2) mm wide; corolla 6-14 mm long; flowers 1-3 (-4) per raceme.
7 Legume (in fruit) and ovary (in flower) hirsute with swollen-based hairs; corolla 10-14 mm long ..... ***L. hirsutus***
7 Legume (in fruit) and ovary (in flower) glabrous; corolla 6-9 mm long ..... ***L. pusillus***
6 Stems with wings 1-3 mm wide; corolla 13-30 mm long; flowers 2-12 per raceme.
8 Stems hirsute with swollen-based hairs; plant an annual; flowers 2-4 per raceme ..... ***L. odoratus***
8 Stems glabrate; plant a perennial; flowers (3-) 4-12 per raceme.
9 Stipules 4-10 mm wide; leaflets 2-5× as long as wide..... ***L. latifolius***
9 Stipules 2-3 mm wide; leaflets 6-15× as long as wide..... ***L. sylvestris***

* ***Lathyrus hirsutus*** Linnaeus, Caley Pea, Singletary Pea. Cp, Pd (GA, NC, SC, VA), Mt (GA, VA): roadsides, fields, disturbed areas; common, introduced from Europe. April-July. [= RAB, C, F, G, I, K, S, SE, W]

* ***Lathyrus latifolius*** Linnaeus, Everlasting Pea, Perennial Sweet Pea. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): roadsides, fencerows, disturbed areas; common, introduced from Europe. May-September. [= RAB, C, F, G, I, K, SE, W]

* ***Lathyrus odoratus*** Linnaeus, Sweet Pea. Cp, Pd, Mt (GA, NC, SC, VA): cultivated, and occasionally persisting; rare, introduced from s. Europe. [= C, F, G, I, K, SE]

Lathyrus palustris Linnaeus, Marsh Pea, Marsh Vetchling. Pd (GA, VA), Mt (VA), Cp (NC): bottomland forests, marshes, streambanks; rare (GA Special Concern). May-June; July-September. Circumboreal, ranging in North America south to NJ, VA, ne. NC, ec. GA, OH, IN, MO, CO, and CA. [= RAB, I, K, SE; > *L. palustris* var. *palustris* – C, F, G; > *L. palustris* var. *myrtifolius* (Muhlenberg ex Willdenow) A. Gray – F, G; > *L. palustris* var. *linearifolius* Seringe – G; > *L. myrtifolius* Muhlenberg ex Willdenow – S]

Lathyrus pusillus Elliott. Cp (NC, VA): open areas in bottomlands; rare. April-July. E. VA, MO and KS south to FL and TX. [= RAB, F, G, I, K, S, SE]

* ***Lathyrus sylvestris*** Linnaeus, Perennial Pea. Pd (GA) (NC?, SC?, VA): cultivated, and occasionally persisting; rare, introduced from Europe. [= C, F, G, I, K, SE]

Lathyrus venosus Muhlenberg ex Willdenow, Forest Pea, Bush Vetch. Mt, Pd (GA, NC, VA), Cp (VA): dry to mesic slope and bottomlands forests and woodlands, especially in base-rich soils; common. July-September. S. Ontario west to MN and Saskatchewan, south to c. NC, wc. GA, and MO. [= RAB, I, K, S, SE, W; > *L. venosus* var. *venosus* – C, F, G; > *L. venosus* var. *intonsus* Butters & St. John – C, F, G; > *L. venosus* var. *meridionalis* Butters & St. John – F]

* *Lathyrus aphaca* Linnaeus, Yellow Vetchling, introduced from Eurasia, is scattered in occurrence in the Southeast, including AL, TN, and KY (Kartesz 1999). [= G, I, K, SE]

Lathyrus maritimus (Linnaeus) Bigelow var. *pellitus* (Fernald) Gleason, Beach Pea, has been reported from ocean beaches in Dare County (NC). Documentation of the occurrence of this species in our area is needed. [= C, G; = *Lathyrus japonicus* Willdenow var. *pellitus* Fernald – F, K; < *L. japonicus* – I]

Lathyrus ochroleucus Hooker, White Pea. Forests over limestone. May-July. South sc. PA (Rhoads & Klein 1993) and NJ (Kartesz 1999). [= C, F, G, I, K]

* *Lathyrus pratensis* Linnaeus, Meadow Pea. Reported for VA on the basis of "personal communication" (Kartesz 1999). {investigate} [= C, F, I, K] {not keyed at this time}

* *Lathyrus tuberosus* Linnaeus. Introduced in e. TN (Chester, Wofford, & Kral 1997), WV (Kartesz 1999), and at scattered locations in PA (Rhoads & Klein 1993). [= C, F, G, I, K, SE] {not keyed at this time}

Lespedeza Michaux 1803 (Lespedeza)
(also see *Kummerowia*)

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.

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 Plant a shrub, usually 1-3 m tall, bushy-branched, the woody stems over-wintering; corolla 8-15 mm long; [plants alien, planted in "wildlife food plots" and persisting or spreading]; [section *Macrolespedeza*).

3 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***

3 Calyx lobes longer than the calyx tube (especially or 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***

2 Plant an herb, 0.1-2 m tall, not bushy-branched (the taller species often wand-like), the stems in some species somewhat woody but dying back; corolla to 10 mm long; [plants native, except *L. cuneata* and *L. virgata*).

4 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***

4 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*].

5 Midrib of leaflets distinctly excurrent as a spinose bristle 0.5-1.5 mm long; [plant a rare introduction] ..... ***L. virgata***

5 Midrib of leaflets not excurrent, or only as an obscure mucro, not at all spinose; [plants native].

6 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.

7 Pubescence of the stem spreading (pilose) ..... ***L. procumbens***

7 Pubescence of the stem appressed (strigose).

8 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***

8 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***

6 Plants erect at maturity; stems generally stout, stiff; corolla pink, purple, white, cream, or mixed.

9 Plants in flower.

10 Corolla primarily white or cream (often with a purplish throat).

11 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***

11 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).

12 Leaflets 4-8 (-10)× as long as wide ..... ***L. angustifolia***

12 Leaflets 1.3-1.8× as long as wide.

13 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***

13 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***

10 Corolla primarily pink or purple.

14 Peduncles of the racemes of chasmogamous (petaliferous) flowers longer than the subtending leaves; keel 1-2 mm longer than the wings ..... ***L. frutescens***

14 Peduncles of the racemes of chasmogamous (petaliferous) flowers shorter than the subtending leaves; keel about as long as or shorter than the wings.

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***

9 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 Leaflets (1.3-) 1.8-3 (-3.5)× as long as wide.

23 Upper surface of the leaflets glabrous (sometimes strigose along the midrib only); pubescence of the stem appressed.....***L. violacea***

23 Upper surface of the leaflets pubescent; pubescence of the stem appressed or spreading .....***L. stuevei***

22 Leaflets 1.3-1.8× as long as wide.

24 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***

24 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. Cp (GA, NC, SC, VA), Pd (GA), Mt (NC): sandhill-pocosin ecotones and dry to moist savannas, mountain bogs; common. August-October; September-November. MA south to c. 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, Y, Z; > *L. angustifolia* – F; > *L. hirta* var. *intercursa* Fernald – F]

* ***Lespedeza bicolor*** Turczaninow, Bicolor Lespedeza. Pd, Cp, Mt (GA, NC, SC, VA): "wildlife food plots", roadsides; common, introduced from e. Asia. June-September; August-November. [= RAB, C, I, K, Q, S, SE, W]

Lespedeza capitata Michaux, Bush-clover. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): woodlands and woodland borders; common. August-October; September-November. ME and s. Ontario west to MN, SD, and NE, south to FL and TX. [= RAB, C, I, K, S, SE, W, Y, Z; > *L. capitata* var. *capitata* – F, G; > *L. capitata* var. *stenophylla* Bissell & Fernald – F, G; > *L. capitata* var. *velutina* (Bicknell) Fernald – F, G; > *L. capitata* var. *vulgaris* Torrey & A. Gray – F]

* ***Lespedeza cuneata*** (Dumont-Cours.) G. Don, Sericea Lespedeza, Chinese Lespedeza. Cp, Pd, Mt (GA, NC, SC, VA): roadbanks, "wildlife food plots", disturbed areas; common, introduced from e. Asia. July-September; October-November. [= RAB, C, F, G, I, K, SE, W]

Lespedeza frutescens (Linnaeus) Elliott, Violet Lespedeza. Mt, Pd (GA, NC, VA), Cp (GA, SC, VA): woodlands and woodland borders; common. July-September; October-November. MA and NY west to MI, WI, IA, and KS, south to NC, SC, GA, AL, MS, AR, and TX. [= K, S; = *L. violacea* (Linnaeus) Persoon – RAB, C, F, G, I, S, SE, W, Y, Z, misapplied]

Lespedeza hirta (Linnaeus) Hornemann *var.* ***curtissii*** (Clewell) Isely, Silvery Lespedeza. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): sandhills and dry to moist savannas; common. 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; = *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. Mt, Pd, Cp (GA, NC, SC, VA): woodlands and woodland borders; common. August-October; September-November. S. ME and s. Ontario west to MI, n. IL, c. MO, and OK, south to FL and TX. [= C, I, SE, X; < *L. hirta* – RAB, G, S, W; > *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. Pd, Cp, Mt (GA, NC, SC, VA): woodlands and woodland borders; common. 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, Y, Z; > *L. procumbens* var. *procumbens* – F; > *L. procumbens* var. *elliptica* Blake – F]

Lespedeza repens (Linnaeus) W. Barton, Smooth Trailing Lespedeza. Cp, Pd, Mt (GA, NC, SC, VA): woodlands and woodland borders; common. July-September; August-November. CT and NY west to n. OH, s. WI, MO, and KS, south to panhandle FL and c. TX. [= RAB, C, F, G, I, K, S, SE, W, Y, Z]

Lespedeza stuevei Nuttall, Velvety Lespedeza. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC): woodlands and woodland borders; common. July-September; August-November. MA south to n. 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, Y, Z; = *L. stuvei* – S, orthographic variant]

* ***Lespedeza thunbergii*** (Augustin de Candolle) Nakai. Pd (GA, NC, SC), Cp (NC, SC), Mt (NC): "wildlife food plots"; rare, introduced from e. Asia. Reported for Macon County, NC by Pittillo & Brown (1988). [= C, F, G, I, K, Q, SE]

Lespedeza violacea (Linnaeus) Persoon, Wand Lespedeza. Mt, Pd, Cp (GA, NC, SC, VA): woodlands and woodland borders; common. July-September; August-November. S. ME and s. Ontario west to MI and se. MN, south to panhandle FL and e. TX. [= K, S; = *L. intermedia* (S. Watson) Britton – RAB, C, F, G, I, SE, W, Y, Z]

* ***Lespedeza virgata*** (Thunberg) Augustin de Candolle. Mt (NC): roadbanks; rare, introduced from e. Asia. Clewell & Stickel (1990) report the occurrence of this species in NC. [= I, K]

Lespedeza virginica (Linnaeus) Britton, Virginia Lespedeza. Cp, Pd, Mt (GA, NC, SC, VA): woodlands and woodland borders; common. July-September; August-November. MA and NH west to MI, WI, IA, and KS, south to n. FL and c. TX. [= RAB, C, F, G, I, K, S, SE, W, Y, Z]

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. The following hybrids combinations are known to occur in our area.

L. angustifolia × *capitata*.
L. angustifolia × *hirta* [= *L.* ×*oblongifolia* (Britton) W. Stone (pro sp.) – K; *L. hirta* var. *appressipilis* Blake – F (as to type)].
L. angustifolia ×*repens*.
L. angustifolia ×*stuevei*.
L. capitata × *hirta*. [= *L.* ×*longifolia* Augustin de Candolle (pro sp.) – K; *L. hirta* var. *longifolia* (Augustin de Candolle) Fernald – F; *L. longifolia* Augustin de Candolle – S]
L. capitata × *repens*.
L. capitata × *stuevei*.
L. capitata × *virginica*. [= *L.* ×*simulata* Mackenzie & Bush (pro sp.) – F, K; *L. simulata* Mackenzie & Bush – S]
L. hirta × *procumbens*.
L. hirta × *repens*.
L. hirta × *stuevei*.
L. hirta × *violacea*. [= *L.* ×*nuttallii* Darlington (pro sp.) – K; *L. nuttallii* Darlington – RAB, F, S; *L. nuttallii* var. *nuttallii* – G].
L. hirta × *virginica*.
L. intermedia × *procumbens*.
L. intermedia × *repens*.
L. intermedia × *stuevei*.
L. procumbens × *repens*.
L. procumbens × *virginica*. [= *L.* ×*brittonii* Bicknell (pro sp.) – K; *L. brittonii* Bicknell – F; *L. procumbens* var. *elliptica* Blake – F].
L. repens × *stuevei*.
L. repens × *virginica*.
L. stuevei × *violacea*.
L. stuevei × *virginica* [= *L.* ×*neglecta* Mackenzie & Bush (pro sp.) – K; *L. stuevei* var. *angustifolia* Britton – F; *L. neglecta* Mackenzie & Bush – S].
L. violacea × *virginica* [= *L.* ×*acuticarpa* Mackenzie & Bush (pro sp.) – K]. Documented from Northampton Co. VA.

Leucaena Bentham (Leadtree)

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. Cp (GA): disturbed areas; rare, introduced from 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; < *L. glauca* (Linnaeus) Bentham – S, misapplied]

Lotus Linnaeus (Birdsfoot-trefoil)
(also see *Acmispon*)

A genus of about 120-130 species, annual and perennial herbs, 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).

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. Cp (NC, VA), Pd (VA), Mt (GA, VA): fields, roadsides, and waste places; uncommon, introduced from Eurasia. June-September. First reported for GA (Rabun County) by Stiles & Howel (1998). [= RAB, C, F, G, K, S, SE, W, Z; < *L. corniculatus* Linnaeus – I (also see *L. tenuis*)]

* ***Lotus tenuis*** Waldstein & Kitaibel ex Willdenow, Slender Birdsfoot-trefoil. Pd (NC): fields, roadsides, and waste places; rare, introduced from Eurasia. June-September. [= C, K, SE, Z; < *L. corniculatus* Linnaeus – I]

Lupinus Linnaeus (Lupine)

A genus of about 150-200 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 palmately compound; leaves and stems deciduous, dying back in winter; plant inconspicuously pubescent.
  2 Stem short; leaves clustered, nearly whorled; leaflets narrow; racemes long exserted; flowers small; [plants of e. GA southward] ..... ***L. perennis ssp. gracilis***
  2 Stem elongate; leaves alternate; leaflets broad; racemes only moderately exserted; flowers large; [plants of n. SC northward] ..... ***L. perennis ssp. perennis***
1 Leaves unifoliolate; leaves and stems evergreen, overwintering (absent in midsummer); plant conspicuously pubescent.
  3 Standard blue, with a white to creamy eyespot; hairs on legume ca. 2 mm long; petioles with short and appressed pubescence ..... ***L. diffusus***
  3 Standard reddish to purplish, with a red or deep purple eyespot; hairs on legume 3-5 mm long; petioles with long and spreading (shaggy) pubescence ..... ***L. villosus***

Lupinus diffusus Nuttall, Blue Sandhill Lupine. Cp (GA, NC, SC): sandhills, sandy roadsides; common. 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]

Lupinus perennis Linnaeus *ssp.* ***gracilis*** (Nuttall) Dunn, Southern Sundial Lupine. Cp, Pd (GA): sandhills and sandy or dry rocky roadsides; uncommon. 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; = *L. perennis* var. *gracilis* (Nuttall) Chapman – I; = *L. nuttallii* S. Watson – S]

Lupinus perennis Linnaeus *ssp.* ***perennis***, Northern Sundial Lupine. Mt (VA), Pd (NC, SC, VA), Cp (NC, SC, VA): sandhills, sandy roadsides, other dry habitats; uncommon. 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; > *L. perennis* var. *occidentalis* S. Watson – F; > *L. perennis* ssp. *perennis* var. *perennis* – K; > *L. perennis* ssp. *perennis* var. *occidentalis* – K; = *L. perennis* – S]

Lupinus villosus Willdenow, Pink Sandhill Lupine. Cp (GA, NC, SC): sandhills, sandy roadsides; uncommon (NC Watch List). April-May; June-August. Se. NC south to n. FL, west to se. LA. [= RAB, I, K, S, SE]

Macroptilium (Bentham) Urban

A genus of about 20 species, annual and perennial herbs, of tropical and subtropical America. References: Isely (1998)=I.

* ***Macroptilium lathyroides*** (Linnaeus) Urban. Cp (GA, SC): disturbed areas; rare, naturalized from a native range in tropical America. [= I, K, SE; = *Phaseolus lathyroides* Linnaeus]

Medicago Linnaeus (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. Cp, Pd (GA, NC, SC), Mt (GA, VA): fields, roadsides, disturbed areas; uncommon, introduced from Mediterranean Europe. April-August. [= RAB, F, G, I, K, S, SE]
* ***Medicago falcata*** Linnaeus, Yellow Alfalfa, Sickle Medick. Mt? (VA?): disturbed areas; rare, introduced from n. Eurasia. April-July. The occurrence of this taxon in our area requires verification. [= F, G, I, S, SE; = *M. sativa* Linnaeus ssp. *falcata* (Linnaeus) Arcangeli – C, K]
* ***Medicago laciniata*** (Linnaeus) P. Miller. Cp (SC): waste areas aropund wool-combing mills; rare, native of Europe, perhaps merely a waif. [= F, I, K]
* ***Medicago lupulina*** Linnaeus, Black Medick, Yellow Trefoil. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): fields, roadsides, disturbed areas; common, introduced from Europe. April-August. [= RAB, C, G, I, K, S, SE, W; > *M. lupulina* var. *lupulina* – F; > *M. lupulina* var. *glandulosa* Neilreich – F]
* ***Medicago minima*** (Linnaeus) Linnaeus, Downy Bur-clover, Bur Medick. Cp (NC, SC, VA): fields, roadsides, disturbed areas; rare, introduced from Eurasia. April-August. [= RAB, C, G, I, K, S, SE; > *M. minima* var. *minima* – F; > *M. minima* var. *compacta* Neyraut – F; > *M. minima* var. *longiseta* Augustin de Candolle – F]
* ***Medicago orbicularis*** (Linnaeus) Bartalini. Pd (GA, NC): lawns, disturbed areas; rare, introduced from Mediterranean Europe and n. Africa. April-July. [= RAB, G, I, K, SE]
* ***Medicago polymorpha*** Linnaeus, Smooth Bur-clover, Toothed Medick. Cp (GA, NC, SC), Pd (SC): fields, roadsides, lawns, disturbed areas; uncommon, introduced from Mediterranean Europe. March-April. [= RAB, C, I, K, SE; = *M. hispida* Gaertner – F, G, S]
* ***Medicago sativa*** Linnaeus, Alfalfa, Lucerne, Blue Alfalfa. Mt, Pd, Cp (GA, NC, SC, VA): roadsides, fields, disturbed areas; common, introduced from se. Europe. April-July. [= RAB, F, G, I, S, SE, W; = *M. sativa* Linnaeus ssp. *sativa* – C, K]

Melilotus P. Miller (Melilot, Sweetclover, Sourclover)

A genus of about 20 species, annual and perennial herbs, of temperate Eurasia. References: Stace (1997)=Z; Isely (1998)=I. Key based in part on Stace (1997).

1 Flowers white..... ***M. albus***
1 Flowers yellow.
2 Flowers 2-3.5 mm long; fruits < 3 mm long ..... ***M. indicus***
2 Flowers > 4 mm long; fruits > 3 mm long.
3 Fruits > 5 mm long, mostly 2-seeded, black when ripe, pubescent (at 10× magnification); keel about equalling the wings..... ***[M. altissimus]***
3 Fruits < 5 mm long, mostly 1-seeded, brown when ripe, glabrous; keel shorter than the wings..... ***M. officinalis***

* ***Melilotus albus*** Medikus, White Melilot, White Sweetclover. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, introduced from 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 K. Other differences useful in the determination of faded herbarium specimens are given but 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, Z; = *M. alba* – RAB, C, F, G, S, SE, W, orthographic variant; < *M. officinalis* – K]
* ***Melilotus indicus*** (Linnaeus) Allioni, Small Melilot, Sourclover. Cp (GA, NC, SC, VA), Pd (GA, SC): roadsides, disturbed areas; uncommon, introduced from Mediterranean Europe. April-October. [= I, K, Z; = *M. indica* – RAB, C, F, G, S, SE, orthographic variant]
* ***Melilotus officinalis*** (Linnaeus) Pallas, Yellow Melilot, Yellow Sweetclover, Ribbed Melilot. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, introduced from Eurasia. April-October. [= RAB, C, F, G, I, S, SE, W, Z; < *M. officinalis* – K (also see *M. albus*)]

* *Melilotus altissimus* Thuiller, Tall Melilot, another Eurasian weed, is known to be naturalized as far south as e. PA (Rhoads & Klein 1993). It likely occurs in our area. It superficially resembles *M. officinalis*; see key for distinguishing characteristics. [= I, Z; = *Melilotus altissima* – C, F, G, orthographic variant]

Mimosa Linnaeus (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 Leaflets without apparent secondary veins; pinnae 4-8 (-11) pairs ..... ***M. microphylla***
  2 Leaflets with evident (sometimes weakly so) secondary veins; pinnae 3-5 (-6) pairs..... ***M. quadrivalvis* var. *floridana***

Mimosa microphylla Dryander, Eastern Sensitive-brier. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): dry woodlands and forests, especially sandhills, disturbed areas; common (VA Rare). 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, Y; = *Schrankia microphylla* (Dryander) J.F. Macbride – RAB, F, G, W; = *Schrankia microphylla* (Dryander) J.F. Macbride var. *microphylla* – SE; > *Leptoglottis microphylla* (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 quadrivalvis Linnaeus *var.* ***floridana*** (Chapman) Barneby, Florida Sensitive-briar. Cp (GA): xeric sandhills and other dry, sandy habitats; rare. 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, 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. Cp (GA): floodplain forests, open wet areas; uncommon. 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, Y, Z]

Mucuna Adanson (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) Augustin de Candolle. Velvetbean, Bengal Bean, Florida Bean. Cp (NC, SC): disturbed areas, fields, cultivated and sporadically established in disturbed areas; rare, introduced from se. Asia. [= I, SE; > *M. pruriens* var. *pruriens* – K; > *Stizolobium deeringianum* Bort – S; > *M. deeringiana* (Bort) Merrill]

Neptunia Loureiro (Neptunia)

A genus of ca. 10-11 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]

Orbexilum Rafinesque (Scurfpea, Sampson's-snakeroot)

A genus of about 9 species, perennial herbs, of s. North America and Mexico. 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 Jefferson Co. KY and now 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. Cp (GA, NC, SC): sandhills; uncommon (NC Watch List). 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, Z, orthographic variant; = *Rhytidomene lupinellus* (Michaux) Rydberg – S]

Orbexilum macrophyllum (Rowlee in Small) Rydberg, Bigleaf Scurfpea. Mt (NC): wooded slopes of mountain on Blue Ridge escarpment, precise habitat not known (probably nutrient-rich dry woodlands); rare (US Species of Concern, NC Endangered). 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) is correct in stating 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. Mt (NC, VA): habitat in our area not known, elsewhere usually in nutrient-rich, open or semi-open areas; rare (NC Watch List, VA Rare). 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. Mt (GA, NC, SC), Pd, Cp (GA, SC): open woodlands; rare (NC Watch List). 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. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): savannas, open woodlands; uncommon. May-July; July-September. Var. *psoralioides*, the eastern variety, occurs primarily on the Atlantic Coastal Plain, ranging from e. VA to n. 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 virgatum (Nuttall) Rydberg, Slender Leather-root. Cp (GA, SC?): sandhills; rare (GA Special Concern). Se. GA (or SC?) south to ne. FL. A collection by Curtiss is labeled as from South Carolina. [= I, K, SE, Z; = *Psoralea virgata* Nuttall]

Orbexilum simplex (Nuttall ex Torrey & Gray) Rydberg. Prairies, open woodlands. AR and OK south to s. AL 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, Jefferson Co., KY, and now extinct. [= C, I, K, SE, Z; = *Psoralea stipulata* Torrey & Gray – F, G]

Parkinsonia Linnaeus (Jerusalem Thorn)

A genus of about 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. Cp (GA, SC): disturbed areas; rare, introduced from 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, Z]

Pediomelum Rydberg (Buckroot, Prairie-turnip)

A genus of about 21 species, perennial herbs, of North America. References: Allison, Morris, & Egan (2006)=Y; Grimes (1988, 1990)=Z; Isely (1998)=I.

1 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***
1 Plants caulescent, 3-10 dm tall; leaves 3-foliolate; [plants of sandhills of the Coastal Plain and rocky woodlands of the lower Coastal Plain]; [subgenus *Pediomelum*].
  2 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***
  2 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. Cp (GA, NC, SC, VA): sandhills; rare (NC Watch List, VA Rare). 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, Z; = *Psoralea canescens* Michaux – RAB, F, G]

Pediomelum piedmontanum J.R. Allison, M.W. Morris, & A.N. Egan, Piedmont Buckroot. Pd (GA, SC): open, rocky woodlands in the lower Piedmont; rare. 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. [= *P. piedmontanum* J.R. Allison, M.W. Morris, & A.N. Egan – Y]

Pediomelum subacaule (Torrey & A. Gray) Rydberg, Nashville Breadroot. Mt (GA): limestone glades; rare (GA Special Concern). E. TN and nw. GA west to c. TN and n. nw. AL. [= I, K, SE, Z; = *P. subacaulis* – S, orthographic variant]

Petalostemon
(see *Dalea*)

Phaseolus Linnaeus (Bean)

A genus of about 50 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] ..... ***Ph. 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] ..... ***Ph. 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*] ..... ***Ph. 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*]..... ***Ph. lunatus***
4 Legumes nearly terete at maturity, about 8 mm in diameter; corolla usually pink-purple, at least in part; [section *Phaseoli*] .....***Ph. vulgaris***

* ***Phaseolus coccineus*** Linnaeus *ssp*. ***coccineus***, Scarlet Runner Bean. Cp, Pd, Mt (GA, NC, SC, VA): infrequently cultivated, mostly as an ornamental in home gardens, rarely found as a waif, introduced from tropical America. [= Z; < *Ph. coccineus* – C, F, G, I, K, SE; > *Ph. coccineus* ssp. *coccineus* var. *coccineus* – Y]

* ***Phaseolus lunatus*** Linnatus, Lima Bean. Cp, Pd, Mt (GA, NC, SC, VA): frequently cultivated (both commercially and in home gardens), rarely found as a waif, introduced from tropical America. [= I, K, S, SE, Y, Z; = *Ph. limensis* Macfadyen – F]

Phaseolus polystachios (Linnaeus) Britton, Sterns, & Poggenburg, Wild Bean, Wild Kidney Bean. Mt, Pd, Cp (GA, NC, SC, VA): thickets, woodlands; uncommon. July-September; August-October. S. ME west to OH, IL, and MO, south to FL and TX. [= RAB, C, G, I, SE, W; > *Ph. polystachios* var. *polystachios* – F; > *Ph. polystachios* var. *aquilonius* Fernald – F; = *Ph. polystachios* var. *polystachios* – K; = *Ph. polystachyus* – S, orthographic variant; = *Ph. polystachyus* ssp. *polystachyus* – Y; = *Ph. polystachyus* var. *polystachyus* – Z]

Phaseolus sinuatus (Nuttall) Torrey & A. Gray, Sandhills Bean. Cp (GA, NC, SC): sandhills; rare (GA Special Concern). July-September; August-October. Sc. NC south to s. peninsular FL, west to s. MS, a Southeastern Coastal Plain endemic. Freytag & DeBouck (2002) describe *Ph. sinuatus* and *Ph. polystachios* as being "very distinct and there seems to be no intergradation;" I choose to recognize them as species. Not easy to distinguish in sterile condition from *Strophostyles*. [= RAB, I, S, SE, W; = *Ph. polystachios* (Linnaeus) Britton, Sterns, & Poggenburg var. *sinuatus* (Nuttall) R. Marechal, J.M. Mascherpa, & F. Stainier – K; = *Ph. polystachyus* ssp. *sinuatus* (Nuttall) Freytag – Y; = *Ph. 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. Cp, Pd, Mt (GA, NC, SC, VA): frequently cultivated (both commercially and in home gardens), rarely found as a waif, introduced from tropical America. [= C, F, G, I, K, S, SE; > *Ph. vulgaris* var. *vulgaris* – F; > *Ph. vulgaris* var. *humilis* Alefeld – F; < *Ph. vulgaris* var. *vulgaris* – Z]

Pisum Linnaeus (Pea)

A genus of 2 species, annual herbs, native to the Mediterranean region. References: Isely (1998)=I.

* ***Pisum sativum*** Linnaeus, Pea, Garden Pea, English Pea. Mt, Pd, Cp (GA, NC, SC, VA): commonly cultivated in home gardens, rarely found as a waif. March-May. [= I, K, SE; > *P. sativum* var. *sativum* – F; > *P. sativum* var. *arvense* (Linnaeus) Poiret – RAB, F]

Psoralea
(see *Orbexilum, Pediomelum*)

Psoralidium Rydberg

A genus of 3 species, herbs, of c. and w. North America. References: Grimes (1988, 1990)=Z; Isely (1998)=I.

Psoralidium tenuiflorum (Pursh) Rydberg, Gray Scurf-pea. Prairies. KY to MT, south to TX and n. Mexico; disjunct in MS. [= C, I, K, SE, Z; = *Psoralea tenuiflora* Pursh – F, G]

Pueraria Augustin de Candolle (Kudzu)

A genus of about 15 species, perennial vining herbs, of tropical and subtropical Asia. References: Isely (1998)=I; Ward (1998)=Z.

* ***Pueraria montana*** (Loureiro) Merritt *var*. ***lobata*** (Willdenow) van der Maesen & S. Almeida, Kudzu. Mt, Pd, Cp (GA, NC, SC, VA): roadsides, waste areas; common, introduced from 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, Z; = *P. lobata* (Willdenow) Ohwi – RAB, C, F, G, SE, W; = *P. thunbergiana* (Siebold & Zuccarini) Bentham – S]

Rhynchosia Loureiro (Snoutbean)

A genus of about 200 species, perennial herbs, of tropical and warm temperate regions, nearly cosmopolitan. References: 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] ..... ***Rh. michauxii***
  2 Plants erect or ascending, usually with fewer than 6 leaves; stipels present; [plant common in the Coastal Plain in our area] ..... ***Rh. 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 8-10 (-12) mm long, about as long as the corolla; [plants widespread in our area]..... ***Rh. difformis***
    4 Calyx 2.5-3 (-4) mm long, clearly shorter than the corolla; [plants of e. GA southward] ..... ***Rh. minima***
  3 Plant erect; pubescence of the lower leaf surface not restricted to the veins, grayish tomentose and velvety to the touch.
    5 Inflorescence a single exserted terminal raceme, 5-20 cm long; stipules caducous; [plants of s. SC southward] ..... ***Rh. tomentosa*** *var.* ***mollissima***
    5 Inflorescences several and axillary, 1-3 cm long; stipules persistent; [plants widespread in our area] ..... ***Rh. tomentosa*** *var.* ***tomentosa***

Rhynchosia difformis (Elliott) Augustin de Candolle. Cp (GA, NC, SC, VA), Pd (SC): sandhills; common. June-August; July-October. Se. VA south to s. FL, west to e. TX. [= RAB, C, F, G, I, K, SE; = *Rh. tomentosa* – S, misapplied]

*? ***Rhynchosia michauxii*** Vail. Cp (GA, NC): disturbed areas; rare. June-August; August-October. Se. NC (one record) 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; = *Rh. americana* (Houston ex P. Miller) M.C. Metz – RAB (based on misidentification of specimen)]

Rhynchosia minima (Linnaeus) Augustin de Candolle. Cp (GA): coastal sands; uncommon. Along the coast in e. GA, south to 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; = *Dolicholus minimus* (Linnaeus) Medikus – S]

Rhynchosia reniformis Augustin de Candolle, Dollarweed. Cp (GA, NC, SC): sandhills; common. 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; = *Rh. simplicifolia* (Walter) Wood – S]

Rhynchosia tomentosa (Linnaeus) Hooker & Arnott *var.* ***mollissima*** (Elliott) Torrey & A. Gray. Cp (GA, SC): sandhills, rare. June-August; August-October. Peninsular FL, e. GA, and se. SC (Beaufort County, documented by an old specimen [GH] by Mellichamp from the vicinity of Bluffton, where it was probably native). [= I, K, SE; = *Rh. mollissima* (Elliott) S. Watson – S]

Rhynchosia tomentosa (Linnaeus) Hooker & Arnott *var.* ***tomentosa***. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): xeric woodlands and forests, sandhills, edges, open areas; common. June-August; August-October. DE south to FL, west to LA, and north in the interior to e. and c. TN. [= C, I, K, SE; < *Rh. tomentosa* – RAB, F, G, W; > *Rh. erecta* (Walter) Augustin de Candolle – S; > *Rh. intermedia* (Torrey & Gray) Small – S]

Rhynchosia cytisoides (Bertol.) Wilbur. AL and Panhandle FL west to MS. [= I, K, SE; = *Pitcheria galactioides* Nuttall – S] {not keyed at this time}

Robinia Linnaeus (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. The key is differently structured than that in RAB or SE; it is presented as an alternative. {NOTE: This treatment may be altered substantially prior to publication.} References: Isely & Peabody (1984)=Z; Ashe (1922)=Y; Isely (1998)=I.

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. Mt (NC, SC): forests and outcrop edges on high elevation granitic domes, also clearings; rare (NC Rare). 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. Mt (NC): woodlands and forests; rare (NC Rare). 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. Mt, Pd*, Cp* (GA, NC, SC, VA); woodlands and forests, and as an escape in disturbed areas and roadsides; common (uncommon in Piedmont and Coastal Plain, where mostly or entirely introduced). 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 (also see *R. hispida* var. *fertilis*); = *R. hispida* – G, S, Y; > *R. hispida* – S; > *R. pallida* Ashe – S; > *R. speciosa* Ashe – S; < *R. hispida* – W]

Robinia hispida Linnaeus *var*. ***kelseyi*** (Cowell ex Hutchinson) Isely, Kelsey's Locust. Mt (NC, SC), Pd* (VA*): mountain woodlands, introduced elsewhere; rare (NC Rare). 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. Mt (GA, NC, SC, VA): mountain woodlands; rare (NC Watch List). April-July. Originally distributed from w. NC and e. TN south to nw. SC, n. GA, and ne. AL, now ocasionally 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. Cp, Pd, Mt (GA, NC, SC): sandhills, dry rocky forests (especially associated with chestnut oak); uncommon (rare in Piedmont and escarpment region of Mountains). April-June; July-October. Se. and nc. NC south through SC to GA and AL. This species flowers infrequently. [= RAB, S, Y; = *R. hispida* Linnaeus var. *nana* (Elliott) Augustin 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. Mt, Pd, Cp (GA, NC, SC, VA): forests, woodlands, disturbed areas, roadcuts; common. 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, Z; = *R. pseudo-acacia* – RAB, F, S, orthographic variant; > *R. pseudo-acacia* var. *pseudo-acacia* – G, orthographic variant; > *R. pseudo-acacia* var. *rectissima* (Linnaeus) Raber – G]

Robinia viscosa Ventenat, Clammy Locust. Mt (GA, NC, SC), Pd* (NC), Cp* (NC): mountain forests and woodlands, roadsides, disturbed areas; rare in wild, uncommon as an escape (NC Watch List). 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. [= RAB, F, G, S; = *R. viscosa* var. *viscosa* – C, K, SE, Y, Z; < *R. viscosa* – W (also see *R. hartwigii*)]

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 ×*margaretta* 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.

Securigera Augustin de Candolle (Crown-vetch)

A genus of about 12 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. Cp (SC): disturbed areas; rare, 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]
* ***Securigera varia*** (Linnaeus) Lassen, Crown-vetch. Mt, Pd (GA, NC, SC, VA), Cp (VA): roadbanks, woodland borders; common (rare in Piedmont south of NC), introduced from 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]

Senna P. Miller (Senna, Sicklepod, Wild Coffee)

A genus of about 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 corymbosa*** (Lamarck) Irwin & Barneby. Cp (GA, SC), Pd (GA): cultivated as an ornamental, rarely persistent or spreading to disturbed areas; rare, introduced from South America. August-September. [= I, K, SE, Y; = *Adipera corymbosa* (Lamarck) Britton & Rose – S; = *Cassia corymbosa* – X, Z]

Senna hebecarpa (Fernald) Irwin & Barneby, Northern Wild Senna. Pd (GA?, NC, VA), Mt (NC, VA), Cp (VA): open wet habitats, moist forests; uncommon in VA Mountains and VA Piedmont, rare in VA Coastal Plain and NC (NC Watch List). 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; > *C. hebecarpa* var. *longipila* E.L. Braun – F; = *Ditremexa marilandica* (Linnaeus) Britton & Rose – S, misapplied]

Senna marilandica (Linnaeus) Link, Maryland Wild Senna. Pd (GA, NC, SC, VA), Mt, Cp (NC, GA, VA): dry to moist forests, especially on greenstone and diabase barrens and rocky woodlands, thickets, woodland borders, sometimes somewhat weedy; uncommon (rare in NC). 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, Y; = *Cassia marilandica* Linnaeus – RAB, F, G, W, X, Z; = *Ditremexa medsgeri* (Shafer) Britton & Rose – S]

* ***Senna obtusifolia*** (Linnaeus) Irwin & Barneby, Sicklepod, Coffeeweed. Cp, Pd (GA, NC, VA), Mt (GA): fields (especially soybean fields), disturbed areas; common (uncommon in VA), probably introduced from the New World Tropics. July-September; August-November. The species is now pantropical. [= C, I, K, SE, 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. Cp, Pd (GA, NC, SC), Mt (VA): disturbed places; rare, native of the Old World Tropics. July-August; August-November. The species is now pantropical. [= C, I, K, SE, Y; = *Cassia occidentalis* Linnaeus – RAB, F, G, X, Z; = *Ditremexa occidentalis* (Linnaeus) Britton & Rose ex Britton & Wilson – S]

* ***Senna septemtrionalis*** (Viviani) Irwin & Barneby. Cp (NC): disturbed areas; rare, introduced from the tropics, where it is widespread, probably originally from tropical America, perhaps not truly established, though Isely (SE) states that "the weedy nature of this species suggests that it is almost certainly somewhat established." [= I, K, SE, Y; = *Cassia laevigata* Willdenow – Z]

* *Senna alata* (Linnaeus) Roxburgh, Emperor's Candlesticks, Candlestick Plant. September-November. Native to the American tropics, planted and slightly naturalized from s. AL and FL west to OK and TX. [= I, K, SE, Y; = *Cassia alata* Linnaeus – Z]

Sesbania Scopoli (Rattlebox, Sesban)
(also see *Glottidium*)

A genus of about 50 species, annual herbs, perennial herbs, shrubs, and trees, of tropical, subtropical, and less commonly warm temperate regions of the Old and New World. References: Isely (1998)=I.

1 Corolla 8-9 mm long; legume flat; leaves with 8-13 pairs of leaflets ..... **[see *Glottidium vesicarium*]**
1 Corolla 10-25 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 conspicuously 4-winged longitudinally, 3-8 cm long, 1-1.5 cm wide; corolla 13-25 mm long, yellow, orange, or scarlet; leaves with 10-20 pairs of leaflets; [plant a shrub, to 4 m tall].
    3 Corolla yellow; pedicels 0.5-1.0 cm long; legume blunt or short-acuminate to a beak ..... ***S. drummondii***
    3 Corolla orange or red; pedicels 0.5-1.2 (-1.5) cm long; legume acuminate or tapering to beak ..... ***S. punicea***

* ***Sesbania drummondii*** (Rydberg) Cory, Rattlebox, Poison-bean. Cp (GA, SC): disturbed areas, spoil, marsh edges, ditches; rare, introduced. First reported for GA and SC by Townsend et al. (2000). [= GW, I, K, SE; = *Daubentonia drummondii* Rydberg – S]
*? ***Sesbania herbacea*** (P. Miller) McVaugh, Sesban, Coffee-weed, Indigo-weed, Peatree. Cp (GA, NC, SC, VA), Pd (NC): ditches, wet fields; common (rare in Piedmont), perhaps native only in the deeper South. July-September; August-November. [= K; = *S. exaltata* (Rafinesque) Cory – RAB, C, F, G, I, SE; = *Sesbania macrocarpa* Muhlenberg ex Rafinesque – GW; = *Sesban exaltatus* (Rafinesque) Rydberg – S]
* ***Sesbania punicea*** (Cavanilles) Bentham, Rattlebox, Scarlet Wisteria-tree, Purple Sesban. Cp (GA, NC, SC, VA), Pd (GA): ditches, wet fields, marshes, ponded wetlands, wet pinelands; common, presumably introduced from South America. June-October; August-November. [= GW, I, K, SE; = *Daubentonia punicea* (Cavanilles) Augustin de Candolle – RAB, S]

Sophora Linnaeus
[see ***Styphnolobium***]

Strophostyles Elliott (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, equalling or exceeding the calyx tube; leaflets usually prominently 3-lobed; terminal leaflet 2.5-3.5 cm wide; plant an annual ..... ***S. helvula***
  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 helvula (Linnaeus) Elliott, Annual Sand Bean. Cp, Pd, Mt (GA, NC, SC, VA): coastal dunes, beaches, dry sandy woodlands, disturbed areas; common. June-September; August-October. Québec 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. [= K, SE, W, Z; = *S. helvola* – RAB, C, G, S, 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. Cp (VA): disturbed areas; rare, presumably introduced but possibly native (VA Watch List). This species is native east to KY and TN; it should be sought in our area in prairies, glades, and barrens with midwestern affinities. [= C, F, G, K, SE, Z; *S. pauciflora* (Bentham) S. Watson – S]

Strophostyles umbellata (Muhlenberg ex Willdenow) Britton, Perennial Sand Bean. Cp, Pd, Mt (GA, NC, SC, VA): dry sandy or rocky woodlands, disturbed areas; common. 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, Z; > *S. umbellata* var. *umbellata* – F; > *S. umbellata* var. *paludigena* Fernald – F]

Stylosanthes Swartz (Pencil-flower)

A genus of about 25 species, annual and perennial herbs, pantropical and less commonly temperate. References: Isely (1998)=I.

Stylosanthes biflora (Linnaeus) Britton, Sterns, & Poggenburg, Pencil-flower. Cp, Pd, Mt (GA, NC, SC, VA): sandhills, dry to moist (but not wet) pine savannas and flatwoods, dry forests, woodlands, woodland borders, glades, barrens, rock outcrops; common. 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; > *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 (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).

* *Styphnolobium japonicum* (Linnaeus) Schott, Pagoda Tree. Pd (GA, NC, SC, VA), Mt (VA): cultivated ornamental, 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 (Goat's-rue)

A genus of about 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 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***
    4 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.
      5 Leaves with (3-) 5-7 leaflets; petiole 0-5 mm long; stem and fruit hairs < 0.5 mm long ..... ***T. chrysophylla***
      5 Leaves with (7-) 9-17 (-19) leaflets; petiole 2-15 mm long; some stem and fruit hairs > 0.5 mm long.
        6 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***
        6 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. Cp (GA): sandhills; rare (GA Rare). E. GA s. to s. FL, and west to s. MS. [= I, K, SE, Y; = *Cracca chrysophylla* (Pursh) Kuntze – S]

Tephrosia florida (F.G. Dietrich) C.E. Wood. Cp (GA, NC, SC): pine savannas and other pinelands; common. May-July; June-September. E. NC south to s. FL, west to se. LA, a Southeastern Coastal Plain endemic. [= RAB, I, K, SE, Y; = *Cracca ambigua* (M.A. Curtis) Kuntze – S]

Tephrosia hispidula (Michaux) Persoon. Cp (GA, NC, SC, VA?): pine savannas and other pinelands; common. 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, Y; = *Cracca hispidula* (Michaux) Kuntze – S]

Tephrosia mohrii (Rydberg) Godfrey, Dwarf Goat's-rue. Cp (GA): sandhills, dry savannas; rare (GA Rare). 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, Y; = *Cracca mohrii* Rydberg – S; = *T. virginiana* var. *mohrii* (Rydberg) D.B. Ward – Z]

Tephrosia spicata (Walter) Torrey & A. Gray. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): woodlands; common. 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, 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. Cp, Pd, Mt (GA, NC, SC, VA): sandhills, other pinelands, xeric and rocky woodlands and forests, outcrops, barrens; common. May-June; July-October. S. NH west to WI, se. MN, and c. KS, south to FL, c. TX, and nw. TX. [= RAB, C, I, K, SE, W; > *T. virginiana* var. *glabra* Nuttall – F, G; > *T. virginiana* var. *virginiana* – F, G; < *T. virginiana* – I, SE, Y (also see *T. mohrii*); = *Cracca virginiana* Linnaeus – S; = *T. virginiana* var. *virginiana* – Z]

Tephrosia onobrychoides Nuttall. Dry pinelands, s. AL west to c. TX. [= I, K, SE, Y; = *Cracca onobrychoides* (Nuttall) Kuntze – S]

Thermopsis R. Brown ex Aiton & Aiton f. (Golden-banner)

A genus of 8-10 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 ..... ***Th. 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] ..... ***Th. 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] ..... ***Th. mollis***

Thermopsis fraxinifolia (Nuttall ex Torrey & A. Gray) M.A. Curtis, Ash-leaf Golden-banner. Mt, Pd (GA, NC, SC): dry slopes and ridges; rare (GA Rare, NC Rare). 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, *Th. fraxinifolia* tends to have thinner stems than *Th. 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 *Th. mollis* and the first flowering of *Th. fraxinifolia*) provides strong support to the recognition of *Th. fraxinifolia* and *Th. mollis* at the species level. [= RAB, K, S, W, Y; = *Th. mollis* var. *fraxinifolia* (Nuttall ex Torrey & A. Gray) Isely – I, SE, Z]

Thermopsis mollis (Michaux) M.A. Curtis ex A. Gray, Appalachian Golden-banner. Pd, Mt (GA, NC, SC, VA): dry slopes and ridges; rare (GA Rare, NC Rare, SC Rare, VA Watch List). 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 *Th. fraxinifolia*. [= RAB, C, F, G, K, W, Y; = *Th. mollis* var. *mollis* – I, SE, Z; > *Th. hugeri* Small – S; > *Th. mollis* – S]

Thermopsis villosa (Walter) Fernald & Schubert, Aaron's-rod, Blue Ridge Golden-banner. Mt (GA, NC, VA*): floodplains, mesic disturbed areas, woodland edges, roadbanks; rare (GA Rare, NC Watch List). 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. *Th. 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; = *Th. caroliniana* M.A. Curtis – S]

Trifolium Linnaeus 1753 (Clover)

A genus of abut 240 species, annual and perennial herbs, nearly cosmopolitan. References: 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 m 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. (SC). SC according to Kartesz (1999), based on specimen at NCU {check}. [= I, K] {not keyed at this time}
* ***Trifolium arvense*** Linnaeus, Rabbitfoot Clover. Pd (GA, NC, SC, VA), Cp, Mt (NC, SC, VA): disturbed areas; common, introduced from the Mediterranean region. April-August. [= RAB, C, F, G, I, K, S, SE, W]
* ***Trifolium aureum*** Pollich, Large Hop Clover, Yellow Clover. Mt, Pd, Cp (NC, VA): fields, roadsides, disturbed areas; uncommon, introduced from Eurasia. May-August. [= C, I, K, SE, W; = *T. agrarium* Linnaeus – RAB, F, G, S, misapplied]
Trifolium calcaricum J.L. Collins & Wieboldt. Mt (VA): limestone glades; rare. In c. TN (Chester, Wofford, & Kral 1997). For additional information, see Collins & Wieboldt (1992). [= I, K]
* ***Trifolium campestre*** Schreber, Hop Clover. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, fields, lawns, disturbed areas; common, introduced from Eurasia. April-October. [= RAB, C, I, K, SE, W; *? T. procumbens* Linnaeus – F, G, S, misapplied]
Trifolium carolinianum Michaux, Wild White Clover, Carolina Clover. Cp (GA, NC, SC), Pd (GA, SC): open woodlands, woodland edges, pine savannas, thin soils around rock outcrops; rare. April-July. [= RAB, C, F, G, I, K, S, SE, W; > *T. carolinianum* – S; > *T. saxicola* Small – S]
* ***Trifolium cernuum*** Brot., Nodding-head Clover. (SC). (Kartesz 1999). [= K] {not keyed at this time}
* ***Trifolium depauperatum*** Desvaux *var. **depauperatum.*** (SC). (Kartesz 1999). [= I, K] {not keyed at this time}
* ***Trifolium dubium*** Sibthorp, Low Hop Clover. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, lawns, disturbed areas; common, introduced from Europe. April-September. [= RAB, C, F, G, I, K, S, SE, W]
* ***Trifolium fragiferum*** Linnaeus, Strawberry Clover. Pd (GA): disturbed areas; rare, introduced from 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. {prov} (SC): {habitat}; rare, introduced from Mediterranean region. [= I, K, S, SE]
* ***Trifolium hirtum*** Allioni, Rose Clover. Pd (NC, VA): roadsides, disturbed areas; rare, introduced from Eurasia and n. Africa. April-July. [= RAB, C, G, I, K, SE]
* ***Trifolium hybridum*** Linnaeus, Alsike Clover. Cp, Pd, Mt (GA, NC, SC, VA): lawns, fields, roadsides, disturbed areas; common, introduced from Europe. April-September. [= RAB, C, G, I, K, S, SE, W; > *T. hybridum* var. *hybridum* – F; > *T. hybridum* var. *elegans* (Savi) Boiss. – F]
* ***Trifolium incarnatum*** Linnaeus, Crimson Clover. Cp, Pd, Mt (GA, NC, SC, VA): fields, disturbed areas; uncommon, introduced from Europe. April-June; June-August. [= RAB, C, F, G, I, K, S, SE, W]
* ***Trifolium lappaceum*** Linnaeus, Lappa Clover. Cp (NC): disturbed areas; rare, introduced from Mediterranean Eurasia and Africa. April-August. [= RAB, I, K, S, SE]
* ***Trifolium pratense*** Linnaeus, Red Clover. Mt, Pd, Cp (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, introduced from Europe. April-September. [= RAB, C, G, I, K, S, SE, W; > *T. pratense* var. *pratense* – F; > *T. pratense* var. *sativum* (P. Miller) Schreber – F]
Trifolium reflexum Linnaeus, Buffalo Clover. Pd, Cp (GA, NC, SC, VA), Mt (GA, SC): open woodlands, woodland edges; rare. April-August. [= RAB, C, I, K, S, SE, W; > *T. reflexum* var. *reflexum* – F, G; > *T. reflexum* var. *glabrum* Lojacono – F, G]
* ***Trifolium repens*** Linnaeus, White Clover, Dutch Clover, Ladino Clover. Cp, Pd, Mt (GA, NC, SC, VA): lawns, roadsides, disturbed areas; common, introduced from Eurasia. April-September. [= RAB, C, F, G, I, K, S, SE, W]
* ***Trifolium resupinatum*** Linnaeus, Persian Clover, Reversed Clover. Cp (NC, SC), Pd (GA): lawns and disturbed areas; rare, introduced Mediterranean region and w. Asia. April-July. [= RAB, C, F, G, I, K, S, SE]
* ***Trifolium striatum*** Linnaeus, Knotted Clover. Pd (GA, NC): roadsides, disturbed areas; rare, introduced from Europe. April-August. [= RAB, C, F, G, I, K, S, SE]
* ***Trifolium subterraneum*** Linnaeus, Subterranean Clover. Pd (GA), {prov.} (NC, SC): disturbed areas; rare, introduced from Europe, Asia, and n. Africa. Reported for NC and SC by Isely (1990); reported for Piedmont of GA by Jones & Coile (1988). [= I, K, SE]
* ***Trifolium tomentosum*** Linnaeus. {prov.} (NC): disturbed areas; rare, introduced from Mediterranean region. Reported for NC by Isely (1998). [= I, K]
* ***Trifolium vesiculosum*** Savi, Arrowleaf Clover. Pd (GA, SC), Cp (GA): roadsides, disturbed areas; uncommon, introduced from s. Europe. First reported for South Carolina by Hill & Horn (1997). [= I, K, SE]
Trifolium virginicum Small, Kates Mountain Clover, Shale-barren Clover. Mt, Pd (VA): shale barrens, other rock outcrops; uncommon (rare in Piedmont). May-June. Ranges from sc. PA through w. MD south to w. VA and e. WV. [= C, F, G, I, K, SE, W]

* *Trifolium medium* Linnaeus, Zigzag Clover. Introduced in MD (Kartesz 1999). [= K] {not keyed}
* *Trifolium nigrescens* Viviani, Ball Clover. Introduced in c. TN (Chester, Wofford, & Kral 1997). [= I, K, S, SE]
Trifolium stoloniferum Muhlenberg ex Eaton, Running Buffalo-clover, a rare native, occurs (at least formerly) in dry upland woodlands and prairies from WV, OH, n. IN, IL, MO, and e. KS, south to KY and AR. [= C, F, G, I, K, S, SE]

Ulex Linnaeus (Gorse)

References: Isely (1998)=I.

* ***Ulex europaeus*** Linnaeus, Gorse, Furze. Cp (VA): disturbed areas; rare, introduced from 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 tropoical 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..... ***A. farnesiana*** *var.* ***farnesiana***
1 Leaves with 10-15 (-20) pairs of pinnae; each pinna with 20-30 pairs of leaflets..... ***A. macracantha***

Vachellia farnesiana (Linnaeus) Wight & Arnott *var.* ***farnesiana***, Sweet Acacia. Cp (GA): sandy flats on barrier islands, maritime scrub; rare, apparently native but possibly adventive from further south (GA Special Concern). E. GA, along the coast, south to s. FL. See Duncan (1985). [= X; < *Acacia farnesiana* (Linnaeus) Willdenow – I, K, SE, Z; < ***Vachellia farnesiana*** (Linnaeus) Wight & Arnott – S; = *Acacia farnesiana* ssp. *farnesiana* – Y]
* ***Vachellia macracantha*** **(**Humboldt & Bonplandt ex Willdenow) Seigler & Ebinger, Apopanax. Cp (GA): planted as an ornamental and rarely naturalized; rare, introduced from further south. [= X; = ***Acacia macracantha*** Humboldt & Bonplandt ex Willdenow – I, K, SE, Z; ***Vachellia***]

Vicia Linnaeus 1753 (Vetch, Tare)

A genus of about 150 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 not 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 an annual.
18 Legume symmetrically rounded at the apex; inflorescence with 1-2 (-4) flowers..... ***V. tetrasperma***
18 Legume asymmetrically acute at the apex; inflorescence with 1-15 flowers.
19 Legume finely hirsute; leaves with (8-) 10-16 leaflets ..... ***V. hirsuta***
19 Legume glabrous to inconspicuously puberulent; leaves with 2-4 leaflets..... ***V. minutiflora***
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***

Vicia acutifolia Elliott, Fourleaf Vetch. Cp (GA, SC): pond margins, pine flatwoods, ditches; rare. April-May; May-June. Se. SC south to s. FL, west to e. Panhandle FL. [= RAB, GW, I, K, S, SE]

Vicia americana Willdenow *var. **americana***, American Vetch, Purple Vetch, Tare. Mt (VA): {habitat}; rare. May-June. Var. *americana* ranges from Québec west to AK, south to w. VA, MO, OK, TX, Mexico. Var. *minor* Hooker occurs in w. North America. [= C, F, G, I, SE; = *V. americana* ssp. *americana* – K; < *V. americana* – W]

Vicia caroliniana Walter, Pale Vetch, Wood Vetch, Carolina Vetch. Mt, Pd, Cp (GA, NC, SC, VA): forests, woodlands, and disturbed areas; common. April-June; May-July. NY west to WI, south to s. GA, s. MS, and c. TX. [= C, F, G, I, K, SE, W; > *V. caroliniana* – RAB, S; > *V. hugeri* Small – RAB, S]

* ***Vicia cracca*** Linnaeus, Tufted Vetch, Cow Vetch, Canada-pea. Cp, Pd (VA), Mt (NC): disturbed areas; rare, introduced from Europe. May-July; June-August. [= RAB, C, G, S, SE; > *V. cracca* var. *cracca* – F, I; > *V. cracca* ssp. *cracca* – K]

Vicia floridana S. Watson, Florida Vetch. Cp (GA): moist soils of hammocks, ditches, roadbanks; rare. S. FL north to McIntosh Co., GA (Isely 1998). [= GW, I, K, S, SE]

* ***Vicia grandiflora*** Scopoli, Large Yellow Vetch. Cp, Pd (GA, NC, SC, VA): disturbed areas; uncommon, introduced from Europe. April-June; May-July. [= C, I, F, G, K, SE, W; > *V. grandiflora* var. *kitaibeliana* W.D.J. Koch – RAB]

* ***Vicia hirsuta*** (Linnaeus) S.F. Gray, Tiny Vetch, Hairy Tare. Cp, Pd (GA, NC, SC, VA), Mt (SC, VA): disturbed areas, uncommon, introduced from Europe. April-June; May-July. [= RAB, C, F, G, I, K, S, SE]

* ***Vicia lathyroides*** Linnaeus, Spring Vetch. Cp (NC, SC, VA), Pd (GA, NC): lawns, disturbed areas; rare, introduced from Europe. April-June; May-July. [= RAB, C, I, F, G, K, SE]

* ***Vicia lutea*** Linnaeus, Yellow Vetch. Pd (NC): disturbed areas; rare, introduced from Europe. [= I, K, SE]

Vicia minutiflora F.G. Dietrich, Smallflower Vetch. Cp (GA): woodlands; rare. TN, w. FL, and sw. GA west to OK and TX. [= GW, I, K, SE, V; = *V. micrantha* Nuttall ex Torrey & A. Gray – F, G, S]

* ***Vicia pannonica*** Crantz, Hungarian Vetch. Pd (GA): disturbed areas; rare, introduced. Introduced in c. GA. Reported for NC (Kartesz 1999). {investigate} [= I, K, SE]

* ***Vicia sativa*** Linnaeus *ssp. **nigra*** (Linnaeus) Ehrhart, Narrowleaf Vetch. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas; common, introduced from 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; > *V. angustifolia* var. *segetalis* (Thuill.) Ser. – F, G; > *V. angustifolia* var. *uncinata* (Desv.) Rouy – F]

* ***Vicia sativa*** Linnaeus *ssp. **sativa***, Common Vetch. Pd (GA, NC, VA), Mt (NC), Cp (VA): disturbed areas; rare, introduced from 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 tetrasperma*** (Linnaeus) Schreber, Slender Vetch, Smooth Tare, Lentil Vetch. Cp, Pd (GA, NC, SC, VA): disturbed areas; uncommon, introduced from Europe. April-June; May-July. [= RAB, C, G, I, K, S, SE; > *V. tetrasperma* var. *tetrasperma* – F; > *V. tetrasperma* var. *tenuissima* Druce – F]

* ***Vicia villosa*** Roth ***ssp. varia*** (Host) Corbière, Winter Vetch. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas; common, introduced from Europe. May-September. [= I, K, SE; = *V. dasycarpa* Tenore – RAB, C, F, G, W]
* ***Vicia villosa*** Roth ***ssp. villosa***, Hairy Vetch, Fodder Vetch. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): disturbed areas; common, introduced from Europe. May-September. [= I, K, SE; = *V. villosa* – RAB, C, F, G, W]

* *Vicia articulata* Hornemann, Monantha Vetch. Probably only cultivated. [=I, K, SE]
* *Vicia faba* Linnaeus, Horse Bean, Faba Bean, Broad Bean. Introduced in se. PA (Rhoads & Klein 1993). Also reported for VA (Kartesz 1999). {investigate} [= C, F, G, I, K, SE]
Vicia ludoviciana Nuttall ssp. *ludoviciana*, Louisiana Vetch. AL and FL west to OR and CA. [= K]
* *Vicia narbonensis* Linnaeus, Narbonne Vetch. Introduced in MD and DC (Fernald 1950). [= C, F, G, I, K, SE]
* *Vicia sepium* Linnaeus, Bush Vetch, Wild Tare. Introduced south to WV and in e. PA (Rhoads & Klein 1993). [= C, G, I, SE; > *L. sepium* var. *sepium* – F, K]

Vigna Savi (Cow Pea)

A genus of about 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. Cp (GA, NC, SC): edges of freshwater tidal marshes, beaches, disturbed areas, railroad embankments, low fields, in the outer Coastal Plain; rare (GA Special Concern). July-September; August-October. Se. NC south to FL, west to se. TX, and in the New World tropics. Often weedy in appearance, and its nativity in our area perhaps uncertain. [= 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. Cp, Pd (GA, NC, SC, VA): commonly cultivated in commercial and home gardens, rarely persistent or occurring as a waif, introduced from tropical Africa or Asia. June-August; July-September. [= RAB, I, K; *? V. sinensis* (Linnaeus) Savi – F, S; > *V. unguiculata* var. *unguiculata* – Z]

Wisteria Nuttall (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). 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.

1 Legume and ovary glabrous; pedicels 5-10 (-15) mm long; standard reflexed near the middle; seeds reniform; [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; [introduced species, naturalized in a wide variety of situations].
  2 Vine twining counter-clockwise (sinistrorse; from lower right ascending to upper left); leaflets 11-19 per leaf; racemes 2-5 (-7) dm long, the 50-170 flowers opening successively from base to tip of the inflorescence; corolla 1.5-2.0 cm long ..... ***W. floribunda***
  2 Vine twining clockwise (dextrorse; from lower left ascending to upper right); leaflets 7-13 per leaf; racemes 1-2 (-3.5) dm long, the 25-95 flowers opening nearly simultaneously; corolla 2.0-2.5 (-2.7) cm long..... ***W. sinensis***

  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..... ***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.
    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) Augustin de Candolle, Japanese Wisteria. Cp, Pd, Mt (GA, NC, SC, VA): commonly cultivated, sometimes escaped to urban, suburban, and rural forests and woodlands, introduced from Japan. April-July; July-November. [= RAB, C, F, G, I, K, SE, Z; = *Kraunhia floribunda* (Willdenow) Taubert – S; = *Rehsonia floribunda* (Willdenow) Stritch – Y]

* ***Wisteria ×formosa*** Rehder, Hybrid Asian Wisteria. Cp, Pd, Mt (GA, NC, SC, VA): commonly cultivated, sometimes escaped to urban, suburban, and rural forests and woodlands, introduced from Japan. April-July; July-November. [= *Rehsonia ×formosa* (Rehder) Stritch – Y]

Wisteria frutescens (Linnaeus) Poiret, American Wisteria, Swamp Wisteria, Atlantic Wisteria. Cp (GA, NC, SC, VA), Pd (GA, NC), Mt (GA, VA): swamp forests, wet thickets; common. April-May; June-September. E. VA south to 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; > *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) Augustin de Candolle, Chinese Wisteria. Cp, Pd (GA, NC, VA), Mt (GA): commonly cultivated, commonly escaped to urban, suburban, and rural forests and woodlands, introduced from China. April-July; July-November. [= RAB, C, F, I, K, SE; = *Rehsonia sinensis* (Sims) Stritch – Y]

Zornia J. F. Gmelin (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. Cp (GA, NC, SC, VA): sandy roadsides, woodlands, and sandhills; common. June-August; July-October. Se. VA south to FL, west to TX and e. Mexico, endemic to the Southeastern Coastal Plain. [= RAB, C, F, G, K, S, SE]

FAGACEAE Dumortier 1829 (Beech Family)

A family of about 8 genera and 620-1050 species, trees and shrubs, mostly of the Northern Hemisphere, but extending into se. 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.

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).
  2 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]***
  2 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***
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.
  3 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 ..... ***C. dentata***
  3 Undersurface of leaves persistently and densely tomentose beneath; leaves mostly < 15 cm long, generally short-acuminate; twigs puberulent ..... ***C. mollissima***

Castanea dentata (Marshall) Borkhausen, American Chestnut. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp (GA, VA): mesic and xeric forests; common (uncommon in Piedmont, rare in Coastal Plain). June-July; September-October. 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. [= RAB, C, F, FNA, G, K, S, W, Z]

* ***Castanea mollissima*** Blume, Chinese Chestnut. Pd, Mt (NC): forests; rare, introduced and naturalized from 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]

Castanea pumila (Linnaeus) P. Miller, Common Chinquapin. Cp, Pd, Mt (GA, NC, SC, VA): xeric forests and woodlands, generally in fire-maintained habitats; uncommon. May-July; September-October. NJ, s. PA, s. OH, n. KY, and s. MO, south to c. FL and se. TX. It is relatively resistant to chestnut blight. [= FNA; = *C. pumila* var. *pumila* – C, K, Z (in a broad sense, in relation to var. *ozarkensis*); > *C. pumila* var. *pumila* – RAB, F (in a narrow sense); > *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 ×*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). [= K, Z] {not keyed}

Castanea ozarkensis W.W. Ashe, Ozark Chinquapin, is mainly distributed in the Ozarks and Ouachitas of AR, MO, and OK, but also occurs (at least formerly) as a disjunct in nc. AL. It is affected by the chestnut blight. Related to *C. pumila*, though showing some relation as well to *C. dentata*, is *C. ozarkensis* Ashe [sometimes treated as *C. pumila* var. *ozarkensis* (Ashe) Tucker]. *C. ozarkensis* is more susceptible to blight, and occurs in s. MO, e. OK, and w. AR, and disjunct in c. AL, where now apparently extirpated by blight. [= FNA, S; = *C. pumila* P. Miller var. *ozarkensis* (W.W. Ashe) G.E. Tucker – K, Z]

* *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 keyed at this time; 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. Cp, Pd, Mt (GA, NC, SC, VA): moist forests, from near sea level to low elevations in the Mountains, mostly below 1050 meters (3500 feet); common (uncommon in Coastal Plain south of VA). March-April; 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, 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. Mt (NC, VA): moderate to high elevation forests, especially on high elevation ridges, gaps, and open slopes, often forming clonal dwarfed thickets in the most exposed situations; common. April; September-October. Nova Scotia, New Brunswick, and s. Québec west to s. Ontario 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, 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]

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 *Qu. 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. Twenty-one of our *Quercus* species are in this group: *Qu. arkansana, Qu. coccinea, Qu. elliottii, Qu. falcata, Qu. georgiana, Qu. hemisphaerica, Qu. ilicifolia, Qu. imbricaria, Qu. incana, Qu. laevis, Qu. laurifolia, Qu. marilandica* var. *marilandica, Qu. myrtifolia, Qu. nigra, Qu. pagoda, Qu. palustris, Qu. phellos, Qu. rubra* var. *ambigua, Qu. rubra* var. *rubra, Qu. shumardii var. shumardii,* and *Qu. velutina*.

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: *Qu. alba*, *Qu. austrina*, *Qu. bicolor*, *Qu. boyntonii, Qu. chapmanii, Qu. geminata*, *Qu. lyrata*, *Qu. macrocarpa, Qu. margaretta*, *Qu. michauxii*, *Qu. minima, Qu. montana*, *Qu. muehlenbergii*, *Qu. oglethorpensis*, *Qu. prinoides*, *Qu. robur, Qu. similis, Qu. sinuata* var. *sinuata*, *Qu. stellata*, and *Qu. 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).

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 *Qu. stellata*, *Qu. marilandica* var. *marilandica*, *Qu. ilicifolia*, and *Qu. 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, *Qu. stellata* and *Qu. 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: *Qu. arkansana, Qu. chapmanii, Qu. geminata, Qu. hemisphaerica, Qu. incana, Qu. laevis, Qu, margerettiae, Qu. marilandica* var. *marilandica, Qu. minima, Qu. myrtifolia, Qu. stellata*, and less typically *Qu. falcata, Qu. nigra, Qu. velutina,* and *Qu. 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:
Qu. margaretta – Often forms dense clonal, stoloniferous patches in frequent fire conditions. Tends to retain standard leaf characteristics.
Qu. stellata – Less prone to formal clonal patches. Sprout leaves often very large, with exaggerated lobing.

Red oaks normally with deeply lobed leaves:
Qu. 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.
Qu. 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 *Qu. marilandica* var. *marilandica* and *Qu. velutina*. See pubescence differences in main key.

Qu. velutina – Not clonal. Leaves variable, sometimes minimally lobed and closely resembling *Qu. marilandica* var. *marilandica* and *Qu. falcata*. See pubescence differences in main key.

Red oaks normally with unlobed leaves:
Qu. 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.
Qu. 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 *Qu. hemisphaerica*).
Qu. 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 *Qu. elliottii*.
Qu. 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 *Qu. incana*, best separated by leaf pubescence (white in *Qu. elliottii*, gray in *Qu. incana*), margin (slightly revolute in *Qu. elliottii*, flat in *Qu. incana*), leaf vernation (planate in *Qu. incana*, rolled in *Qu. elliottii*), and acorn maturation (1 year in *Qu. elliottii*, with acorns often on small plants, 2 years in *Qu. incana*, with small plants rarely produing acorns).
Qu. 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:
Qu. geminata – Sometimes clonal. Leaves, even of sprouts, not normally with lobes or teeth.
Qu. virginiana – Sometimes clonal. Leaves of vigorous summer shoots (but apparently not spring shoots) often coarsely toothed, very similar to similar leaves of *Qu. hemisphaerica*, but lacking bristle tips (instead the translucent margin with a darker, thickened callus at the tip of the tooth).
Qu. minima – Always clonal. Leaves often with teeth or lobes.

Identification notes: 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 compound 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*].....***Qu. 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*].....***Qu. 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*].....***Qu. sinuata* var. *sinuata***
      4 Leaves bright green beneath; [section *Lobatae*].

5 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]***Qu. myrtifolia***

5 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.

6 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]..... ..... ***Qu. arkansana***

6 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]..... ***Qu. nigra***

1 Leaves linear, elliptic, or narrowly obovate, 2-10× as long as wide.

7 Leaves (at maturity) glabrous or at most sparsely pubescent on the surface below, though often with tufts of hairs in the main vein axils.

8 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*]..... ***Qu. chapmanii***

8 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 *Qu. hemisphaerica*]; [section *Lobatae*].

9 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]..... ***Qu. phellos***

9 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].

10 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]..... ***Qu. hemisphaerica***

10 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]... ..... ***Qu. laurifolia***

7 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.

11 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*].

12 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]..... ***Qu. imbricaria***

12 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].

13 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]..... ***Qu. incana***

13 Leaves 0.5-1.5 cm wide, mostly 4-8× as long as wide, lustrous dark-green above; acorns 8-12 mm long; petioles1-3 mm long; [plant a stoloniferous shrub, to 1 m tall (or to 2 m in fire-suppressed pinelands)].... ..... ***Qu. elliottii***

11 Leaves not bristle-tipped, evergreen (overwintering, falling with the expansion of new leaves in the spring) or deciduous (in *Qu. 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 *Qu. oglethorpensis*); acorns maturing in 1 year (immature acorns not present through the winter, unless aborted); [section *Quercus*].

14 Leaves deciduous in autumn; bark gray, resembling *Qu. alba*; [trees of bottomlands and upland clay flats of GA and SC] ..... ***Qu. oglethorpensis***

14 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].

15 Plant a stoloniferous shrub, to 1 m tall (or to 2 m in fire-suppressed pinelands) ..... ***Qu. minima***

15 Plant a small to large tree.

16 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); 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 sandhills near the coast] ..... ***Qu. geminata***

16 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); 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] ..... ***Qu. 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*] ..... ***Qu. 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 ..... ***Qu. 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 ..... ***Qu. michauxii***

4 Hairs of the leaf undersurface in clusters with a diameter of 0.1-0.25 mm, sparse; bark of mature trees dark gray, tight, deeply furrowed ..... ***Qu. 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 6-16 rays; 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 ..... ***Qu. muehlenbergii***

5 Stoloniferous shrub to 5 m tall; veins ending in teeth usually 3-7 on each side of the leaf; leaves 4-10 cm long and 2-6 cm wide ..... ***Qu. 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 ..... ***Qu. 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 ..... ***Qu. 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] ..... ***[Qu. 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 ..... ***Qu. 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 ..... ***Qu. 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 ..... ***Qu. 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]..... ***Qu. 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] ..... ***Qu. 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 ..... ***Qu. 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]..... ***Qu. margaretta***

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 (Qu. stellata) or 3-10 (-15) mm long (*Qu. boyntonii* and *Qu. similis*); leaf blades (5-) 7.5-15 (-20) cm long, usually 5-lobed, the overall form of the leaf typically cruciform (*Qu. stellata*) or not (*Qu. boyntonii* and *Qu. 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 (*Qu. stellata*) or not sublobed, tapering from base to tip (*Qu. boyntonii* and *Qu. 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] ..... ***Qu. 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 (*Qu. similis*) or localized on sandstone in nc. AL (*Qu. boyntonii*)].

12 Rhizomatous shrubs to small trees, generally < 2 m tall; [of sandstone outcrops in nc. AL] ..... ***[Qu. boyntonii]***

12 Single-trunked large trees; [usually of temporarily flooded calcareous swamps of the Coastal Plain, from SC (NC?) southward in our area]..... ***Qu. 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 *Qu. 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] ..... ***Qu. 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]..... ***Qu.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..... .....***Qu. 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 ..... ***Qu. falcata***

1 Leaves shallowly to deeply 5-12-lobed (some of the leaves of *Qu. 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] .....***Qu. 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..... ***Qu. 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..... ***Qu. 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) ..... ***Qu. 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..... ***Qu. pagoda***

4 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 ..... ***Qu. 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..... ***Qu. 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 1/4 of the way to the midrib; bark of mature trees dark gray to black; [widespread in our area, at low to medium elevations] ....***Qu. 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]..... .....***Qu. 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)..... ***Qu. georgiana***

14 Larger lateral lobes of most leaves with 2 or more bristles.

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 1/4 of the acorn ..... ***Qu. 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 5-11 lobes; acorns (12-) 15-25 (-37) mm long; acorn cup nearly flat, turbinate, or rounded, covering 1/4 to 1/2 of the acorn.

16 Acorn cup turbinate, covering about 1/2 of the acorn; acorn (12-) 15-20 mm long, with 1-3 concentric grooves near the tip; upper surface of leaves bright green ..... ***Qu. coccinea***

16 Acorn cup nearly flat at base, covering about 1/4 to 1/3 of the acorn; acorn 15-37 mm long, lacking concentric grooves near the tip; upper surface of leaves dark green ....***Qu. shumardii*** *var.* ***shumardii***

* ***Quercus acutissima*** Carruthers, Sawtooth Oak. Pd (NC, VA): commonly cultivated as a suburban street tree and also widely planted in "wildlife food plots"; commonly cultivated, rarely (at this time) persistent and spreading, introduced from 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. [= K; *? Qu. acutissima* ssp. *acutissima*]

Quercus alba Linnaeus, White Oak. Pd, Mt, Cp (GA, NC, SC, VA): mesic to xeric forests; common. April; September-November (of the same year). Widespread in e. North America. Historically, one of the most valuable timber trees of eastern North America. *Qu. 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 *Qu. alba* and many other species of *Quercus* subgenus *Quercus*. [= RAB, C, F, FNA, G, K, W; < *Qu. alba* – S (also see *Qu. austrina*)]

Quercus arkansana Sargent, Arkansas Oak. Cp (GA): dry bluffs; rare (GA Special Concern). Sw. and wc. GA west in a fragmented distribution to sw. AR and e. TX. [= FNA, K, S; > *Q. caput-rivuli* W.W. Ashe]

Quercus austrina Small, Bluff Oak. Cp (GA, NC, SC), Pd (NC): river bluffs, natural levees of brownwater rivers, over mafic rocks in the Piedmont of NC, on shell or calcareous sediments on the Coastal Plain of SC (Charleston and Beuafort counties); rare (GA Special Concern, NC Rare). 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; < *Qu. alba* – S (apparently)]

Quercus bicolor Willdenow, Swamp White Oak. Mt (VA), Pd (NC, SC, VA), Cp (NC, VA): upland depression swamp forests over mafic rocks such as gabbro or diabase, bottomland swamps with calcareous sediments; uncommon (rare south of VA) (NC Watch List, SC Rare). 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 chapmanii Sargent, Chapman Oak. Cp (GA, SC): dry pinelands; rare (GA Special Concern). February-March; September-November (of the same year). A Southeastern Coastal Plain endemic: se. SC south to FL, west to sw. AL. [= RAB, FNA, K, S]

Quercus coccinea Muenchhausen, Scarlet Oak. Mt, Pd, Cp (GA, NC, SC, VA): xeric upland forests; common (uncommon in Coastal Plain south of VA). 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; > *Qu. coccinea* var. *coccinea* – K; > *Qu. coccinea* var. *tuberculata* Sargent – K]

Quercus elliottii Wilbur, Running Oak. Cp (GA, NC, SC): pine flatwoods, especially on loamy soils in the Middle Coastal Plain; uncommon. March-April; September (of the first year). A Southeastern Coastal Plain endemic: se. NC south to s. FL and west to s. MS. Wilbur (2002) discusses the reasons for rejecting the traditional use of *Qu. pumila* for this species; Walter's diagnosis states that *Qu. pumila* has leaves that are glabrous and glaucous below, ruling out application to this species. [= *Q. pumila* Walter – RAB, FNA, K, S, Z, apparently misapplied]

Quercus falcata Michaux, Spanish Oak, Southern Red Oak. Cp, Pd, Mt (GA, NC, SC, VA): upland forests, usually xeric; common (uncommon in Mountains). 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. "*Qu. 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; = *Qu. falcata* var. *falcata* – RAB, G, GW; > *Qu. falcata* var. *falcata* – F; > *Qu. falcata* var. *triloba* (Michaux) Nuttall – F (the juvenile form); = *Qu. rubra* – S, misapplied; *? Qu. digitata* Sudworth; > *Qu. triloba* Michaux]

Quercus geminata Small, Sand Live Oak. Cp (GA, NC, SC): xeric sandhills near the coast; uncommon (VA Watch List). April; September-November (of the same year). A Southeastern Coastal Plain endemic: se. NC south to FL (where common) and west to s. MS. The alleged occurrence of *Qu. geminata* as far north as se. VA is apparently based on ambiguous specimens that probably are only *Qu. virginiana* (the so-called var. *maritima*). The relative ranges, habitats, and abundance of this species and *Qu. virginiana* in NC are poorly understood. Apparently flowering about 2-3 weeks later than *Qu. virginiana* when growing in close proximity and in similar habitats. [= C, FNA, GW, K, S; < *Qu. virginiana* – RAB; *? Qu. virginiana* var. *maritima* (Michaux) Sargent – F, misapplied]

Quercus georgiana M.A. Curtis, Georgia Oak. Pd (GA, SC): dry slopes and bluffs over granite; rare (SC Rare). 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. Cp (GA, NC, SC, VA): sandhills and other dry, sandy soils, an abundant component of maritime forests with *Qu. virginiana*, and widely planted as a street tree in most parts of our region; common (VA Rare). 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 *Qu. laurifolia* (see the key for distinctions). *Qu. hemisphaerica* is the semi-evergreen laurel oak planted widely as a street tree in southern cities, often intermixed with the strictly deciduous *Qu. phellos*. [= C, F, FNA, Z; < *Qu. laurifolia* – RAB; = *Qu. laurifolia* – S, misapplied; > *Qu. hemisphaerica* var. *hemisphaerica* – K; > *Qu. hemisphaerica* var. *maritima* (Michaux) Muller – K]

Quercus ilicifolia Wangenheim, Bear Oak, Scrub Oak. Mt (VA), Pd (NC, VA): xeric soils in ridges in the Mountains and monadnocks in the upper Piedmont; common (rare in Piedmont and south of VA) (NC Rare). Late April-June; August (of the second year). Primarily Appalachian: s. ME south to w. VA, w. NC, and e. KY. This scrubby oak is limited in NC to dry summits and upper slopes of Piedmont monadnocks; it 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]

Quercus imbricaria Michaux, Shingle Oak. Mt, Pd (NC, VA), Cp (VA): 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; uncommon (GA Special Concern). 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, Z]

Quercus incana Bartram, Bluejack Oak. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): sandhills, primarily in somewhat loamier textured, submesic soils; common (rare in Piedmont) (VA Rare). 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; = ***Qu. cinerea*** Michaux – C, G, S; *? **Qu. humilis*** Walter]

Quercus laevis Walter, Turkey Oak. Cp (GA, NC, SC, VA): sandhills, primarily in very xeric soils of deep sandy deposits (Carolina bay rims, old beach dunes, early Cenozoic deposits of the Sandhills Province); common (VA Rare). 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, Z; = ***Qu. catesbaei*** Michaux]

Quercus laurifolia Michaux, Laurel Oak. Cp (GA, NC, SC, VA): mesic to seasonally flooded soils of floodplains, also (rarely) mesic slopes and swamps in maritime forests; common. 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 ***Qu. hemispherica***, but (in addition to the key characters above) ***Qu. laurifolia*** has blunter leaf tips, flowers about 2 weeks earlier, and generally occupies much moister habitats. [= C, F, FNA, G, GW, K, Z; < ***Qu. laurifolia*** – RAB (also see ***Qu. hemisphaerica***); = ***Qu. obtusa*** (Willdenow) Ashe – S]

Quercus lyrata Walter, Overcup Oak. Cp, Pd (GA, NC, SC, VA), Mt (GA): common in 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; common (rare in Piedmont and Mountains). March-April; September-October (of the same year). Primarily a species of the Southeastern Coastal Plain: DE south to nw. 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, ***Qu. lyrata*** tolerates the wettest habitats, both in terms of depth and duration of flooding. [= RAB, C, F, FNA, G, GW, K, S]

Quercus macrocarpa Michaux *var. **macrocarpa***, Bur Oak, Mossycup Oak. Mt (VA): bottomland forests; rare (VA Rare). New Brunswick and Québec west to s. Manitoba, south to nw. VA, KY, TN, LA, and TX. Variation in this species needs additional study; ***Qu. macrocarpa*** in our area is the typic variety or subspecies if other taxa are recognized. [= K; < ***Qu. macrocarpa*** – C, F, FNA, G, GW, S, W]

Quercus margaretta Ashe ex Small, Sand Post Oak. Cp (GA, NC, SC, VA), Pd (GA): sandhills, typically in slightly loamy or clayey soils, not usual in the deepest and most xeric sands; common (VA Watch List). 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 F, 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. Some nomenclaturists believe that the original spelling, "*margaretta*" should be treated as a correctable error, according to Articles 73.10 and Recommendation 73C.1 of the International Code, and replaced with "*margarettiae*." [= RAB, C, FNA, G, S; = ***Qu. margarettiae*** Ashe ex Small – K, orthographic variant; = ***Qu. stellata*** var. *margaretta* (Ashe ex Small) Sargent – F]

Quercus marilandica Muenchhausen *var. **marilandica***, Blackjack Oak. Pd, Cp, Mt (GA, NC, SC, VA): uplands forests and woodlands, usually on periodically droughty soils, as over shrink-swell clays, sandstones, deep sands, and sands with clay lenses; common (uncommon in Mountains). 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 [= ***Qu. 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; < ***Qu. marilandica*** – RAB, C, F, G, S, W]

Quercus michauxii Nuttall, Basket Oak, Swamp Chestnut Oak. Cp, Pd (GA, NC, SC, VA), Mt (GA): bottomland forests, especially in fertile soils of upper terraces where flooded only infrequently and for short periods; common (uncommon in Piedmont). April; September-October (of the same year). NJ south to n. FL and west to e. TX and se. OK, north in the interior to s. IL and s. IN. See discussion under ***Qu. montana*** of the application of the name ***Qu. prinus*** Linnaeus. [= RAB, C, F, FNA, G, GW, K, W; = ***Qu. prinus*** Linnaeus – S, possibly misapplied]

Quercus minima (Sargent) Small, Dwarf Live Oak. Cp (GA, NC, SC): pine flatwoods, coastal fringe sandhills; uncommon (NC Watch List). April; September-November (of the same year). A Southeastern Coastal Plain endemic: se. NC (New Hanover County) south to FL, west to s. MS. [= FNA, K, S]

Quercus montana Willdenow, Rock Chestnut Oak. Mt, Pd (GA, NC, SC, VA), Cp (GA, NC, VA): xeric forests of ridges, slopes; common. 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 "***Qu. prinus***" is controversial and unclear, having been debated and variously applied for well over a

century. I have here decided to err on the side of clarity. The name "*Qu. prinus*" has nomenclatural priority over either "*Qu. montana*" or "*Qu. michauxii*", but it is not clear which species was intended; Whittemore & Nixon (2005) have proposed its formal rejection. [= FNA, S, W; = *Qu. prinus* Linnaeus – RAB, C, F, G, K, probably misapplied]

Quercus muehlenbergii Engelmann, Yellow Oak, Chinquapin Oak. Mt, Pd (GA, NC, SC, VA), Cp (GA, SC, VA): slopes and bluffs, on soils derived from calcareous or mafic rocks; common in VA Mountains (rare elsewhere) (NC Watch List). April; October-November (of the same year). S. New England and Ontario west to WI, se. MN, and IA, south to nw. FL, TX, and n. Mexico. The similar *Qu. montana* sometimes has a few leaves with somewhat sharply lobed leaves, but these are minutely mucronate and lack the well-developed callus of *Qu. muehlenbergii*. Additionally, *Qu. muehlenbergii* has a flaky, light gray bark, very different from the dark gray, deeply furrowed bark of *Qu. montana*. [= RAB, C, F, K; = *Qu. muhlenbergii* – FNA, S, W, orthographic variant; = *Qu. prinoides* Willdenow var. *acuminata* (Michaux) Gleason – G]

Quercus myrtifolia Willdenow, Myrtle Oak. Cp (GA, SC): dry pinelands; rare (SC Rare). February-March; September (of the second year). A Southeastern Coastal Plain endemic: se. SC south to s. peninsular FL, west to se. MS. [= RAB, FNA, K, S, Z]

Quercus nigra Linnaeus, Water Oak, Paddle Oak. Cp, Pd (GA, NC, SC, VA), Mt (GA): bottomland forests, especially on levees or second terraces where flooded infrequently and for short periods, less commonly on mesic slopes; common (uncommon in Piedmont). 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, Z; > *Qu. nigra* var. *nigra* – F; > *Qu. nigra* var. *heterophylla* (Aiton) Ashe – F: = *Qu. aquatica* Walter]

Quercus oglethorpensis Duncan, Oglethorpe Oak. Pd (GA, SC): bottomland forests, upland oak flats over clays (Iredell and Enon soils); rare (GA Threatened, SC Rare). April; September-October (of the same year). Ranging (in a widely scattered pattern) 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. Cp, Pd (GA, NC, SC, VA): bottomland forests, especially on second terraces; common (rare in Piedmont). 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; = *Qu. falcata* var. *pagodifolia* Elliott – RAB, F, G, GW]

Quercus palustris Muenchhausen, Pin Oak. Pd (NC, VA), Cp (VA), Mt (GA, VA): 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; uncommon (rare south of VA) (GA Special Concern, NC Watch List). 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]

Quercus phellos Linnaeus, Willow Oak. Cp, Pd (GA, NC, SC, VA), Mt (GA): 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; common (uncommon in Piedmont). 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. Pd, Mt (GA, NC, VA), Cp (VA): xeric uplands, especially on clay soils derived from mafic rocks, and probably in sites which naturally burned rather frequently; rare (GA Special Concern, NC Rare, VA Rare). 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; > *Qu. prinoides* var. *prinoides* – F; > *Qu. prinoides* var. *rufescens* Rehder – F; = *Qu. prinoides* var. *prinoides* – G]

Quercus rubra Linnaeus *var. **ambigua*** (A. Gray) Fernald, Gray Oak. Mt (NC, SC, VA), Pd (VA): forests on ridges, slopes, and coves, mostly at over 1000 meters elevation; common. 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; = *Qu. rubra* var. *borealis* (Michaux f.) Farwell – RAB, F, FNA; < *Qu. rubra* – C, W; = *Qu. borealis* Michaux f. var. *borealis* – G; = *Qu. borealis* – S]

Quercus rubra Linnaeus *var. **rubra***, Red Oak. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): moist to fairly dry forests of slopes, coves, and ravines, below 1000 meters elevation; common (rare in Coastal Plain). 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; < *Qu. rubra* – C, W; = *Qu. borealis* Michaux f. var. *maxima* (Marshall) Ashe – G; = *Qu. maxima* (Marshall) Ashe – S]

Quercus shumardii Buckley *var. **shumardii***, Shumard Oak. Pd, Cp, Mt (GA, NC, SC, VA): moist and fertile soils of bottomlands and lower slopes, also in xeric sites over calcareous rocks (such as limestone); uncommon (rare in Coastal Plain and Mountains). April; September-October (of the second year). Sc. PA, OH, s. MI, IN, s. IL, MO, and e. KS south to FL and TX. A number of varieties have been recognized in *Qu. 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 *Qu. shumardii*, but they plan additional studies. *Qu. acerifolia* (E.J. Palmer) Stoynoff & W.J. Hess (*Qu. 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). [= F, FNA, G, K; < *Qu. shumardii* – RAB, C, S, W]

Quercus similis Ashe, Swamp Post Oak, Delta Oak. Cp (GA?, NC?, SC): calcareous stream flats; rare. *Qu. similis* resembles *Qu. stellata*, differing in its less definitely cross-shaped leaves and its distinctly wetland habitat. [= FNA, K; = *Qu. stellata* Wangenheim var. *paludosa* Sargent; = *Qu. ashei* Sterret]

Quercus sinuata Walter *var. **sinuata***, Bastard Oak. Cp (GA, SC): alluvial and slope forests; rare (GA Special Concern, SC Rare). April-May; September-November (of the same year). Se. SC west to TX. [= FNA, K; > *Qu. durandii* Buckley – RAB, S]

Quercus stellata Wangenheim, Post Oak. Pd, Cp, Mt (GA, NC, SC, VA): upland forests and woodlands, especially in clay or rocky soils and in fire communities; common (uncommon in Mountains). April; September-November (of the same year). Se. MA, s. NY, s. PA, s. OH, s. IN, s. IA, and e. KS south to 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 *Qu. margaretta* from *Qu. stellata*. See *Qu. similis*. [= RAB, C, FNA, G, K, S, W; = *Qu. stellata* var. *stellata* – F; = *Qu. villosa* Walter]

Quercus velutina Lamarck, Black Oak. Mt, Pd, Cp (GA, NC, SC, VA): upland forests and woodlands, especially in fairly xeric and sandy soils; common. April; September-October (of the second year). Widespread in e. North America. [= RAB, C, F, FNA, G, K, S, W]

Quercus virginiana P. Miller, Live Oak. Cp (GA, NC, SC, VA): 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 *Qu. geminata*, also planted (especially in the outer Coastal Plain); uncommon (VA Watch List). April; September-November (of the same year). A Southeastern Coastal Plain endemic: se. VA south to FL and west to TX. *Qu. fusiformis* Small of TX has sometimes been treated as a variety of *Qu. virginiana*, but is best separated as a species. Flowering before *Qu. geminata* when growing together. [= C, FNA, GW, K, S; < *Qu. virginiana* – RAB, G (also see *Qu. geminata*); < *Qu. virginiana* var. *virginiana* – F; *Qu. sempervirens* Walter]

Quercus boyntonii Beadle, Boynton Oak. Dry forests. Ne. AL and (possibly) TX. [= FNA, K, S; *Q. stellata* Wangenheim var. *boyntonii* (Beadle) Sargent]

* *Quercus robur* Linnaeus, English Oak, is cultivated in our area and sometimes persists or escapes in ne. United States, south at least to s. PA (Rhoads & Klein 1993). [= FNA, K]

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; = *Qu. nuttallii* E.J. Palmer – F, GW; = *Qu. shumardii* Buckley var. *texana* (Buckley) W.W. Ashe] {not keyed at this time}

FUMARIACEAE Augustin de Candolle 1821 (Fumitory Family)

This family includes 15-20 genera and 500-600 species, herbs, mostly north temperate. The Fumariaceae should likely be merged into the Papaveraceae (Lidén 1981, 1986; Lidén et al. 1997; Judd, Sanders, & Donoghue 1994). References: 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 Caulescent herbaceous vine (acaulescent in its first year, and appearing to be an herb); ultimate leaf segments 5-10 mm wide ..... ***Adlumia***
- 2 Acaulescent herb with basal leaves; ultimate leaf segments 1-4 mm wide.
  - 3 Leaves basal only ..... ***Dicentra***
  - 3 Leaves cauline and basal ..... ***[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 Augustin 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. Mt (NC, VA): cliffs, talus, rocky slopes, rich stream-bottom forests, cool rocky forests; rare (NC Rare, VA Watch List). June-September. Québec west to WI and MN, south to DE, 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. Mt (GA, NC, SC, VA), Pd (NC, VA): rock outcrops, especially granitic exfoliation domes, but also quartzite, greenstone, and sandstone; uncommon (rare in NC and VA Piedmont) (GA Special Concern). April-June; May-July. Newfoundland west to AK, south to NJ, PA, in and near the mountains to ne. GA, n. OH, n. IN, MN, MT, and British Columbia. [= S; = *Corydalis sempervirens* (Linnaeus) Persoon – RAB, C, F, FNA, G, K, W, Z]

Corydalis Augustin de Candolle 1805 (Corydalis)
(also see *Capnoides*)

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).

1 Flowers pink, the petals tipped with yellow; biennial; stem erect, 3-8 (-10) dm tall; capsules erect, 25-35 mm long ..... ***[Capnoides]***

1 Flowers yellow; annual; stem erect, decumbent, or prostrate, 1-3 (-4) dm tall; capsules erect, ascending, divergent, or pendent, 10-20 (-25) mm long.

2 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***

2 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.

3 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***

3 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 flavula (Rafinesque) Augustin de Candolle, Short-spurred Corydalis. Pd, Mt, Cp (GA, NC, SC, VA): rich moist forests, especially alluvial forests, glades and outcrops over mafic rocks (such as greenstone); common (rare in NC and SC Coastal Plain) (GA Special Concern). March-April; May-June. S. CT, NY, and s. Ontario west to SD, south to NC, AL, LA, and OK. [= RAB, C, F, FNA, G, K, W, Z; = *Capnoides flavulum* (Rafinesque) Kuntze – S]

Corydalis halei (Small) Fernald & Schubert, Southern Corydalis. Cp (GA, NC, SC): sandy roadsides and disturbed areas; uncommon. 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. Mt, Pd (NC): circumneutral rock outcrops and adjacent glades and woodlands; rare (NC Rare). April; June. Ssp. *micrantha* 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 ssp. *micrantha*; their association in the Brushy Mountains with other species disjunct from western or prairie ranges (*Anemone berlandieri, Arabis hirsuta, Pellaea wrightiana*) provides phytogeographic corroboration. [= F; = *Corydalis micrantha* (Engelmann ex A. Gray) A. Gray ssp. *micrantha* – FNA, K, Z; = *Corydalis micrantha* (Engelmann ex A. Gray) A. Gray var. *micrantha* – C; < *Corydalis micrantha* – G; = *Capnoides micranthum* (Engelmann ex A. Gray) Britton – S]

Corydalis aurea Willdenow, south and east to MD, WV (?), and PA (Kartesz 1999). [= G, K; = *Corydalis aurea* var. *aurea* – C, F; = *Corydalis aurea* ssp. *aurea* – FNA; = *Capnoides aureum* (Willdenow) Kuntze – S] {not keyed at this time}

Corydalis crystallina Engelmann, a species of the sc. United States, 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]

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 Leaves cauline and basal..... ***[see Lamprocapnos spectabilis]***
1 Leaves basal only.
  2 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.
    3 Reflexed portions of the outer sepals 4-8 mm long; [native and cultivated] .....***D. eximia***
    3 Reflexed portions of the outer sepals 2-5 mm long; [cultivated]..... ***[D. formosa ssp. formosa]***
  2 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.
    4 Spurs of the corolla rounded, incurved, 2-5 mm long; bulblets yellow, spherical.....***D. canadensis***
    4 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. Mt (GA, NC, VA), Pd, Cp (NC, VA): rich, moist forests, especially rich cove forests in the mountains; common (uncommon in VA Piedmont, rare in Coastal Plain, rare or extirpated in NC Piedmont) (GA Special Concern). 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; = *Bicuculla canadensis* (Goldie) Millspaugh – S]

Dicentra cucullaria (Linnaeus) Bernhardi, Dutchman's Britches. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (NC): rich, moist forests, especially rich cove forests in the mountains; common (rare in NC and SC Piedmont and NC Coastal Plain) (SC Rare). March-April; May-June. Nova Scotia west to n. MN, south to GA, AR, and KS; disjunct in WA, OR, and ID. [= RAB, C, F, FNA, G, K, W; = *Bicuculla cucullaria* (Linnaeus) Millspaugh – S]

Dicentra eximia (Ker-Gawler) Torrey, Wild Bleeding Heart. Mt (GA, NC, SC, VA), Pd (NC, VA): cliffs, talus slopes, rocky slopes, rock outcrops, shale slopes; common in VA mountains (rare elsewhere) (GA Special Concern, NC Rare, SC Rare). April-June; July-August. An Appalachian endemic: NY and NJ south to NC and TN. [= RAB, C, F, FNA, G, K, W; = *Bicuculla eximia* (Ker-Gawler) Millspaugh – S]

* *Dicentra formosa* (Haworth) Walpers ssp. *formosa*, native from s. British Columbia south to c. CA, is frequently cultivated and resembles our native *D. eximia*. It has the reflexed portion of the outer petals 2-4 mm long. A variety of cultivars, some apparently derived from hybrids between the 2 species, make identification uncertain in some cases. [= FNA]

Fumaria Linnae 1753 (Fumitory)

A genus of about 50 species, annual herbs, primarily Eurasian. References: Boufford in FNA (1997); Lidén in Kubitzki, Rohwer, & Bittrich (1993).

* ***Fumaria officinalis*** Linnaeus, Fumitory, Earthsmoke. Cp (GA, NC, SC, VA), Pd (NC, SC, VA), Mt (VA): sandy fields, disturbed places, escaped from gardens; rare, introduced from Europe. March-May. [= RAB, C, F, FNA, G, K, S; > *F. officinalis* ssp. *officinalis* – K; > *F. officinalis* ssp. *wirtgenii* (W.D.J. Koch) Arcangeli – K]

Lamprocapnos Endlicher (Asian Bleeding Heart)

A monotypic genus, a perennial herb of e. Asia. References: Lidén et al. (1997).

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. [= K; *Dicentra spectabilis* (Linnaeus) Lem.]

GARRYACEAE Lindley 1834 (Garrya Family)

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, introduced from Japan and se. Asia. The most frequently planted cultivars have the dark green leaves prominently speckled with yellow. [= K]

GELSEMIACEAE (G. Don) Struwe & V. Albert 1995 (Jessamine Family)

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. Cp (GA, NC, SC): swamps of blackwater rivers, restricted in NC to the se. corner of the state, most notably the swamps of the Waccamaw and Black rivers; rare north of GA (NC Rare). 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, Z]

Gelsemium sempervirens St. Hilaire, Carolina Jessamine. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA): in a wide range of habitats, from swamp forests to dry uplands and thickets, also commonly planted as an ornamental; common. 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, Z]

GENTIANACEAE A.L. de Jussieu 1789 (Gentian Family)
(also see *MENYANTHACEAE*)

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).

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 anear 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: Gillett (1959)=Z.

1 Corolla lobes white, 5-10 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) mm long, ascending or erect, oblong to ovate or lance-ovate, acuminate or rounded-mucronate at the apex; flowering in summer or fall.
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. Cp (GA, NC, SC), Mt (GA, VA), Pd (SC, VA): swamps, bogs, pocosins, pocosin ecotones, sphagnous seepages, sinkhole ponds; rare (NC Watch List, VA Watch List). August-October. Ssp. *paniculata* ranges from MA south to 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 Newfoundland south to MA. These taxa have been variously treated (and ignored). Intermediates are alleged to occur in NC, MS, AL, and northward to MA (Gillett 1959, Wood & Weaver 1982). [= K, Z; < *B. paniculata* – RAB, GW; = *B. paniculata* – G; = *B. paniculata* var. *paniculata* – C, F; = *B. lanceolata* Small – S]

Bartonia verna (Michaux) Rafinesque ex Barton, Spring Bartonia, White Bartonia. Cp (GA, NC, SC, VA): wet pine savannas, shores of Coastal Plain depression ponds, other moist sands; uncommon (NC Watch List, VA Rare). February-April (-June). VA (1 site known from City of Virginia Beach) (Belden et al. 2004) and se. NC (Carteret County) south to s. FL, west to se. TX. Perhaps not truly congeneric with the other 2 species; Wood & Weaver (1982) commented that "the species [of *Bartonia*] can be divided into two remarkably distinct groups." [= RAB, GW, K, S, Z]

Bartonia virginica (Linnaeus) Britton, Sterns, & Poggenburg, Virginia Bartonia. Cp, Mt (GA, NC, SC, VA), Pd (NC, SC, VA): bogs, swamps, savannas, pocosin ecotones, pocosins; uncommon (rare in Mountains). July-October. Nova Scotia and Québec west to WI, south to n. FL and LA. [= RAB, C, F, G, GW, K, S, 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. Pd (NC, VA), Cp (VA), {GA}: lawns, disturbed areas; rare, introduced from 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. Cp (VA): disturbed areas; rare, introduced from Europe. June-September. [= C, F, G, K, S]

* ***Centaurium spicatum*** (Linnaeus) Fritsch, Spiked Centaury. Cp (VA): disturbed areas; rare, introduced from 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. Alkaline prairies, saline coastal areas. AL and FL west to TX, south to Mexico and Belize; West Indies. June-November. [= GW, S, 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 (NC Rare, SC Rare). Late May-June; September-October. W. NY, nw. PA, and s. Ontario 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; 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*] ..... ***G. autumnalis***
1 Flowers clustered; corolla not spotted within; leaves planar, mostly lanceolate, elliptic, or ovate (rarely linear); subgenus *Pneumonanthe*, series *Pneumonanthe*].
  2 Calyx lobes keeled, the keel decurrent on the calyx tube; corolla greenish-white or yellowish-white; leaves ovate to lanceolate, acuminate ..... ***G. alba***
  2 Calyx lobes not keeled; corolla white, greenish-white, or variously blue.
    3 Corolla greenish-white (sometimes somewhat purplish); seeds wingless; lower leaves spatulate to obovate..... ..... ***G. villosa***
    3 Corolla blue, purplish, pale blue, or nearly white; seeds winged; lower leaves linear, lanceolate, elliptic, or ovate.
      4 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***
      4 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).
        5 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]***
        5 Anthers connate at anthesis; outer surfaces of petals not suffused with green; calyx lobes various; corolla lobes usually shorter.
          6 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***
          6 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.
            7 Corollas open to loosely closed; involucral and upper leaves obtuse to acute (rarely acuminate); calyx lobes lanceolate.
              8 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***
              8 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***
            7 Corollas tightly closed; involucral and upper leaves acuminate; calyx lobes ovate-orbicular.
              9 Corolla lobes reduced to a minute mucro or triangular tooth, much exceeded by the corolla appendages ..... ***[G. andrewsii var. andrewsii]***
              9 Corolla lobes aboiut as long as the corolla appendages.
                10 Calyx tubes densely puberulent; stems puberulent; filaments 7-12 mm long; corolla lobes often triangular, about 1/2 as wide as the corolla appendages..... ..... ***G. austromontana***

10 Calyx tubes glabrous; stems glabrous; filaments 10-15 mm long; corolla lobes usually rounded, about as wide as the corolla appendages ..... ***G. clausa***

Gentiana alba Muhlenberg ex Nuttall, Pale Gentian. Mt (NC): habitat unknown (not collected in NC in this century); rare (NC Rare). August-October. Mainly distributed in midwestern United States, from MI west to MN, south to n. AR, *G. flavida* occurs as scattered disjunctions eastward to PA, OH, WV, KY, and w. NC. *G. alba* is 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, X, Y, Z; = *Gentiana flavida* A. Gray – C, F, G; = *Dasystephana flavida* (A. Gray) Britton – S; = *Pneumonanthe flavida* (A. Gray) Greene]

Gentiana austromontana Pringle & Sharp, Blue Ridge Gentian. Mt (NC, VA): high elevation forests and grassy balds; rare (NC Watch List, VA Watch List). September-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, W, X, Y, Z; < *G. clausa* Rafinesque – RAB, F, G, GW; < *Dasystephana decora* (Pollard) Small – S]

Gentiana autumnalis Linnaeus, Pinebarren Gentian. Cp (NC, SC, VA): savannas, pine flatwoods, sandhills, in a variety of sites varying from moist to very xeric, nearly always associated with *Pinus palustris* and *Aristida stricta*; uncommon, rare in VA (SC Rare, VA Rare). Late September-early 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, 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 occur in Mexico: *G. bicuspidata* (G. Don) Briq., *G. hooperi* Pringle, and *G. longicollis* Nesom. *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. Cp (GA, NC, SC, VA), Pd (VA): pocosins, moist savanna edges, edges of moist hardwood forests; common (rare in Piedmont). Late September-November. S. NJ south to n. FL, on the Coastal Plain. [= RAB, C, G, GW, K, 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. Mt, Pd (NC, VA): forests; uncommon. September-October. Mostly Appalachian: ME south to w. NC and ne. TN, extending east and west to adjacent physiographic provinces. [= C, K, W, X, Y, Z; < *G. clausa* – RAB, F, G, GW (also see *G. austromontana*); < *Dasystephana decora* (Pollard) Small – S; = *Pneumonanthe clausa* (Rafinesque) Greene]

Gentiana decora Pollard, Appalachian Gentian. Mt, Pd (GA, NC, SC, VA): forests; common (rare in Piedmont). 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, X, Y, Z; < *Dasystephana decora* (Pollard) Small – S; = *Pneumonanthe decora* (Pollard) Greene]

Gentiana linearis Frölich, Narrowleaf Gentian. Mt (VA): openings in spruce-fir forest near the summit of Whitetop Mountain, VA; rare (VA Rare). September-October. Mainly occurring in ne. United States and e. Canada, west to Lake Superior, and south (scattered) in the Appalachians to sw. VA 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, X, Y, Z; = *Pneumonanthe linearis* (Frölich) Greene]

Gentiana saponaria Linnaeus, Soapwort Gentian. Cp, Pd, Mt (GA, NC, SC, VA): bogs, marshes, wet hardwood forests, other moist to wet habitats; uncommon. Late September-November. NY west to n. IL, south to w. 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, X, Y, Z; > *G. saponaria* – F, G; > *G. cherokeensis* (W.P. Lemmon) Fernald – F, G; > *G. saponaria* var. *saponaria* – K; > *G. saponaria* var. *latidens* House – K; = *Dasystephana saponaria* (Linnaeus) Small – S; = *Pneumonanthe saponaria* (Linnaeus) F.W. Schmidt] {investigate varieties}

Gentiana villosa Linnaeus, Striped Gentian. Pd, Mt, Cp (GA, NC, SC, VA): upland forests, sandhill/pocosin ecotones; uncommon. Late August-November. Se. PA west to n. KY and w. TN, south to w. FL and e. LA. [= RAB, C, F, G, K, W, X, Y, Z; = *Dasystephana villosa* (Linnaeus) Small – S; = *Pneumonanthe villosa* (Linnaeus) F.W. Schmidt]

Gentiana andrewsii Grisebach var. *andrewsii*, a northern species, ranges south to s. MD and WV; 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 Manitoba and Saskatchewan south in the Great Plains to MO and IL. [= C, K, X, Y, Z; < *G. andrewsii* – F, G; < *Dasystephana andrewsii* (Grisebach) Small – S; = *Pneumonanthe andrewsii* (Grisebach) W.A. Weber var. *andrewsii*]

Gentiana puberulenta J. Pringle, Prairie Gentian, ranges from w. NY west to ND, south to WV, KY, sc. TN (Coffee County) (Chester, Wofford, & Kral 1997), LA, n. AR, and KS. [= C, K, X, Y, Z; = *G. puberula* – F, G, misapplied; = *Dasystephana puberula* (Michaux) Small – S, misapplied]

Gentianella Moench (Agueweed)

A genus of about 125 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. Mt (VA): calcareous barrens, dry and dry-mesic limestone woodlands; rare (VA Rare). Late August-October. Var. *occidentalis* A. Gray is more western, from OH and s. Ontario 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. Mt (GA, NC, SC, VA): forests, grassy balds; common. Late August-October. Var. *quinquefolia* is primarily Appalachian, from ME west to w. NY and s. Ontario, south to n. GA and sc. TN. [= C, G; < *Gentiana quinquefolia* Linnaeus – RAB, GW, W; = *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. Mt (GA, NC, VA): sunny or semi-shaded seepage areas over calcareous, mafic, or ultramafic rocks (such as limestone, amphibolite, or serpentinized olivine); rare (GA Threatened, NC Endangered, VA Rare). September-October. ME, s. Ontario, and ND south to NJ, 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; = *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. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): nutrient-rich, moist forests; common (rare in Coastal Plain south of VA). 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, Z]

Sabatia Adanson 1763 (Sabatia, Rose-gentian, 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; [very rare introduction from c. United States] ..... ***S. campestris***
8 Calyx tube not winged; corolla lobes pink or white; [native, primarily of the Coastal Plain, except *S. campanulata* which has disjunct occurrences in the Mountains].
9 Calyx lobes foliaceous, 5-8 mm wide, oblong to oblanceolate, mostly exceeding the corolla lobes..... ***S. calycina***
9 Calyx lobes linear-setaceous, 0.5-2 mm wide, if equaling the corolla lobes then very narrow and not foliaceous.
10 Calyx lobes (3-) 4-7 (-8) mm long; corolla lobes white; [of the Coastal Plain from se. SC southward]..... ***S. brevifolia***
10 Calyx lobes (4-) 6-17 (-23) mm long; corolla lobes pink (rarely white in individual plants); [of the Coastal Plain of GA, NC, SC, and VA, and rarely the Mountains of NC and VA].
11 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***
11 Plants annual, solitary; calyx lobes up to 3/4× as long as the corolla lobes; [of brackish marshes and interdune swales] ..... ***S. stellaris***
7 Upper branches of main stem opposite.
12 Corolla lobes pink (rarely white); pedicels at least in part > 5 mm long.
13 Lower half of stem winged; leaves ovate, clasping, < 2× as long as wide; [widespread in our area] ..... ***S. angularis***
13 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***
12 Corolla lobes white or creamy white; pedicels (above the uppermost bracts or branches) ca. 1-2 (-5) mm long.
14 Lower portion of stem quadrangular, narrowly winged; plants annual or biennial, with 1 (-several) stems arising from a taproot ..... ***S. quadrangula***
14 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*].
15 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***
15 Leaves and upper stem glaucous; stem terete throughout; corolla lobes (4-) 5-7 (-8) mm long; [of GA southward and westward].
16 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***
16 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. Cp, Pd, Mt (GA, NC, SC, VA): forests, woodlands, marshes, fields; common. 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, S, W, Z]

Sabatia bartramii Wilbur, Bartram's Rose-gentian. Cp (GA, SC): margins of *Taxodium ascendens-Nyssa* depressions, wet pine flatwoods; rare north of GA (SC Rare). June-August; August-October. Ne. SC south to s. FL, west to s. AL and se. MS. [= GW, K, Z; = *S. dodecandra* var. *coriacea* (Elliott) Ahles – RAB; = *S. decandra* (Walter) Harper – S]

Sabatia brachiata Elliott, Narrowleaf Rose-pink. Cp (GA, NC, SC, VA), Pd (GA, NC), Mt (GA): sandhills, pine savannas, pine flatwoods; uncommon (VA Watch List). 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, S, W, Z]

Sabatia brevifolia Rafinesque. Cp (GA, SC): pine savannas; rare north of GA. September-October; October-November. E. SC south to peninsular FL, west to s. AL. [= RAB, GW, K, Z; = *S. elliottii* Steudel – S]

Sabatia calycina (Lamarck) Heller, Coastal Rose-pink. Cp (GA, NC, SC, VA): swamp forests, river banks; common (VA Watch List). June-October; July-October. Se. VA south to peninsular FL, west to se. TX; e. Cuba and Hispaniola. [= RAB, C, F, GW, K, S, Z]

Sabatia campanulata (Linnaeus) Torrey, Slender Marsh-pink. Cp (GA, NC, SC, VA), Mt (GA, NC, VA): pine savannas, bogs; common (rare in Mountains) (VA Rare). June-August; September-October. MA south to n. FL, west to LA and AR; scattered inland as in w. VA, w. NC, c. TN, and KY. [= RAB, C, GW, K, S, W, Z; > *S. campanulata* var. *campanulata* – F; > *S. campanulata* var. *gracilis* (Michaux) Fernald – F]

* ***Sabatia campestris*** Nuttall, Western Marsh-pink, Prairie Rose-gentian, Prairie Sabatia. Mt (NC): roadsides and woodland edges; rare (NC Watch List), introduced from c. United States. July-August; September-October. [= RAB, C, F, GW, K, Z]

Sabatia capitata (Rafinesque) Blake, Cumberland Rose-gentian. Mt (GA, NC): sloping woodlands and meadows, over sandstone or shale; rare (GA Rare, NC Watch List). 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. Cp (GA, NC, SC, VA), Pd (NC, SC): pine savannas, bogs, pocosins; common (rare in Piedmont) (VA Rare). May-September; September-December. S. NJ south to peninsular FL, west to s. AL. [= RAB, C, F, GW, K, S, Z]

Sabatia dodecandra (Linnaeus) Britton, Sterns, & Poggenburg, Perennial Sea-pink, Large Marsh Rose-pink. Cp (GA, NC, SC, VA): tidal brackish and freshwater marshes; common (VA Watch List). June-August; August-October. CT south to e. SC and e. GA (Sorrie 1998b). [= F, S; < *S. dodecandra* var. *dodecandra* – RAB (also see *S. foliosa*); = *S. dodecandra* var. *dodecandra* – C, GW, K, Z]

Sabatia foliosa Fernald. Cp (GA, SC): openings along blackwater rivers, rare north of GA. June-August; August-October. E. SC south to n. FL, west to se. TX. [< *S. dodecandra* var. *dodecandra* – RAB; = *S. dodecandra* (Linnaeus) Britton, Sterns, & Poggenburg var. *foliosa* (Fernald) Wilbur – GW, K, Z; > *S. foliosa* – S; > *S. harperi* Small – S]

Sabatia gentianoides Elliott. Cp (GA, NC, SC): pine savannas, bogs; common. July-August; September-October. NC south to n. FL, west to se. TX. [= RAB, GW, K, Z; = *Lapithea gentianoides* (Elliott) Grisebach – S]

Sabatia kennedyana Fernald, Plymouth Gentian. Cp (NC, SC, VA*): 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); rare (NC Threatened, SC Rare). June-August; August-October. This species has a strange, disjunct range, likely related to Pleistocene refugia on the (now) Continental shelf, present in s. Nova Scotia; 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. Cp (GA): wet savannas; uncommon. Sw. GA west to e. LA. [= K, Z; < *S. macrophylla* – GW; = *S. macrophylla* Hooker – S]

Sabatia macrophylla Hooker *var. **recurvans*** (Small) Wilbur, Small's Rose-gentian. Cp (GA): wet savannas; common. E. and c. GA south to ne. FL; it may occur in se. SC. [= K, Z; < *S. macrophylla* – GW; = *S. recurvans* Small – S]

Sabatia quadrangula Wilbur, Four-angle Sabatia. Cp, Pd (GA, NC, SC, VA): sandhills, moist forests, pocosin ecotones; uncommon (NC Watch List). June-September; August-November. E. VA south to FL, west to s. AL. [= RAB, C, GW, K, Z; = *S. paniculata* Michaux – F, S, misapplied]

Sabatia stellaris Pursh, Annual Sea-pink. Cp (GA, NC, SC, VA): brackish marshes; common. July-October; August-November. S. MA south to s. FL, west to LA; Bahama Islands, Cuba, c. Mexico. [= RAB, C, F, GW, K, Z]

GERANIACEAE A.L. de Jussieu 1789 (Geranium Family)

A family of about 11 genera and 700 species, herbs and shrubs, mostly temperate.

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 Linnaeus (Stork's-bill, Filaree)

A genus of about 60 species, herbs, mainly Old World.

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, Pd, Cp (GA, NC, SC, VA): disturbed areas, fields, lawns; common, introduced from Europe. March-June; April-July. [= RAB, C, F, G, S, W; > *E. cicutarium* ssp. *cicutarium* – K]

* ***Erodium moschatum*** (Linnaeus) L'Héritier *var.* ***moschatum***, Whitestem Filaree. Cp (SC): waste area near wool-combing mill; rare, perhaps merely a waif, 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).

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 ca. 1 mm long .... ***[G. sibiricum]***

8 Pedicels either retrorse-strigose or glandular-villous; mature stylar beak 3-5 mm long.

9 Pedicels glandular-villous ..... ***[G. bicknellii]***

9 Pedicels retrorsely strigose ..... ***G. columbinum***

Geranium carolinianum Linnaeus *var.* ***carolinianum***, Southern Carolina Crane's-bill. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, lawns, pastures, gardens, disturbed areas; common. March-June (and sometimes later). [= C, F, G; < *G. carolinianum* – RAB, S, W; < *G. carolinianum* var. *carolinianum* – K]

Geranium carolinianum Linnaeus *var.* ***confertiflorum*** Fernald, Northern Carolina Crane's-bill. Mt (NC, VA), Pd (VA): fields, roadsides, lawns, gardens, disturbed areas; common. March-June (and sometimes later). [= C, F, G; < *G. carolinianum* – RAB, S, W; < *G. carolinianum* var. *carolinianum* – K]

* ***Geranium columbinum*** Linnaeus, Long-stalk Crane's-bill. Mt (GA, NC, VA), Pd (VA): roadsides, pastures, disturbed areas; common, introduced from Europe. May-July. [= RAB, C, F, G, K, S, W]

* ***Geranium dissectum*** Linnaeus, Cutleaf Crane's-bill. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (GA, NC, VA): roadsides, pastures, disturbed areas; common, introduced from Europe. April-June. [= RAB, C, F, G, K, S, W]

Geranium maculatum Linnaeus, Wild Geranium. Mt, Pd, Cp (GA, NC, SC, VA): cove forests, bottomland forests, other mesic, base-rich forests; common (rare in Coastal Plain). April-June. ME west to Manitoba, south to SC, GA, and ne. OK. Sometimes cultivated. [= RAB, C, F, G, K, S, W]

* ***Geranium molle*** Linnaeus, Dove's-foot Crane's-bill. Pd (GA, NC, SC, VA), Mt (NC, SC, VA), Cp (VA): roadsides, pastures, disturbed areas; common, introduced from Europe and w. Asia. April-July. [= RAB, C, F, G, K, S, W]

* ***Geranium pusillum*** Linnaeus, Small-flowered Crane's-bill. Mt (NC, VA), Pd (SC, VA), Cp (VA): roadsides, pastures, disturbed areas; common, introduced from Europe. May-June. [= RAB, C, G, K, S, W]

Geranium robertianum Linnaeus, Herb Robert. Mt (VA): rocky woodlands, especially over calcareous rocks; rare (VA Rare). 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]

Geranium bicknellii Britton. South to PA, IN, IL, c. TN. No documentation is known for the reports for VA and WV by Kartesz (1999). [= C, G, K, W; > *G. bicknellii* var. *bicknellii* – F]

* ***Geranium ibericum*** Cavanilles, Iberian Crane's-bill. Mt (NC): rare, spread from horticultural use, native of Europe. Recently been found in Great Smoky Mountains National Park, in both NC and TN (K. Langdon, pers. comm.). [= F, K; *G. nepalense* – C] {not keyed at this time}

* ***Geranium sanguineum*** Linnaeus, Blood-red Crane's-bill. Mt (NC): roadbank, rare, probably persistent or spread from cultivation. [= C, F, G, K] {not keyed at this time; 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]

* ***Geranium thunbergii*** Siebold & Zuccarini ex Lindley & Paxton. Mt (NC), Pd (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] {not keyed at this time, and 'promote' to main text}

GROSSULARIACEAE DC. 1805 (Currant Family)
(also see *ITEACEAE*)

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).

Ribes Linnaeus 1753 (Currant, Gooseberry)

A genus of about 150 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 or mentioned 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* var. *sativum*. 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: Sinnott (1985)=Z; Weigend, Mohr, & Motley (2002); Spongberg (1972); Schultheis & Donoghue (2004); Senters & Soltis (2003). 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 maturirty; stems with (0-) 1-3 nodal spines and sometimes also with internodal bristles (especially on young, vigorous growth); [subgenus *Grossularia*].
- 2 Ovary and fruit bristly or spiny; stamens (at full anthesis) either 9-15 mm long, exserted well beyond the calyx lobes (*R. echinellum*) or 1-3 mm long, shorter than the calyx lobes (*R. cynosbati*).
  - 3 Bristles of the ovary and fruit not gland-tipped; stamens (at full anthesis) 1-3 mm long, shorter than the calyx lobes; calyx lobes 2.5-4 mm long; petals 1-2 mm long; [of the Mountains] ..... ***R. cynosbati***
  - 3 Bristles of the ovary and fruit gland-tipped; stamens (at full anthesis) either 9-15 mm long, exserted well beyond the calyx lobes; calyx lobes 4-7 mm long; petals 2-3 mm long; [of the Piedmont or, potentially, Coastal Plain]..... ..... ***R. echinellum***
- 2 Ovary and fruit glabrous; 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***

1 Flowers in racemes of 4-many; pedicels jointed just beneath the ovary or fruit, the fruit disarticulating at maturity; stems lacking nodal spines and internodal bristles (except *R. lacustre*); [subgenus *Ribes*].
- 5 Stems (especially young, vigorous growth) with internodal bristles and sometimes internodal spines; fruit bristly, purple or black when mature; racemes drooping..... ***R. lacustre***
- 5 Stems lacking internodal bristles and nodal spines; fruit glabrous or glandular-hispid, red or black when mature (but not both dark and bristly); racemes ascending, spreading, or drooping.
  - 6 Ovary and fruit bristly or spiny with glandular hairs; fruit dark red when mature; racemes ascending; leaves mostly 5-10 cm across, the 5-7 lobes more-or-less acute ..... ***R. glandulosum***
  - 6 Ovary and fruit glabrous; fruit red or black when mature; racemes spreading to drooping; leaves mostly 3-8 cm across, the 3-5 lobes more-or-less obtuse.

7 Leaves with resinous glands beneath; fruits black when mature; [native]..... ***R. americanum***
7 Leaves not glandular beneath; fruits red when mature; [introduced, rarely naturalized]..... ***R. rubrum***

Auxiliary Key to widely distributed *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 190-230 degrees, 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 equalling the petals..... ***R. cynosbati***
2 Ovary and fruit glabrous; leaf bases rounded or cuneate (rarely truncate or cordate), the angle of leaf tissue mostly 130-170 degrees, 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. Mt (VA): moist forests, marl marshes; rare (VA Rare). April-June. Nova Scotia west to Alberta, south to w. VA, e. and nc. KY (Clark et al. 2005), IN, NE, and CO. [= C, F, G, K, W]

Ribes cynosbati Linnaeus, Prickly Gooseberry, Dogberry. Mt (GA, NC, VA): moist slopes, periglacial boulderfields, grassy balds, mostly at high elevations; common. May-June; July-September. Ne. United States and s. Canada south to w. NC, e. TN, n. GA, n. AL, AR, and OK. [= RAB, C, G, K, W, Z; > *R. cynosbati* var. *cynosbati* – F; > *R. cynosbati* var. *glabratum* Fernald – F; = *Grossularia cynosbati* (Linnaeus) P. Miller – S]

Ribes echinellum (Coville) Rehder, Miccosukee Gooseberry. Pd (SC): mesic, nutrient-rich forests; rare (US Endangered, SC Rare). 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. [= K, Z; = *Grossularia echinella* Coville – S]

Ribes glandulosum Grauer, Skunk Currant, Mountain Currant. Mt (NC, VA): periglacial boulderfields, high elevation seeps, spruce-fir forests; uncommon, but locally abundant (VA Watch List). May-June; June-September. Newfoundland and British Columbia, south to VT, MI, and MN, and in the mountains to w. NC and e. TN. [= RAB, C, F, G, K, S, W]

Ribes lacustre (Persoon) Poiret, Bristly Black Currant, Spiny Swamp Currant. Mt (VA): forests, acid swamps; rare (VA Rare). May-June. Labrador to AK, south to MA, PA, w. VA, TN (allegedly), n. OH, MI, MN, CO, UT, and CA. The documentation for the inclusion of *R. lacustre* in the flora of VA is a sterile specimen not definitely identifiable (Wieboldt, pers. comm.). [= C, F, G, K, W]

Ribes missouriense Nuttall, Missouri Gooseberry. Mt (VA): forests, rock outcrops; rare, in VA probably introduced from further west (VA Watch List), but native in KY and TN. 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, and VA. [= C, F, G, K, Z; = *Grossularia missouriensis* (Nuttall) Coville & Britton – S]

Ribes rotundifolium Michaux, Appalachian Gooseberry. Mt (NC, SC, VA), Pd (VA): moist slopes, balds, boulderfields, rocky forests, mostly at high elevations south of VA; common (rare in Piedmont). April-May; June-September. An Appalachian endemic: MA, CO, and NY south to w. NC and e. TN. [= RAB, C, F, G, K, W, Z; = *Grossularia rotundifolia* (Michaux) Coville & Britton – S]

* ***Ribes rubrum*** Linnaeus, Garden Red Currant. Mt (NC, VA), Pd (VA): persistent from cultivation and rarely escaped to adjacent fence-rows and disturbed areas; rare, native of Europe. [= K; > *R. sativum* Syme – C, F, G]

Ribes aureum Pursh var. *villosum* Augustin de Candolle, Buffalo Currant, of midwestern United States is cultivated in ne. United States, rarely as far south as our area; it may escape. It also is reported as occurring as a native species as far east as Montgomery County in nc. TN (Chester, Wofford, & Kral 1997). It will key to couplet 6, where trouble will be encountered. It has the hypanthium long-tubular, the flowers golden yellow, and fruits black (rarely yellow). [= K; = *R. odoratum* H. Wendland – C, F, G] {not keyed at this time}

Ribes curvatum Small, Granite Gooseberry. Pd, Mt (GA): rocky upland forests; rare (GA Special Concern). Native from c. and nw. GA (Jones & Coile 1988) and e. TN, in the Cumberland Plateau (Chester, Wofford, & Kral 1997) westward. Also reported for NC by Sinnott (1985), and his report is backed up by specimens. The specimens, however, indicate that the species was cultivated in a botanist's garden; there is no evidence that *R. curvatum* is a native or naturalized component of NC's flora. It will key best to *R. missouriense*; it can be distinguished from all our species of gooseberries by its glandular-punctate leaves, and additionally from *R. missouriense* by its calyx lobes 7.5-9 mm long, sparsely hairy to villous (vs. 5-7.5 mm long, glabrous to sparsely pubescent). [= K; = *Grossularia curvata* (Small) Coville & Britton – S] {not keyed at this time}

Ribes hirtellum Michaux, Northern Gooseberry, ranges south to WV (Tucker County), n. NJ, s. PA, and OH. It will key to couplet 2, where trouble will be encountered. It has glabrous ovaries and fruits, but the stamens are short and included. [= C, K; > *R. hirtellum* var. *hirtellum* – F, G] {not keyed at this time}

* *Ribes nigrum* Linnaeus, Garden Black Currant or Cassis, native to Europe, is cultivated in ne. United States, rarely as far south as our area; it may escape. It will key to *R. americanum*, from which it can be distinguished by its pedicels 2-8 mm long,

much longer than subtending ovate bracts (vs. pedicels 0-2 mm long, shorter than the subtending lanceolate bracts). [= C, F, G, K] {not keyed at this time}

Ribes triste Pallas, Swamp Red Currant, ranges south to WV (Mineral, Pocahontas, and Randolph counties); it may occur in our area. It is very similar to ***R. rubrum***, and will key there. It differs in the following ways: decumbent or straggling shrub (vs. erect), axis and pedicels of inflorescence often with stipitate glands (vs. not glandular). If found in our area, it should be in an obviously native habitat, likely in boggy forests or seepage wetlands at high elevations, and probably in VA. [= C, F, G, K] {not keyed at this time}

* *Ribes uva-crispa* Linnaeus var. *sativum* Augustin de Candolle, Garden Gooseberry, native of Europe, is cultivated in ne. United States, rarely as far south as our area; it may escape. It will key best to ***R. cynosbati***, but differs in the fruits being glandular-pubescent (vs. hispid), and the peduncles and pedicels being short (vs. peduncles 7-25 mm long, pedicels 5-16 mm long). [= K; > ***R. uva-crispi*** – C; = ***R. grossularia*** Linnaeus – F, G] {not keyed at this time}

HALORAGACEAE R. Brown 1814 (Water-milfoil Family)

A family of about 9 genera and 145 species, aquatic and wetland herbs, but also shrubs and trees, cosmopolitan but centered in the Southern Hemisphere. The family is sometimes spelled "Haloragidaceae."

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 60 species, aquatic and wetland herbs, cosmopolitan, but centered in Australia. References: 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 ..... ***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 ..... ***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 ..... ***M. aquaticum***
      4 Leaves strictly alternate; flowers/fruits on submersed stems (forma *capillaceum*) or on emersed stems with pinnatifid or pectinate leaves (forma *natans*) ..... ***M. humile***
    3 Flowers/fruits in erect spikes emersed from water, f/f subtended by bracts much smaller than the normally submersed leaves.
      5 Uppermost flowers/fruits alternate; leaves alternate or whorled or both.
        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] ..... ***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 ..... ***M. heterophyllum***
        7 Bracts usually < 2× as long as pistillate flowers; stems drying pale tan or whitish.

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 ..... ***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 ..... ***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] ..... ***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 ..... ***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.
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 ..... ***M. verticillatum***
7 Bracts vary from entire to pectinate.
8 Leaves alternate, pseudo-whorled, or both; plain green; [of se. VA and southward] ... ***M. laxum***
8 All leaves whorled, grayish green; [collectively widespread]
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*** (Vell. Conc.) Verdc., Parrot-feather. Cp, Pd, Mt (GA, NC, SC, VA): ditches, slow-moving rivers, pools, ponds; common (rare in Piedmont and Mountains), 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, Y, Z; = *M. brasiliense* Cambessedes – RAB, F, G; = *M. proserpinacoides* Gillies ex Hooker & Arnott – S]

Myriophyllum heterophyllum Michaux, Southern Water-milfoil. Cp (GA, NC, SC, VA), Pd, Mt (GA): ditches, slow-moving waters of rivers and streams, pools, ponds; common. April-July. NY west to Ontario and MN, south to FL and TX. [= RAB, C, F, G, GW, K, S, Y, Z]

Myriophyllum humile (Rafinesque) Morong. Cp (VA): floating in an artificial pond; rare (VA Rare). [= C, F, G, K, Y, Z]

Myriophyllum laxum Shuttleworth ex Chapman, Loose Water-milfoil. Cp (GA, NC, SC, VA): limesink depression ponds (dolines), spring-runs, rarely also in lakes; rare (GA Threatened, NC Threatened, SC Rare). 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, S, Y]

Myriophyllum pinnatum (Walter) Britton, Sterns, & Poggenburg, Alternate-leaved Water-milfoil. Cp (GA, NC, SC, VA), Mt? (GA, VA): pools, ditches; uncommon (VA Watch List). June-October. MA west to IA and SD, south to GA and TX. [= RAB, C, F, G, GW, K, S, W, Y, Z]

* ***Myriophyllum spicatum*** Linnaeus, Eurasian Water-milfoil. Cp (GA, NC, SC, VA): ponds and impoundments; uncommon? {habitat and range in our area uncertain}, native of Eurasia, confused with *M. sibiricum*, (see below). An introduced species, now widespread in e. United States. Reported for South Carolina by Hill & Horn (1997). [= C, GW, K, W, Y, Z]

Myriophyllum tenellum Bigelow, Leafless Water-milfoil. Cp (NC, VA): natural lakes (Carolina bay lakes), typically growing on the sandy bottoms in water 1-2 meters deep; rare (NC Rare, VA Rare). Newfoundland west to MN, south to PA and NJ, and disjunct south to a few occurrences in VA and NC. [= C, F, G, K, Y, Z]

Myriophyllum sibiricum Komarov. South to DE, and reported for VA. [= C, G, K, Z; > *M. exalbescens* Fernald – F, Y]

Myriophyllum verticillatum Linnaeus. A circumboreal species, south in North America to DE, MD, IN, NE, TX, and CA. [= C, G, K, Y, Z; > *M. verticillatum* var. *pectinatum* Wallroth – F]

Proserpinaca Linnaeus (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. Cp (NC, SC, VA), Mt (VA); {GA}: wet places; rare (NC Watch List). July-September. Nova Scotia 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. crebra*** Fernald & Griscom, Common Mermaid-weed. Cp (GA, NC, SC, VA): wet places, swamp forests; uncommon. June-October. Throughout e. North America and south to the Caribbean and Central America. [= C, F, G, K, Z; < *P. palustris* – RAB, S, W; < *P. palustris* – GW (also including *P. intermedia)*]

Proserpinaca palustris Linnaeus ***var. palustris***, Coastal Mermaid-weed. Cp (GA, NC, SC, VA), Pd (NC, SC), Mt? (GA?): wet places, swamp forests; common. June-October. MA (?) to FL and west to LA, on the Coastal Plain. [= C, F, G, K, Z; < *P. palustris* – RAB, S, W; *P. palustris* – GW (also including *P. intermedia)*]

Proserpinaca pectinata Lamarck, Feathery Mermaid-weed. Cp (GA, NC, SC, VA), Pd (GA): bogs, savannas, ditches, other wet places; common. June-October. Nova Scotia 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, Z]

Proserpinaca palustris Linnaeus ***var. amblyogona*** Fernald occurs east to KY, TN, and GA. [= C, F, G, K; < *P. palustris* – GW, S] {not keyed at this time}

HAMAMELIDACEAE R. Brown 1818 (Witch Hazel Family)
(also see *ALTINGIACEAE*)

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; 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*).

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. Cp (GA, NC, SC): wet savannas, pocosins, and pocosin margins; uncommon (GA Threatened). 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. Mt, Pd (GA, NC, SC): 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; rare (GA Special Concern, NC Rare, SC Rare). 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. 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 moderately stellate-pubescent beneath, usually with 9 or 10 lateral veins; [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 virginiana Linnaeus *var.* ***henryae*** Jenne ex C. Lane, Small-leaved Witch-hazel. Cp (GA, SC): sandhill margins, xeric hammocks, streamheads; uncommon. 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 form. Additional study is needed of these small-leaved Coastal Plain populations. [< *H. virginiana* – FNA, GW, K, S; = *H. virginiana* var. *henryi* Jenne ex C. Lane – Y, Z, orthographic error; = *H. virginiana* var. *henryae*]

Hamamelis virginiana Linnaeus *var.* ***virginiana***, Witch-hazel. Mt, Pd, Cp (GA, NC, SC, VA): forests; common. October-December; October-November (of the following year). Québec and Nova Scotia 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; > *H. virginiana* var. *parvifolia* Nuttall – F; > *H. virginiana* var. *virginiana* – F]

Hamamelis ovalis S.W. Leonard. Apparently endemic to dry-mesic pineland ravines in sc. MS (Perry County) (Leonard 2006). Late December-early February. [= X]

HELIOTROPACEAE Schrader 1819 (Heliotrope Family)

A family of 5 genera and ca. 400 species, trees, shrubs, and herbs, semicosmopolitan.

Heliotropium Linnaeus (Heliotrope, Turnsole)

A genus of ca. 250 species, widespread in tropical and temperate regions. Probably 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, Pd (GA, NC, SC, VA): disturbed areas, roadsides, fields; uncommon (rare north of SC), introduced from South America. April-September. [= RAB, C, F, G, K, Z]

Heliotropium curassavicum Linnaeus *var.* ***curassavicum***, Seaside Heliotrope. Cp (GA, NC, SC, VA): edges of brackish and salt marshes, estuarine shores; rare (NC 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 (GA, NC, SC, VA), Pd (NC, VA): roadsides, disturbed areas; rare, introduced from s. Europe. June-September. [= RAB, C, F, G, K, Z]

* ***Heliotropium indicum*** Linnaeus, Turnsole. Cp, Pd (GA, NC, SC, VA): roadsides, woodland borders, swamps, ditches; uncommon, introduced from South America. July-November. [= RAB, C, F, G, GW, K, Z; = *Tiaridium indicum* (Linnaeus) Lehm. – S]

Heliotropium tenellum (Nuttall) Torrey, Delicate Heliotrope. Mt (GA): limestone glades and barrens; rare (GA Special Concern). 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]

HIPPOCASTANACEAE (Buckeye Family)

(see *SAPINDACEAE*)

HYDRANGEACEAE Dumortier 1829 (Hydrangea Family)

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. Cp (GA, NC, SC, VA), Pd (GA, SC), Mt (GA, NC): swamp forests and bottomlands in the Coastal Plain (and Piedmont of SC), moist forests in the mountains of n. GA, nw. SC, sw. NC; common (rare in 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. Mt, Pd (NC, VA), Cp (VA): fairly commonly cultivated, persistent around old homesites and escaping to adjacent woodlands; rare, native of Japan and China. First reported for NC (Jackson Co., NC) by Pittillo & Brown (1988). *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. Recent 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.

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)]; [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]; [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. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): forests, especially around rock outcrops and along streambanks; common (rare in Coastal Plain). 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, Z; = *H. arborescens* ssp. *arborescens* – RAB, Y; = *H. arborescens* var. *arborescens* – C, G; > *H. arborescens* var. *arborescens* – F; > *H. arborescens* var. *oblonga* Torrey & A. Gray – F]

Hydrangea cinerea Small, Ashy Hydrangea. Mt, Pd (GA, NC, SC): rocky forests and rock outcrops, roadbanks, perhaps strictly or mostly associated with mafic or calcareous rocks; uncommon. 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. Mt (NC, VA): persistent after cultivation at old home-sites, sometimes appearing naturalized; rare, native of e. Asia. July-August. [= C, F, G, K]

Hydrangea quercifolia Bartram, Oakleaf Hydrangea. Pd, Mt, Cp (GA, *NC, SC): native in rich foothill forests (very rare), also in disturbed areas, thickets, or forests adjacent to urban or suburban areas; rare, introduced from further south. May-July. C. and sw. TN and nw. SC, south through w. GA, AL, and MS to panhandle FL and e. LA; scattered elsewhere as a remnant or escpae from cultivation. Boufford & Wood (1977) describe an apparently native occurrence in nw. SC. This southeastern native is a spectacular garden plant, frequently planted, rarely escaping or persisting. [= C, F, G, K, S]

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 *Ph. hirsutus* and five in *Ph. inodorus*, but these seem to be no more than forms. As Hu writes, "the formerly recognized species, *Ph. grandiflorus* Willd., and *Ph. 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 *Ph. 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: Hu (1954-1955)=Z; A.E. Weakley (2002).

1 Axillary buds exposed; twigs of the current year villous-hirsute; seeds not caudate; [subgenus *Deutzioide*s, section *Deutzioides*] ..... ***Ph. hirsutus***
1 Axillary buds enclosed; 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*] ..... ***Ph. 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..... ***Ph. coronarius***
    3 Bark of the current year gray, not exfoliating later; flowers not fragrant or only slightly so ..... ***Ph. pubescens***

* ***Philadelphus coronarius*** Linnaeus, European Mock-orange. Pd (NC), {GA, SC, VA}: cultivated (though moreso in the past than now), and sometimes escaped or persisting around old homesites; rare, native of Europe. May-July. *Ph. coronarius* is the most commonly cultivated *Philadelphus* in our area, though it is currently considered rather old-fashioned. [= C]

Philadelphus hirsutus Nuttall, Hairy Mock-orange, Cumberland Mock-orange. Mt (GA, NC, SC, VA), Pd (SC): bluffs, rock outcrops, rocky woodlands, often with seepage, over mafic or calcareous rocks; rare (NC Watch List, SC Rare, VA Watch List). April-May; June-August. A Southern Appalachian species: sw. VA and KY south and west to w. NC, TN, n. GA, and n. AL. *Ph. sharpianus* Hu, known from e. TN and nc. AR, is similar to *Ph. 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 *Ph. hirsutus*. *Ph. hirsutus* is cultivated and it may escape outside of the range stated. [= RAB, C, F, G, S, W; > *Ph. hirsutus* – K, Z; > *Ph. sharpianus* Hu – K, Z; > *Ph. hirsutus* var. *intermedius* Hu – Z; > *Ph. hirsutus* var. *nanus* Hu – Z; > *Ph. sharpianus* Hu var. *parviflorus* Hu – Z]

Philadelphus inodorus Linnaeus, Appalachian Mock-orange. Mt, Pd, Cp (GA, NC, SC, VA): rich forests and woodlands, rocky bluffs over mafic or calcareous rocks, and also cultivated and persistent; uncommon (rare in Coastal Plain). April-May; June-August. VA and TN south to panhandle FL, GA, and s. AL (and according to C, also in e. PA). *Ph. floridus* Beadle, known from nw. GA, is similar to *Ph. inodorus*, allegedly differing in the pedicels and hypanthium pubescent (vs. glabrous); it is probably only a form of *Ph. inodorus*. [= RAB, C, G, W; > *Ph. inodorus* var. *inodorus* – F, S, Z; > *Ph. inodorus* var. *carolinus* Hu – Z; > *Ph. inodorus* var. *grandiflorus* (Willdenow) A. Gray – F, Z; > *Ph. inodorus* var. *laxus* (Schrader) Hu – Z; > *Ph. inodorus* var. *strigosus* Beadle – S, Z; > *Ph. grandiflorus* Willdenow – S; > *Ph. gloriosus* Beadle – S; > *Ph. inodorus* – K; > *Ph. floridus* Beadle – K, S, Z]

Philadelphus pubescens Loiseleur, Ozark Mock-orange, Hairy Mock-orange. Mt (GA): limestone bluffs; rare (GA Special Concern). E. TN, KY, nw. GA (Jones & Coile 1988), AL, s. IL, 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. [> *Ph. intectus* Beadle – S; > *Ph. latifolius* Schrader ex Augustin de Candolle – S; > *Ph. intectus* var. *intectus* – Z; > *Ph. intectus* var. *pubigerus* Hu – Z; > *Ph. pubescens* var. *verrucosus* (Schrader) Hu – Z; > *Ph. pubescens* var. *pubescens* – K, Z; > *Ph. pubescens* var. *intectus* (Beadle) A.H. Moore – K]

HYDRASTIDACEAE Martinov 1820 (Golden-seal Family)

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 (1993) 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); Tobe in Kubitzki & Bayer (2002).

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. Mt (GA, NC, SC, VA), Pd (GA, NC, VA): 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; rare (GA Endangered, NC Endangered, VA Watch List). 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 any 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)

HYDROLEACEAE Berchtold & J. Presl 1820 (Hydrolea Family)

The Hydroleaceae is not closely related to Hydrophyllaceae; recent molecular data confirm the prevailing view through most of the 19th century that *Hydrolea* was in its own family. References: Ferguson (1998); Hilger & Diane (2003); Angiosperm Phylogeny Group (1998, 2003).

Hydrolea Linnaeus

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 (GA, SC): pond cypress savannas, depression meadows; rare. Ne. SC south to sw. GA and FL. See Nelson (1993). The author is sometimes stated as J.F. Macbride, but this is an error. [= RAB, GW, K; = *Nama corymbosum* (Macbride ex Elliott) Kuntze – S]

Hydrolea ovata Nuttall ex Choisy, Ovate False-fiddleleaf. Cp (GA): swamps, ponds, ditches; rare. June-August. C. GA west to TX, north in the interior to sc. TN and MO. [= C, F, G, GW, K; = *Nama ovatum* (Nuttall ex Choisy) Britton – S]

Hydrolea quadrivalvis Walter, Waterpod. Cp (GA, NC, SC, VA), Pd (NC, VA): swamp forests, backwater sloughs, marshes, ditches; common (VA Watch List). June-September. Se. VA south to FL, west to LA. [= RAB, C, F, G, GW, K; = *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]

HYDROPHYLLACEAE R. Brown 1817 (Waterleaf Family)
(also see *HYDROLEACEAE*)

A family of about 18 genera and 270 species, herbs and shrubs, nearly cosmopolitan, concentrated in w. North America. References: Wilson (1960a); Constance (1963).

1 Leaves entire, simple; styles 2, distinct to the summit of the ovary.
  2 Flowers in axillary cymes; capsule subglobose; leaves 2-12 cm long..... ***[see Hydrolea in HYDROLEACEAE]***
  2 Flowers solitary or paired in the leaf axils; capsule cylindrical leaves 0.8-1.5 (-3.5) cm long..... ***Nama***
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.
  3 Flowers solitary opposite the leaves on the upper portion of the stem (sometimes also terminal in a lax, (1-) 2-6-flowered cyme).

4 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.....***Ellisia***
4 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..... ***Nemophila***
3 Flowers all terminal in 3-many-flowered cymes.
5 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 .....***Hydrophyllum***
5 Inflorescence with a strong central axis (some secondary branching in *Ph. bipinnatifida*, but not as above); larger leaf blades < 5 cm wide (except *Ph. bipinnatifida*); stamens slightly exserted from the corolla (< 3 mm beyond the corolla) (except well-exserted in *Ph. bipinnatifida*, included in *Ph. covillei*); plants annual (biennial in *Ph. bipinnatifida*) from a taproot.....***Phacelia***

Ellisia Linnaeus (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, Mt (VA): moist shaded forests, especially bottomlands; uncommon. May-June. IN and MI west to Alberta, 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, Z; = *Nyctelea nyctelea* (Linnaeus) Britton – S]

Hydrolea
(see *HYDROLEACEAE*)

Hydrophyllum Linnaeus (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 canadense Linnaeus, Mapleleaf Waterleaf, Canada Waterleaf, Broadleaf Waterleaf. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): cove forests, rocky streambanks, other moist and nutrient-rich forests; common (rare in Coastal Plain and in Piedmont south of VA) (SC Rare). May-June; August. VT and s. Ontario west to MI and WI, south to n. GA, AL, AR, and MO. [= RAB, C, F, G, K, S, W, Y, Z]

Hydrophyllum macrophyllum Nuttall, Hairy Waterleaf. Mt (GA, NC, VA): cove forests and other moist rocky forests, especially over calcareous or mafic rocks; rare (GA Special Concern, NC Rare, VA Watch List). May; July. 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, Y, Z]

Hydrophyllum virginianum Linnaeus *var.* ***atranthum*** (E.J. Alexander) Constance, Appalachian Waterleaf. Mt (NC, VA): cove forests and other moist rocky forests; common. 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 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, 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, Pd (NC, VA), Cp (VA): cove forests, moist rocky forests, alluvial forests; common. April-June; July-August. NH and Québec 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 British Columbia south to CA. See *Phacelia bipinnatifida* for additional suggestions on distinguishing it from this species. [= C, F, G, Z; < ***H. virginianum*** – RAB, K, W, Y; < ***H. virginicum*** – S, orthographic error; = ***H. virginianum*** – X]

Hydrophyllum appendiculatum Michaux, Biennial Waterleaf. S. Ontario and MN, south to sw. PA, 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, Y, Z; = *Decemium appendiculatum* (Michaux) Small – S]

Nama Linnaeus (Fiddleleaf)
(also see *Hydrolea* in *HYDROLEACEAE*)

A genus of about 45 species, herbs, of sw. North America, tropical America, and Hawaii.

* ***Nama jamaicense*** Linnaeus, Jamaica Weed. Cp (SC): lawns; rare, introduced from tropical America (including FL and TX). May. [= K; = ***N. jamaicensis*** – RAB, orthographic variant; = *Marilaunidium jamaicense* (Linnaeus) Kuntze – S]

Nemophila Nuttall (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 ***Ph. 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 lower stem consisting of appressed to ascending, stiff, pointed hairs; [of rivers in the Atlantic drainage] .....***Phacelia covillei***

2 Pubescence of the lower stem spreading or even retrorse, most of the hairs weak and twisted, and many of them glandular-tipped; [of rivers in the Mississippi drainage].....***[Phacelia ranunculacea]***

Nemophila aphylla (Linnaeus) Brummitt. Cp, Pd (GA, NC, SC, VA): moist, nutrient-rich floodplain forests; uncommon, though often locally abundant. 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]

Phacelia A.L. de Jussieu 1789 (Phacelia)

A genus of about 150 species, of North America and South America, concentrated in w. North America. References: Constance (1949)=Z; Levy (1991)=Y; Murdy (1966); Gillett (1968, 1964).

Identification notes: 1. *Phacelia bipinnatifida* and *Hydrophyllum virginianum* are sometimes confused. ***Ph. 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 ***Ph. 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 ..... ***Ph. fimbriata***
  2 Corolla lavender to blue; pubescence of the stem appressed; lobes of cauline leaves mostly acute; seeds 1.5-3.0 mm long ..... ***Ph. 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 lower stem consisting of appressed to ascending, stiff, pointed hairs; [of rivers in the Atlantic drainage] ..... ***Ph. covillei***
    4 Pubescence of the stem spreading or even retrorse, most of the hairs weak and twisted, and many of them glandular-tipped; [of rivers in the Mississippi drainage] ..... ***[Ph. 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] ..... ***Ph. 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 ..... ***Ph. 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] ..... ***Ph. 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] ..... ***Ph. dubia** var. **georgiana***

Phacelia bipinnatifida Michaux, Fernleaf Phacelia, Forest Phacelia. Mt (GA, NC, SC, VA): cove forests, especially where rocky; common (SC Rare, VA Watch List). 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. *Ph. bipinnatifida* var. *plummeri* (= *Ph. 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; > *Ph. bipinnatifida* var. *bipinnatifida* – F; > *Ph. bipinnatifida* var. *plummeri* Wood – F; > *Ph. brevistyla* Buckley – S; > *Ph. bipinnatifida* – S]

Phacelia covillei S. Watson ex A. Gray, Eastern Buttercup Phacelia. Pd (NC, VA): rich soils of floodplains, and contiguous terraces and slopes; rare (NC Rare, VA Rare). April; May. Ranging in two disjunct areas – c. NC and sc. VA (in the drainages of the Cape Fear, Tar, and Roanoke rivers) and DC, n. VA, and sc. MD (in the drainage of the Potomac River). Most recent authors have included this taxon within the closely similar *Ph. ranunculacea*; as thus broadly defined, *Ph. ranunculacea* was considered to occur in 3 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. Chuang & Constance (1977) reported that the western population center has a chromosome number of n=6, and that the two eastern population centers have n=14. The disparate cytotypes of eastern and western *Ph. ranunculacea* sensu lato led Chuang & Constance to seek morphological differences that would warrant the recognition of separate taxa, but they reported that "no consistent morphological distinction has been found between the two cytotypes." Stem pubescence does, however, show consistent, though subtle, differences between eastern and western populations of this complex. Eastern material has the stem pubescence relatively sparse, consisting of appressed to ascending, stiff, pointed hairs. Western populations have stem pubescence relatively dense, much of it spreading or even retrorse, most of the hairs weak and twisted, and many of them glandular-tipped. Given the disparate cytotypes, correlated with allopatric distribution and slight but consistent morphological differences, it seems best to provisionally recognize two taxa; further study, using chemical and molecular techniques would be valuable. Recognition at the species level is nomenclaturally the more conservative (and here followed) because of the pre-existence of Watson's binomial; varietal status might be the more appropriate. *Ph. covillei* and *Ph. ranunculacea* (sensu stricto) have numerous characteristics that render their inclusion in *Phacelia* uncomfortable (see discussion in Chuang & Constance 1977, Constance 1949, Gillett 1968). See *Nemophila aphylla* for suggestions on distinguishing these two superficially similar species. [= K; < *Ph. ranunculacea* (Nuttall) Constance – RAB, C, F, G, Z]

Phacelia dubia (Linnaeus) Trelease *var. **dubia***, Appalachian Phacelia. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): floodplain forests, rocky forests, fields, roadsides, granitic flatrocks; common. 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; < *Ph. dubia* – RAB, C, F, S, W; > *Ph. dubia* var. *dubia* – G; > *Ph. dubia* var. *fallax* (Fernald) Gleason – G; > *Ph. 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; < *Ph. dubia* – RAB, C, F, S, W; *?* *Ph. 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 (GA Special Concern, VA Rare). 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 (NC Rare List). April; May. Sc. NC south to GA and west to ec. AL. [= RAB, K, W, Y, Z; *? Ph. hirsuta* – S, misapplied]

Phacelia purshii Buckley, Miami-mist. Mt (GA, NC, SC, VA): moist forests on floodplains and slopes; rare (GA Special Concern, VA Watch List). May-June. S. PA west to s. Ontario, 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 *Ph. boykinii* and *Ph. bicknellii* (Constance 1949). A study of the matter was initiated and specimens annotated as "*Ph. 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, Z; > *Ph. purshii* – S; > *Ph. boykinii* (A. Gray) Small – S; > *Ph. bicknellii* Small – S]

Phacelia dubia (Linnaeus) Trelease var. *interior* Fernald, endemic in c. TN. [= K; < *Ph. dubia* – C, F, G, S; < *Ph. dubia* var. *dubia* – Z] {not keyed at this time}

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). [= K; < *Ph. ranunculacea* – RAB, C, F, G, Z]

Phacelia strictiflora (Engelmann & Gray) Gray var. *robbinsii* Constance. East to AL. [= K, Z] {not keyed at this time}

HYPERICACEAE A.L. de Jussieu 1789 (St. John's-wort Family)

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). References: Adams (1973)=Z; Godfrey (1988)=Y; Wood & Adams (1976).

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; [tribe *Hypericeae*] ..... ***Hypericum***
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; [tribe *Cratoxyleae*]..... ***Triadenum***

Hypericum Linnaeus 1753 (St. John's-wort)

A genus of about 370 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). {The curious bimodal distribution of *H. prolificum* (more than one taxon?). Basis of Small's *H. lobocarpum* in Blue Ridge of NC. And more....} References: Adams (1973)=Z; Godfrey (1988)=Y; Robson (1977, 1981, 1990, 1996, 2001, 2002, 2006)=X; Adams (1962)=V; Adams (1957); Webb (1980); Robson & Adams (1968); Adams & Robson (1961); Calie, Schilling, & Webb (1983); Culwell (1970). Key based in part on Adams (1973), Godfrey (1988), C, and GW.

1 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*].
  2 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**
  2 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.
    3 Petals 4; sepals 4 (rarely 2); plant 5-100 cm tall; leaves 2-40 mm long; [subsection *Ascyrum*] ..... **Key B**
    3 Petals 5; sepals 5; plant 50-250 cm tall; leaves (10-) 20-70 mm long; [subsections *Centrosperma* and *Brathydium*]

.....**Key C**

1 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; decumbent shrub (*H. buckleyi*) or an annual or perennial herb (suffruticose at the base in *H. cistifolium, H. dolabriforme, H. nudiflorum, H. apocynifolium, H. sphaerocarpum*).
- 5 Leaves ascending or appressed, 1-nerved, < 1 mm wide; inflorescence a compound raceme; [section *Brathys*] .....**Key D**
- 5 Leaves spreading or ascending, generally multi-nerved, > 1 mm wide; inflorescence a dichasial cyme.
  - 6 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; [section *Hypericum*].....**Key E**
  - 6 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.
    - 7 Decumbent shrub or suffruticose herb; [section *Myriandra*, subsections *Pseudobrathydium* and *Suturosperma*].....**Key F**
    - 7 Herb; [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 6-9 mm long; longest leaves 5-10 (-11) mm; flowers 13-15 mm diameter; [of spodosol pine flatwoods]..... ***H. tenuifolium***
- 2 Capsules 3-4.5 mm long; longest leaves 7-16 mm; flowers 13-17 diameter; [of alfisols and ultisols of wet pine savannas, seepage bogs].
  - 3 Flowers 16-17 mm diameter; longest leaves 11-16 mm; plants 2.5-6.5 dm tall; [of wet pine savannas in se. NC to ne. SC] .....***H. species 2***
  - 3 Flowers 13-14 (-15?) mm diameter; longest leaves 7-13 mm; plants 0.5-1.0 dm (rarely to 1.5); [of seepage bogs and wet flatwoods of s. GA to s. FL to w. LA] .....***H. brachyphyllum***

1 Longest leaves 13-30 mm.
- 4 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***
- 4 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].
  - 5 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***
  - 5 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.
    - 6 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]***
    - 6 Plant tall, normally >0.8 m; stem 1-several cm wide at base; crown broader with many ascending to spreading branches.
      - 7 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]***
      - 7 Young branches, leaves, and sepals not glaucous; bark of upper stem and branches not silvery gray and smooth (except some chapmanii); mature plants variously shaped.
        - 8 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***
        - 8 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)].
          - 9 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]***
          - 9 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 Mature capsule 6-9 mm long; longest leaves 5-10 (-14) mm; [plants of spodosol flatwoods] ..... ***H. tenuifolium***
    3 Mature capsule 3-6 mm long; longest leaves 6-13 mm; [of seepage bogs and wet flatwoods of s GA-s FL-w LA]... ..... ***H. brachyphyllum***
  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; occurrring only north of FL.
      5 Flowers 10-12 mm diameter; longest leaves 13-25 mm; [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***
      5 Flowers 16-17 mm diameter; longest leaves 11-16 mm; [plants of wet pine savannas in se NC-ne SC] .... ***H. species 2***
1 Plants > 0.6 m tall, plants erect.
  6 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***
  6 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.
    7 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***
    7 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.
      8 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]***
      8 Plant tall, normally > 0.8 m; stem 1-several cm wide at base; crown broader with many ascending to spreading branches.
        9 Plant to 1.5 m tall, with broad bushy or gumdrop aspect; plants 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 associated with static water 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; [associated with moving water of blackwater streams and impoundments]..... ***H. nitidum***
        9 Plant 2-4 m tall, with tree-like or vase-like aspect; restricted to FL panhandle.
          11 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]***
          11 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]***

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; [plants widespread] ..... ***H. densiflorum***

5 Leaves 1.0-3.7 (-4.1) mm wide; [plants 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. species 1***

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 equalling 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 equalling 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***

Hypericum adpressum Rafinesque ex Barton, Bog St.-John's-wort, Creeping St.-John's-wort. Cp (GA, NC, SC, VA): boggy depressions; rare (US Species of Concern, GA Special Concern, NC Rare, SC Rare, VA Rare). July-August. E. MA south to sw. GA in the Coastal Plain; disjunct inland in WV, IN, IL, and sc. TN. See discussion on its habitats and rarity in Sorrie (1998b). [= RAB, C, F, G, GW, K, S, V, X, Z]

Hypericum apocynifolium Small. Cp (GA): mesic bluffs and ravines, ridges and natural levees in floodplains; rare. C. and s. GA west to se. AR and e. TX. [= S, V, X, Y; < *H. nudiflorum* – GW, K, Z]

Hypericum boreale (Britton) Bicknell, Dwarf St.-John's-wort, Northern St.-John's-wort. Cp (VA), Mt (NC?, VA): sinkhole ponds in the Mountains, interdune ponds in the outer Coastal Plain, boggy places; rare (NC Watch List, VA Watch List). Newfoundland and Québec west to w. Ontario, south to VA, NC (?), OH, IN, and n. IL. Hybrids with *H. canadense* have been called *H.* ×*dissimulatum* Bicknell (pro sp.). [= C, F, G, K; = *H. mutilum* Linnaeus ssp. *boreale* (Britton) J.M. Gillett – X]

Hypericum brachyphyllum (Spach) Steudel. Cp (GA, SC?): ponds and wet pinelands; common. E. GA (near SC) south to s. FL, west to s. MS. Also reported from SC (Kartesz 1999); needs confirmation. [= GW, K, V, X, Y, Z; < *H. aspalathoides* – S]

Hypericum buckleyi M.A. Curtis, Granite Dome St.-John's-wort. Mt (GA, NC, SC): thin soil in seasonal seepage around rock outcrops, particularly granitic exfoliation domes; rare (GA Special Concern, NC Watch List, SC Rare). 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 (GA, NC, SC, VA), Mt (NC, SC, VA), Pd (NC, VA); bogs, pine savannas, ditches; common (rare in Piedmont and VA Mountains). July-September. Newfoundland and Québec west to MN, south to s. GA, n. 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, X, Z; > *H. canadense* var. *canadense* – F; > *H. canadense* var. *galiiforme* Fernald – F]

Hypericum cistifolium Lamarck. Cp (GA, NC, SC): pine savannas, wet pine flatwoods; common. June-August. E. NC south to s. FL, west to e. TX. [= RAB, GW, K, V, 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. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): dry forests and woodlands, pine flatwoods; common (rare in Piedmont and Mountains). 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, X, Y; = *H. stans* (Michaux ex Willdenow) 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. Mt (GA, NC, VA), Pd (NC, VA), Cp (GA, NC, SC): bogs, streambanks, dry to moist forests, rock outcrops, moist forests, pine savannas; common (rare in the VA Piedmont). June-August. 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, 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. Cp (GA, NC, SC, VA), Pd, Mt (NC): savannas, wet pine flatwoods, adjacent ditches, borrow scrapes, blackwater stream shores; common (GA Special Concern, VA Watch List). 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, S; = *H. denticulatum* var. *denticulatum* – RAB, C, F, G, Z; < *H. denticulatum* – GW (also see *H. virgatum*); = *H. denticulatum* ssp. *denticulatum* – X]

Hypericum drummondii (Greville & Hooker) Torrey & A. Gray, Nits-and-lice, Drummond's St.-John's-wort. Pd, Cp (GA, NC, SC, VA), Mt (NC, SC, VA): dry woodlands, woodland borders, fields; uncommon. July-September. MD west to OH, IL, and se. KS, south to panhandle FL and c. TX. [= RAB, C, F, G, GW, K, W, X, Z; = *Sarothra drummondii* Greville & Hooker – S]

Hypericum ellipticum Hooker, Pale St.-John's-wort. Mt (NC?): wet places; rare (NC Watch List). Newfoundland and Nova Scotia west to w. Ontario, south to CT, NY, 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, X]

Hypericum fasciculatum Lamarck, Peelbark St.-John's-wort. Cp (GA, NC, SC): wet pine savannas, beaver ponds, upland depression ponds; uncommon (NC Watch List). May-September. E. NC south to s. FL, west to s. MS. [= RAB, GW, K, V, X, Y, Z; < *H. fasciculatum* – S (also see *H. nitidum* and *H. chapmanii*)]

Hypericum frondosum Michaux. Mt (GA, NC*, VA*), Pd (GA), Cp (GA): rock outcrops and rocky woodlands; rare, native in GA, introduced in NC and VA from further south and west. Late May-July. This species is native and widespread as far east as e. TN (Chester, Wofford, & Kral 1997). [= C, F, G, K, V, W, Y, Z; > *H. aureum* Bartram – S; > *H. splendens* Small – S]

Hypericum galioides Lamarck. Cp (GA, NC, SC): wet pine savannas, wet pine flatwoods, pools, edges of bottomlands; common. June-August. E. NC south to n. FL, west to se. TX. [= RAB, GW, K, V, X, Y, Z; > *H. ambiguum* Elliott – S; > *H. galioides* – S, in a narrower sense]

Hypericum gentianoides (Linnaeus) Britton, Sterns, & Poggenburg, Pineweed, Orange-grass. Mt, Pd, Cp (GA, NC, SC, VA): fields, rock outcrops, woodland borders, eroding areas; common. July-October. ME and Ontario west to MN, south to FL and TX. [= RAB, C, F, G, K, W, X, Z; = *Sarothra gentianoides* Linnaeus – S]

Hypericum graveolens Buckley, Mountain St.-John's-wort. Mt (NC): grassy balds, grassy openings, forests, at high elevations (1200 m or more); rare (NC Watch List). 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. Cp (GA, NC, SC, VA), Pd (GA, VA), Mt (VA): pine savannas, wet pine flatwoods, sinkhole ponds (Augusta and Rockingham counties, VA), other wet to moist habitats; common (rare in Piedmont). June-September. S. NJ south to n. 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, X, Z]

Hypericum harperi R. Keller, Harper's St.-John's-wort. Cp (GA, SC): clay-based Carolina bays, other upland depression ponds, with *Taxodium ascendens*; rare. July-September. E. and c. SC south to sw. GA and 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. [= X; < *H. denticulatum* var. *acutifolium* – RAB, Z; < *H. denticulatum* – GW; < *H. harperi* – K; < *H. acutifolium* – S]

Hypericum hypericoides (Linnaeus) Crantz, St. Andrew's Cross. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): dry forests and woodlands; common (uncommon in Mountains). 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, 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. Mt (GA): rocky forests, riverbanks; uncommon. E. and c. TN, nw. GA south to c. AL. Perhaps best treated as a variety of *H. densiflorum*. [= S; < *H. densiflorum* – K, V, X, Z; *? H. revolutum* R. Keller]

Hypericum lloydii (Svenson) P. Adams, Lloyd's St.-John's-wort. Pd (GA, NC, SC, VA), Cp (GA, NC, SC): dry woodlands, sandhills, edges of granitic flatrocks, edges of Altamaha Grit outcrops, roadbanks; uncommon. June-September. Sc. VA south to c. AL. [= RAB, K, V, X, Z; = *Hypericum galioides* Lamarck var. *lloydii* Svenson]

Hypericum microsepalum (Torrey & A. Gray) A. Gray ex S. Watson. Cp (GA): moist to wet pine flatwoods; rare. S. GA south to n. FL. [= GW, K, V, X, Y, Z; = *Crookea microsepala* (Torrey & A. Gray) Small – S]

Hypericum mitchellianum Rydberg, Blue Ridge St.-John's-wort. Mt (NC, VA): grassy balds, grassy openings, forests, seepages, at moderate to high elevations (1000-1900 m or more); rare (NC Watch List, VA Rare). 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, Z; = *H.* ×*mitchellianum* Rydberg pro sp. – X]

Hypericum mutilum Linnaeus *var.* ***mutilum***, Common Dwarf St.-John's-wort Mt, Pd, Cp (GA, NC, SC, VA): bogs, marshes, other wet habitats; common. June-October. Newfoundland and Québec west to Manitoba, 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, Z; = *H. mutilum* ssp. *mutilum* – X]

Hypericum mutilum Linnaeus *var.* ***latisepalum*** Fernald, Southern Dwarf St.-John's-wort. Cp (GA, SC): marshes and other wet habitats; rare. 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, Z; = *H. mutilum* ssp. *latisepalum* (Fernald) N. Robson – X]

Hypericum myrtifolium Lamarck, Myrtle-leaf St.-John's-wort. Cp (GA, SC): ponds; common (rare north of GA). 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 sc. FL, west to se. MS, a Southeastern Coastal Plain endemic. [= GW, K, S, V, X, Y, Z]

Hypericum nitidum Lamarck. Cp (GA, SC): pine savannas; rare (NC Rare, SC Rare). June-August. C. SC south to panhandle FL, west to sw. AL. [= RAB, GW, K, V, Y, Z; *H. nitidum* ssp. *nitidum* – X]

Hypericum nudiflorum Michaux ex Willdenow. Pd, Cp (GA, NC, SC, VA), Mt (GA, NC): streambanks, moist forests; common (uncommon in VA Piedmont). 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, V, X, Y; < *H. nudiflorum* – GW, K, Z (also see *H. apocynifolium* of the deep South)]

* ***Hypericum perforatum*** Linnaeus, European St. John's-wort. Pd (GA, NC, SC, VA), Mt, Cp (NC, SC, VA): fields, pastures, roadsides, woodland borders; common, introduced from Europe. June-September. See Duncan (1985) for documentation for GA. [= RAB, C, F, G, K, S, W, Z; = *H. perforatum* ssp. *perforatum* – X]

Hypericum prolificum Linnaeus, Shrubby St-John's-wort. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): bogs, seepages, rocky forests, rock outcrops; common (rare in Coastal Plain). June-October. NY west to s. MI and MN, south to GA and LA. [= RAB, C, G, K, W, S, V, X, Z; = *H. spathulatum* (Spach) Steudel – F]

Hypericum pseudomaculatum Bush. Cp, Pd (GA, SC), Mt (GA): wet, moist, or dry forests; rare. 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]

Hypericum punctatum Lamarck, Spotted St.-John's-wort. Mt, Pd, Cp (GA, NC, SC, VA): fields, woodland borders; common. June-September. Québec west to MN, south to c. peninsular FL and TX. [= RAB, C, G, K, W, X, Z; = *H. punctatum* var. *punctatum* – F; > *H. punctatum* – S; > *H. subpetiolatum* Bicknell ex Small – S]

Hypericum setosum Linnaeus. Cp (GA, NC, SC, VA): pine savannas, wet pine flatwoods, boggy areas, adjacent ditches, fireplow lines, and scrapes; common (VA Rare). May-September. Se. VA south to c. peninsular FL, west to se. TX. [= RAB, C, F, G, GW, K, S, X, Z]

Hypericum species 1 Weakley, Radfords' St. John's-wort. Pd (NC): shallow circumneutral soil mats of granitic domes in the Brushy Mountains; rare (NC Watch List). 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*). Further study is planned. [< H. virgatum included in concept of *H. virgatum* (= *H. denticulatum* var. *acutifolium*, *H. denticulatum* ssp. *acutifolium*) by most earlier authors]

Hypericum species 2 LeBlond. Cp (GA, NC, SC?): wet pine savannas, over ultisols or alfisols; rare? June-September. [included in concept of *H. tenuifolium (=reductum)* by earlier authors]

Hypericum stragulum P. Adams & Robson. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): dry rocky or sandy woodlands; common (uncommon in Coastal Plain). May-August. MA (Nantucket I.), 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; = *H. hypericoides* (Linnaeus) Crantz ssp. *multicaule* (Michaux ex Willdenow) Robson – K, X]

Hypericum suffruticosum P. Adams & Robson, Pineland St.-John's-wort. Cp (GA, NC, SC): pine savannas and flatwoods; common (rare in NC and SC) (NC Rare). April-June. Se. NC south to c. peninsular FL, west to se. LA. [= RAB, K, V, X, Y, Z; = *Ascyrum pumilum* Michaux – S]

Hypericum tenuifolium Pursh, Sandhill St.-John's-wort. Cp (GA, NC, SC): pine flatwoods, pine savannas, sandhills; common. June-September. Se. NC south to c. peninsular FL, west to 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) P. Adams – RAB, GW, K, V, Y, Z; < *H. aspalathoides* Willdenow – S (also including *H. brachyphyllum*)]

Hypericum tetrapetalum Lamarck. Cp (GA): wet pinelands and in depressional wetlands (open or dominated by *Taxodium ascendens*); uncommon. E. GA (within a few counties of se. SC), south to s. FL, west to panhandle FL. [= GW, K, V, X, Y; = *Ascyrum tetrapetalum* (Lamarck) Vail – S]

Hypericum virgatum Lamarck. Pd, Mt (GA, NC, SC, VA), Cp (GA, SC): woodlands, rock outcrops, woodland borders; common (VA Watch List). 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 species 1* for additional discussion. [= K; < *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; < *H. denticulatum* – GW; < *H. acutifolium* Elliott – S (also see *H. harperi*); = *H. denticulatum* ssp. *acutifolium* (Elliott) N. Robson – X]

Hypericum ascyron Linnaeus ssp. *pyramidatum* (Aiton) N. Robson, American Great St.-John's-wort. The species is of e. North America and e. Asia; ssp. *pyramidatum* occurs from Québec west to MN, south to s. PA (Rhoads & Klein 1993), MD (Robson 2000), and WV (Kartesz 1999). [= X; < *H. ascyron* Linnaeus – K; = *H. pyramidatum* Aiton – C, F, G] {not keyed at this time} {section *Roscyna*}

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, X, Y, Z; < *H. fasciculatum* – S; = *H. arborescens* Chapman]

Hypericum dolabriforme Ventenat, Glade St. John's-wort. Mt (GA): limestone glades and barrens; rare (GA Special Concern). 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 keyed at this time}

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, Y, Z; = *H. nitidum* Lamarck ssp. *exile* (W.P. Adams) N. Robson – X]

Hypericum lissophloeus W.P. Adams. Margins of sinkhole ponds. Endemic to Panhandle FL (Bay and Washington counties). [= GW, K, V, X, Y, Z]

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 keyed at this time}

Hypericum majus (A. Gray) Britton. South to nw. PA (Rhoads & Klein 1993), NJ, DE, and OH (Kartesz 1999). [= C, F, G, K, X] {not keyed at this time}

Hypericum species 3 J. Allison, Georgia St, John's-wort. Cp (GA): seepage bogs, roadside ditches; rare (GA Special Concern). Apparently endemic to the Altamaha Grit region of the GA Coastal Plain. {not keyed at this time}

Hypericum sphaerocarpum Michaux, Barrens St. John's-wort. Mt (GA): limestone barrens; rare (GA Special Concern). 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 keyed at this time}

Triadenum Rafinesque (Marsh St-John's-wort)

A genus of 6-10 species, herbs, of e. North America and e. Asia. Although *Triadenum* has sometimes formerly been included in *Hypericum*, Robson (1977) and others consider it to be more closely related to the tropical Asian shrub *Cratoxylum* Blume. References: Adams (1973)=Z.

1 Leaves narrowed to the cuneate or broadly cuneate (rarely truncate) base.
  2 Lower leaves sessile; sepals acute; leaves lacking translucent or dark glands or punctae ..... ***T. tubulosum***
  2 Lower leaves petiolate; sepals obtuse; leaves with translucent glands and dark punctae ..... ***T. walteri***
1 Leaves clasping, cordate, or subcordate at the base.
  3 Sepals 2.5-5 mm long at maturity, obtuse or acute; styles 0.5-1 (-1.5) mm long (best seen in fruit) ..... ***T. fraseri***
  3 Sepals 5-8 mm long at maturity, acute or acuminate; styles 1.8-3 mm long (best seen in fruit) ..... ***T. virginicum***

Triadenum fraseri (Spach) Gleason, Marsh St.-John's-wort. Mt (NC, VA): bogs, peaty wetlands; rare (VA Rare). July-August. Newfoundland and Québec 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. [= C, G, K; = *Hypericum virginicum* Linnaeus var. *fraseri* (Spach) Fernald – F; < *T. virginicum* – W, Z, in part; = *Hypericum fraseri* Spach]

Triadenum tubulosum (Walter) Gleason, Marsh St.-John's-wort. Cp (GA, NC, SC, VA), Pd (VA): bogs, peaty wetlands, drawdown sloughs along rivers; uncommon (GA Rare, VA Rare). August-September. Se. VA south to n. FL, west to LA, and north in the interior to se. and c. TN, s. IL and s. OH. [= C, G, GW, K, Z; = *Hypericum tubulosum* Walter – RAB; = *Hypericum tubulosum* Walter var. *tubulosum* – F; = *T. longifolium* Small – S]

Triadenum virginicum (Linnaeus) Rafinesque, Marsh St.-John's-wort. Cp, Mt (GA, NC, SC, VA), Pd (GA, VA): bogs, peaty wetlands; common (rare in Mountains and Piedmont). July-September. Nova Scotia west to OH and s. Ontario, south to FL and MS, mostly on the Coastal Plain but scattered inland. [= C, G, GW, K, S; = *Hypericum virginicum* Linnaeus – RAB; = *Hypericum virginicum* var. *virginicum* – F; < *T. virginicum* – W, Z, in part only (also see *T. fraseri*)]

Triadenum walteri (J.G. Gmelin) Gleason, Marsh St.-John's-wort. Cp, Pd, Mt (GA, NC, SC, VA): swamp forests and marshes; common (uncommon in VA Piedmont, rare in VA Mountains). August-September. MD south to n. FL, west to e. TX, north in the interior to s. MO, s. IL, and OH. [= C, G, GW, K, W, Z; = *Hypericum walteri* J.G. Gmelin – RAB; = *Hypericum tubulosum* Walter var. *walteri* (J.G. Gmelin) Lott – F; = *T. petiolatum* (Walter) Britton – S]

ILLICIACEAE A.C. Smith 1947 (Star-anise Family)

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 and Winteraceae. 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: Vincent in FNA (1997); 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; [section *Illicium*] ..... ***I. floridanum***
1 Flowers 0.8-1.2 cm across; tepals 11-16, yellowish green; leaf tips obtuse or rounded; [section *Cymbostemon*]..... ***I. parviflorum***

Illicium floridanum Ellis, Florida Star-anise. Cp (GA): acid ravines and small stream swamps; rare (GA Endangered). Sw. GA west to e. LA. [= FNA, GW, K, S]

* ***Illicium parviflorum*** Michaux ex Ventenat, Swamp Star-anise, Yellow Anise-tree. Cp (GA): cultivated and persistent; rare (GA Special Concern). 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. [= FNA, K, S]

ITEACEAE J. Agardh 1858 (Sweetspire Family)

A family of 1 genus and about 20 species, shrubs, of e. Asia, e. North America, and Mexico.

Itea Linnaeus (Virginia-willow, Sweetspire, Tassel-white)

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. The remainder of the genus (about 20 species) is found in e. Asia and w. Malaysia; the only close relative of our species is *I. japonica* Oliver, of Japan. References: Spongberg (1972); Morgan & Soltis (1993); Bohm et al. (1999).

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 *Leucothoe racemosa* in vegetative condition.

Itea virginica Linnaeus, Virginia-willow, Sweetspire, Tassel-white. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC): moist forests and thickets, especially along the banks of small streams; common (uncommon in Piedmont and Mountains). May-June. S. NJ south to FL and west to e. TX, north in the interior (especially in the Mississippi Embayment) to s. IL and se. MO. [= RAB, C, F, K, G, GW, S, W]

JUGLANDACEAE A. Richard ex Kunth 1824 (Walnut Family)

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 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***
1 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. alba, C. carolinae-septentrionalis, C. glabra, C. laciniosa, C. myristiciformis, C. ovalis, C. ovata, C. pallida*). 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. alba* 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).

Note that 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. For testing, we present here a plausible middle ground treatment in the key and species accounts (4 taxa). 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 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 elongate, flattened, 9-19 mm long, bright orangy 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.
    3 Leaves with (7-) 9-11 (-13) leaflets; 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 11-19 leaflets; 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 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.
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.
6 Twigs stout; terminal buds 8-20 mm long; leaves with (5-) 7-9 (-11) leaflets; lower surface of leaflets 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 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. alba***
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***
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 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.
9 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, e. SC, and GA] ..... ***C. myristiciformis***
9 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].
10 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***
10 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, and perhaps AL, GA, and western KY and TN, of upland or lowland, acidic or calcareous forests and woodlands] ..... **[*C. texana*]**
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).
11 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***
11 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.
12 Rachis (and also often the petiole and lower surfaces of leaflets) densely pubescent..... ..... ***C. glabra*** *var*. ***hirsuta***
12 Rachis, petiole, and lower surfaces of leaflets glabrous or glabrescent.
13 Husk of fruit 1.5-2.5 mm thick; fruit ellipsoidal, subglobose, to obovoid, 1.5-3.5 cm long; terminal leaflet usually 8-17 cm long; [primarily of the Piedmont and Mountains] .... ***C. glabra*** *var*. ***glabra***

13 Husk of fruit about 3.5 mm thick; fruit pyriform, 2.5-5 cm long; terminal leaflet usually 20-25 cm long; [primarily of the Coastal Plain] ..... ***C. glabra* var. *megacarpa***

Carya alba (Linnaeus) Nuttall ex Elliott, Mockernut Hickory, White Hickory. Pd, Cp, Mt (GA, NC, SC, VA): forests and woodlands; common. April-May; October. MA west to IN and IA, south to 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." However, *C. alba* has not been officially rejected, its application appears to be nomenclaturally clear, and there is no alternative under the International Code of Botanical Nomenclature (Greuter 1988) to its use. For further discussion see Rehder (1945), Howard & Staples (1983), and Wunderlin, Hansen, & Hall (1985). [= K; = *C. tomentosa* (Lamarck ex Poiret) Nuttall – RAB, C, F, FNA, G, W; = *Hicoria alba* (Linnaeus) Britton – S]

Carya aquatica (Michaux f.) Nuttall, Water Hickory, Bitter Pecan. Cp (GA, NC, SC, VA), Pd (GA, SC): swamp forests, where flooded during the winter months; uncommon. April-May; October. Se. VA south to c. peninsular FL, west to e. TX, north inland to se. MO, s. IL, and se. OK. [= RAB, C, F, FNA, G, GW, K; = *Hicoria aquatica* (Michaux f.) Britton – S]

Carya carolinae-septentrionalis (Ashe) Engler & Graebner, Carolina Shagbark Hickory, Carolina Hickory. Pd (GA, NC, SC, VA), Mt (GA): upland flats, especially those weathered from mafic rocks and with shrink-swell soils dominated by montmorillonitic clays, less typically on slopes and bottomlands; uncommon (rare in VA). 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. Mt, Pd, Cp (GA, NC, SC, VA): forests and woodlands, especially in rich, moist alluvial or slope forests; common. April; October. ME and s. Québec west to MN and NE, south to panhandle FL and e. TX. [= RAB, C, F, FNA, G, GW, K, W; = *Hicoria cordiformis* (Wangenheim) Britton – S]

Carya glabra (P. Miller) Sweet *var.* ***glabra***, Pignut Hickory. Mt, Pd, Cp (GA, NC, SC, VA): forests and woodlands; common. April-May; October. *C. glabra* ranges from s. NH west to s. MI, se. IA, and se. KS, south to c. peninsular FL and e. TX; the ranges of the varieties are poorly known. [= F, G; < *C. glabra* – RAB, C, FNA, GW, K; < *C. glabra* var. *glabra* – W; = *Hicoria glabra* (P. Miller) Britton var. *glabra* – S]

Carya glabra (P. Miller) Sweet *var.* ***hirsuta*** (Ashe) Ashe, Hairy Pignut Hickory. Mt, Pd? (GA, NC, SC, VA): forests and woodlands; common? April-May; October. Var. *hirsuta* is apparently primarily Appalachian, variously described as being endemic to the Southern Appalachians or ranging north to s. NH. It needs additional taxonomic assessment. [< *C. glabra* – RAB, C, FNA, GW, K; = *C. ovalis* (Wangenheim) Sargent var. *hirsuta* (Ashe) Sargent – F; = *Hicoria glabra* (P. Miller) Britton var. *hirsuta* Ashe – S; < *C. glabra* var. *glabra* – W]

Carya glabra (P. Miller) Sweet *var.* ***megacarpa*** (Sargent) Sargent, Coastal Pignut Hickory. Cp (GA, NC, SC, VA?): maritime forests and other forests of the outer Coastal Plain; uncommon? April-May; October. Var. *megacarpa* is apparently primarily a tree of the se. United States Coastal Plain, ranging from s. NY south to FL, west to TX, and north in the interior to s. IL. It needs additional taxonomic assessment. [= F, G; < *C. glabra* – RAB, C, FNA, GW, K; ? *Hicoria austrina* Small – S]

* ***Carya illinoinensis*** (Wangenheim) K. Koch, Pecan. Cp, Pd (GA, NC, SC, VA): persistent around dwellings and in pecan orchards, escaped to suburban woodlands, rural forest edges and floodplains; commonly cultivated, rarely naturalized. 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; = *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. Mt (GA), Cp, Pd (NC): moist, circumneutral, alluvial levee forests along brownwater rivers of the Coastal Plain (NC), streams of the Piedmont (NC) and Mountains (GA); rare (NC Rare). April-May; October. NY and s. Ontario 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.) Nuttall, Nutmeg Hickory. Cp (GA, NC, SC): nonriverine swamps over calcareous substrates, including calcareous clays and coquina limestone ("marl"), oak flatwoods; rare (GA Special Concern, NC Threatened, SC Rare). 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. Mt, Pd, Cp (GA, NC, SC, VA): forests and woodlands; common. 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. Mt (GA, NC, VA), Pd, Cp (NC, VA): rich moist bottomlands, slopes, occasionally on dry upland flats; uncommon. May; October. S. ME and s. Québec 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. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): dry sandy or rocky forests and woodlands; common. April-May; October. S. NJ south to 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. Reported to occur as far east as KY, TN, and GA (Kartesz 1999), an eastern extent not reported by FNA, which accepts it as far east as MS. 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]

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 & Hardin in SE (in prep.); 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), Pd (NC, SC, VA), Cp (VA): moist, nutrient-rich forests; uncommon (US Species of Concern, GA Special Concern, NC Watch List, SC Rare, VA Watch List). April-May; October. New Brunswick 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; = *Wallia cinerea* (Linnaeus) Alefeld – S]

Juglans nigra Linnaeus, Black Walnut. Mt, Pd, Cp (GA, NC, SC, VA); moist, nutrient-rich forests; common (uncommon in the Coastal Plain of NC and SC). April; October. MA west to MN, south to nw. 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; = *Wallia nigra* (Linnaeus) Alefeld – S]

KRAMERIACEAE Dumortier 1829 (Krameria Family)

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 to South America. References: Robertson (1973); Simpson et al. (2004).

Krameria Linnaeus (Ratany)

A genus of about 15 species, herbs, shrubs, and trees, hemiparasitic by haustoria. References: Robertson (1973)=Z.

Krameria lanceolata Torrey, Trailing Ratany, Sandspur. Cp (GA): sandhills; uncommon. AR, TX, and s. KS west to se. CO, se. AZ, Chihuahua, and Coahuila; disjunct eastward in the Coastal Plain of FL and GA (east to Bulloch, Bryan, Evans, and Emanuel counties, GA). [= K, Z; > *K. spathulata* Small – S]

LAMIACEAE Lindley 1836 ***or LABIATAE*** A.L. de Jussieu 1789 (Mint Family)

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).

subfamily Viticoideae: *Vitex*.

subfamily Ajugoideae: *Ajuga, Clerodendrum, Teucrium, Trichostema*.
subfamily Scutellarioideae: *Scutellaria*.
subfamily Lamioideae: *Galeopsis, Lamiastrum, Lamium, Leonurus, Macbridea, Marrubium, Physostegia, Sideritis, Stachys, Synandra*.
subfamily Nepetoideae:
tribe Elsholtzieae: *Collinsonia, Elsholtzia, Mosla, Perilla.*
tribe Mentheae:
subtribe Salviinae: *Rosmarinus, Salvia*.
subtribe Menthinae: *Blephilia, Clinopodium, Conradina, Cunila, Dicerandra, Hedeoma, 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*.
incertae sedis: *Callicarpa*.

Acinos
(see *Clinopodium*)

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 nepetoides (Linnaeus) Kuntze, Yellow Giant-hyssop. Pd (NC, SC, VA), Cp (NC, VA), Mt (GA, NC, VA): woodlands and forests, generally over calcareous or mafic rocks; uncommon (GA Special Concern, NC Watch List). 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), Pd (NC, VA): rich woodlands and forests, bottomlands; uncommon (GA Special Concern). 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]

* *Agastache foeniculum* (Pursh) Kuntze, Lavender Giant-hyssop, native of w. North America, is cultivated as an ornamental and naturalized in scattered locations in PA (Rhoads & Klein 1993), KY (Kartesz 1999), and elsewhere. [= C, F, G, K]

Ajuga Linnaeus (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, introduced. May-September. [= C, F, G, K]
* ***Ajuga reptans*** Linnaeus, Carpet Bugle. Pd, Mt (NC, VA), Cp (VA): lawns and roadsides; commonly cultivated, uncommonly established. March-June. [= RAB, C, F, G, K]

* *Ajuga genevensis* Linnaeus, Standing Bugle, is cultivated and rarely escaped in ne. North America, at least as far south as PA (Rhoads & Klein 1993) and MD (Kartesz 1999). [= C, F, G, K]

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, Mt (GA, NC, SC, VA), Cp (NC, SC, VA): woodlands, meadows, forests, usually in circumneutral soils (over diabase, limestone, etc.); uncommon. 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, Pd (NC, VA), {GA}: rocky or alluvial forests, montane forests up to at least 5000 feet elevation; common (VA Watch List). Late June-October; August-November. Québec 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 is endemic (so far as is known) to the Cumberland Plateau of nc. AL (Jackson and Madison counties). [= K, Z]

Calamintha
(see *Clinopodium*)

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 (GA, NC, SC, VA), Pd, Mt (GA, NC, SC): maritime forests, other forests (especially with sandy or rocky soils), disturbed areas; common (rare in Mountains). June-July; August-October (persisting into the winter). MD and AR south to FL, TX, Mexico; West Indies. [= RAB, C, F, G, K, S, W]

* ***Callicarpa dichotoma*** (Loureiro) K. Koch, Chinese Beautyberry. Pd (NC, VA), Cp, Mt (NC), {SC}: roadsides, powerline rights-of-way, woodland edges, suburban woodlands, bogs; uncommon, native of Asia. September-November. This species is beginning to spread more rapidly in the Southeast. [= RAB, C, K]

* ***Callicarpa japonica*** Thunberg, Japanese Beautyberry. Pf (NC): suburban woodlands; rare, native of e. Asia. Reported for Durham Co., NC by Moldenke (1980); corroborated by specimens from Orange County, NC in 2005. [= K, Z]

Chaiturus Willdenow 1787

* ***Chaiturus marrubiastrum*** (Linnaeus) Reichenbach, Horehound Motherwort. Mt, Pd (VA): disturbed areas; rare, introduced from Europe and n. Asia. June-September. [= K; = *Leonurus marrubiastrum* Linnaeus – C, F, G, S]

Clerodendrum Linnaeus (Glory-bower)

A genus of about 400-500 species, trees and shrubs, mostly tropical and warm temperate, e. and w. hemispheres. References: Steane et al. (1999); Hsiao & Lin (1995); Steane, de Kok, & Olmstead (2004); Harley et al. in Kadereit (2004).

* ***Clerodendrum bungei*** Steudel. Pd (GA, SC), Cp (GA): roadsides and suburban woodlands; rare, introduced from e. Asia. August-September. First reported from South Carolina by Hill & Horn (1997); also reported for our area by W. Duncan (pers. comm.). [= K]

* ***Clerodendrum indicum*** (Linnaeus) Kuntze, Tubeflower, Turk's-turban. Cp (GA, SC): disturbed areas, roadsides; rare, introduced from the Malaysian Archipelago. August-October; November-December. [= K; = *Clerodendron indicum* – RAB, orthographic variant]

* ***Clerodendrum trichotomum*** Thunberg *var.* ***ferrugineum*** Nakai, Harlequin Glory-bower. Pd, Mt (NC), {GA}: roadsides, streambanks; rare, cultivated and strongly naturalized, native of e. Asia. [= K]

* *Clerodendrum chinense* (Osbeck) Mabberley, Stickbush, is cultivated and naturalized in FL, including the Panhandle (Escambia County) (Wunderlkin & Hansen 2004). [= K; ? *C. japonicum* (Thunberg) Sweet var. *pleniflorum* (Schauer) Maheshwari]

* *Clerodendrum japonicum* (Thunberg) Sweet is also cultivated and may be encountered in our area. It is naturalized in MD (Staff of the Bailey Hortorium 1976). [= K]

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 Plant a shrubby perennial, not flowering the first year; [of sandy or rocky habitats of the Coastal Plain and Piedmont, from s. NC southward].
  2 Corolla bright scarlet, 27-50 mm long; calyx 8-18 mm long ..... ***C. coccineum***
  2 Corolla light lavender or pink with darker spots, 10-20 mm long; calyx 6.0-7.5 mm long.
    3 Leaves ovate or elliptic, sharply serrate, not revolute; leaves distinctly petioled; leaf surfaces glabrous ..... ***C. georgianum***
    3 Leaves linear to linear-elliptic, entire, strongly revolute; leaves subsessile; leaf surfaces minutely and densely pubescent ..... ***C. ashei***
1 Plant an herbaceous to suffrutescent perennial, often flowering the first year; [of various habitats, collectively widely distributed in our area].
  4 Stem glabrous or pubescent at the nodes only; leaves of flowering stems linear to oblanceolate; [native, of limestone glades, barrens, and bluffs].
    5 Plant stoloniferous, bearing leafy stolons with ovate leaves; leaves of the flowering stems 1-2 cm long, 1-5 mm wide, entire ..... ***C. arkansanum***
    5 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]***
  4 Stem pubescent; leaves of flowering stems elliptic to ovate; [alien or native, generally of disturbed or weedy situations].
    6 Axillary flower clusters sessile, dense.
      7 Whorls with 8 or fewer flowers; calyx 4.5-7 mm long; corolla 7-10 mm long ..... ***C. acinos***
      7 Whorls with > 8 flowers; calyx 7-10 mm long; corolla 12-22 mm long ..... ***C. vulgare***
    6 Axillary flower clusters 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***

* ***Clinopodium acinos*** (Linnaeus) Kuntze, Mother-of-thyme, Basil-thyme. Mt (VA): cultivated, rarely escaped or persisting; rare, introduced from 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). Ontario 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*** (Jord.) Samp., Common Calamint. Cp (VA): rich calcareous slope; rare, introduced from Europe. August. [= *Calamintha sylvatica* Bromf. ssp. *ascendens* (Jord.) 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 (GA Threatened). Peninsular FL and disjunct in e. GA (Candler and Tatnall counties). [= K, S, Y; = *Calamintha ashei* (Weatherby) Shinners – Z; = *Satureja ashei* Weatherby]

* ***Clinopodium calamintha*** (Linnaeus) Stace, Lesser Calamint, Basil-thyme. Mt, Pd, Cp (NC, VA), {GA}: disturbed areas; common (rarer in NC), introduced from 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* (Jord.) 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 (GA): sandhills and flatwoods; uncommon. E. GA south to FL and west to s. MS. [= K, S, Y; = *Calamintha coccinea* (Nuttall ex Hooker) Bentham – Z; = *Satureja coccinea* (Nuttall ex Hooker) Bertolini]

Clinopodium georgianum Harper, Georgia Calamint. Cp, Pd (GA, NC, SC): longleaf pine sandhills, dry rocky woodlands; rare (NC Rare). July-September. S. NC south to Panhandle FL and west to LA. [= K, S, Y; = *Satureja georgiana* (Harper) Ahles – RAB; = *Calamintha georgiana* (Harper) Shinners – Z]

Clinopodium vulgare Linnaeus, Wild Basil. Mt, Pd, Cp (NC, VA): pastures, roadbanks, forests, thin soils around rock outcrops; common. July-September. Newfoundland to Manitoba, 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 brownei (Swartz) Kuntze, Browne's Savory. Cp (GA, SC): floodplain forests, pondshores; rare (GA Special Concern). 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* (Sw.) Bentham var. *pilosiuscula* A. Gray – GW, X] {not keyed at this time}

Clinopodium dentatum (Chapman) Kuntze, of GA and Panhandle FL. [= K; = *Satureja dentata* (Chapman) Briquet; = *Calamintha dentata* Chapman] {not keyed at this time; add to synonymy}

Clinopodium glabellum (Michaux) Kuntze. Dry-mesic to mesic shaley forests, limestone barrens of c. KY, c. TN, MO, AR, and c. AL. 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, introduced in s. AL, FL, LA (Kartesz 1999; Woods, Diamond, & Searcy 2003) and MS (S.W. Leonard, pers. comm. 2005). [= K] {not keyed at this time; add to synonymy}

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; [of 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, Cp (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, 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, Pd, Cp (GA, NC, SC, VA): cove forests, rich forests, especially over calcareous or mafic substrates; common. Late July-September; September-October. Québec, MI, and WI south n. FL and LA. [= RAB, C, F, G, K, S, W, Z; < *C. canadensis* – Y (also see *C. tuberosa*)]

Collinsonia punctata Elliott, Florida Horsebalm. Cp (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, Z]

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 (NC Rare, SC Rare, VA Rare). Late April-early June; June-July. S. 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]

Conradina A. Gray 1870

A genus of 6 species, shrubs and suffrutescent herbs, of temperate se. North America. References: Shinners (1962)=Z; Harley et al. in Kadereit (2004).

1 Leaves densely gray-pubescent above and below ..... ***[C. canescens]***
1 Leaves green above, glabrous or inconspicuously short-pubecsent.
  2 Plants upright to 8 dm tall; calyx tube glabrous or minutely and inconspicuously puberulent; [of the Coastal Plain of Panhandle FL and s. AL] ..... ***[C. glabra]***
  2 Plants decumbent, rooting at the nodes; calyx tube densely short-pubescent and also pilose with longer glandular hairs; [of the Cumberland Plateau of KY and TN] ..... ***[C. verticillata]***

Conradina canescens A. Gray, Gray Rosemary. Sandhills, scrub, flatwoods. January-May. Panhandle FL and s. AL west to s. MS. [= K, Z; > *C. canescens* – S; > *C. puberula* Small – S]

Conradina glabra Shinners, Apalachicola Rosemary. Sandhills. Panhandle FL and s. AL. [= K, Z]

Conradina verticillata Jennison, Cumberland Rosemary. Endemic to flood-scoured cobble bars of the Cumberland Plateau area of ne. TN and se. KY. It has an odor similar to rosemary, and showy purplish flowers. [= K, 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), Pd (NC, SC, VA), Cp (NC, VA): dry rocky slopes, other dry slopes; common (rare in NC Coastal Plain). 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; = *Mappia origanoides* (Linnaeus) House – S]

Dicerandra Bentham 1830

A genus of 9 species, herbs, endemic to se. North America. References: Huck (1987)=Z; Huck (1984)=Y; 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; [of 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; [of extreme s. GA south into e. Panhandle FL and ne. FL]..... ***D. linearifolia** var. **robustior***

Dicerandra linearifolia (Elliott) Bentham *var. **linearifolia***. Cp (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, Y, Z; < *D. linearifolia* – S]

Dicerandra linearifolia (Elliott) Bentham *var. **robustior*** R.B. Huck. Cp (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, Y, Z; < *D. linearifolia* – S]

Dicerandra odoratissima 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]

Dicerandra densiflora Bentham, reported for GA by Small (1933), but this report is apparently in error. Huck (1987) regards it as endemic to n. peninsular FL. October-early November. This taxon is tetraploid. [= K, S, Y, Z]

Dracocephalum Linnaeus 1753 (Dragon's-head)
(also see *Physostegia*)

A genus of about 45-70 species, herbs, of Eurasia and North America. References: Harley et al. in Kadereit (2004).

* ***Dracocephalum parviflorum*** Nuttall, Dragon's-head. Pd (NC): cultivated ground; rare, native west of the Appalachians. May-July; July-September. [= C, F, G, K; = *Moldavica parviflora* (Nuttall) Britton – RAB]

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): disturbed areas; rare, introduced from Asia. First reported for NC by Leonard (1971b). [= C, F, G, K]

Galeopsis Linnaeus 1753 (Hemp-nettle)

A genus of about 10 species, herbs, of Eurasia. References: Stace (1997)=Z; Harley et al. in Kadereit (2004). Key adapted from Stace (1997).

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): streamsides, pastures, roadsides; rare, introduced from Eurasia. July-frost. [= K, Z; < *G. tetrahit* – RAB, S; = *G. tetrahit* Linnaeus var. *bifida* (Boenninghausen) Lejeune & Courtois – C, F, G]

* *Galeopsis ladanum* Linnaeus var. *ladanum*, Red Hemp-nettle is naturalized in ne. North America, south at least to se. PA (Rhoads & Klein 1993) and may occur in our area. [= F, K; > *G. ladanum* Linnaeus var. *angustifolia* (Ehrhart ex Hoffmann) Wallroth – C, G, misappied]

* *Galeopsis tetrahit* Linnaeus, Common Hemp-nettle is naturalized in ne. North America and may occur in our area. Some of the material reported from our area may be this taxon. [= Z; = *G. tetrahit* var. *tetrahit* – C, F, G; > *G. tetrahit* var. *tetrahit* – K]

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, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): lawns, gardens, disturbed areas; common, introduced from Eurasia. Late March-June; May-July. [= C, K; = *Glecoma hederacea* – RAB, S, W, misspelled; > *G. hederacea* var. *hederacea* – F; > *G. hederacea* var. *micrantha* Moricand – F; > *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, Cp (GA): disturbed areas, pastures, granitic flatrocks; rare, apparently adventive from further south and west. Irving (1980) shows no collections of *H. hispida* closer to our area than e. panhandle FL, c. AL, nc. TN, and s. OH; it may be recently arrived in our area or previously overlooked. First reported for SC by Hill & Horn (1997). [= C, F, G, K, Z]

Hedeoma pulegioides (Linnaeus) Persoon, American Pennyroyal. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): dry soils of woodlands, roadbanks, woods-roads, especially common in shaly parts of the VA mountains; common (uncommon to rare in the Carolinas). Late July-October. Nova Scotia, s. Québec, s. Ontario, 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 repellant 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, Z]

Hedeoma drummondii Bentham. East to 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 Leaves lanceolate, narrowed to a narrowly cuneate, subpetiolar base; flowers borne in large, globose heads, 1.5-2.5 cm across, borne on peduncles 2-6 cm long ..... ***H. alata***
1 Leaves ovate, narrowed to a broadly cuneate to truncate base and well-developed petiole (4-6 cm long on larger leaves); flowers borne in irregular verticillate spikes, sessile to pedunculate on peduncles 1-2 mm long ..... ***H. mutabilis***

Hyptis alata (Rafinesque) Shinners, Musky Mint, Cluster Bushmint. Cp (GA, NC, SC): wet pine savannas, margins of swamp forests, wet powerline rights-of-way, ditches; common. Late June-September. Ne. NC south to FL, west to se. TX; also in the West Indies. [= RAB, GW, K; = *H. radiata* Willdenow – S]

Hyptis mutabilis (A. Richard) Briquet, Tropical Bushmint. Cp (GA, SC, VA); rare, perhaps only a waif, introduced from South America. This species is naturalized in disturbed wetlands from e. GA south to s. FL, west to se. LA. [= GW, K, S]

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. Introduced from Eurasia. July-October. [= RAB, C, F, G, K, S]

Isanthus Rafinesque
(see *Trichostema*)

Lamiastrum Heister ex Fabricius 1759 (Yellow Archangel)

A monotypic genus, an herb, of w. Europe to Iran, often included in *Lamium*. The generic name may be illegitimate. References: Mennema (1989)=Z; Harley et al. in Kadereit (2004).

* ***Lamiastrum galeobdolon*** (Linnaeus) Ehrendorfer & Polatschek, Yellow Archangel. Pd (VA): disturbed areas; rare, introduced from Europe and e. Asia. Several subspecies are recognized in Europe. [= K; = *Lamium galeobdolon* (Linnaeus) Linnaeus – Z; = *Galeobdolon luteum* Hudson]

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.....***[see Lamiastrum 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. (VA): disturbed areas; rare, introduced from 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. Cp, Pd, Mt (GA, NC, SC, VA): lawns, fields, roadsides, disturbed areas, gardens, pastures; common, introduced from Eurasia and n. Africa. January-December. [= Z; < *L. amplexicaule* – RAB, C, F, G, K, W]
* ***Lamium dissectum*** With., Cutleaf Dead-nettle. Mt (NC), Pd (VA): lawns, fields, roadsides, disturbed areas; rare, introduced from 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 maculatum*** Linnaeus, Spotted Dead-nettle. Pd, Mt (NC?, VA): lawns, fields, roadsides, disturbed areas; rare, introduced from Eurasia. April-September. [= RAB, C, F, G, K, Z]
* ***Lamium purpureum*** Linnaeus, Red Dead-nettle, Purple Dead-nettle. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): lawns, fields, roadsides, disturbed areas, pastures; common, introduced from Eurasia. March-October. Other varieties are found in the Old World. [= RAB, C, F, G, W; = *L. purpureum* var. *purpureum* – K, Z]

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, Pd (GA, NC, SC): pastures, disturbed areas; uncommon, introduced from s. Africa. Late August-October. [= Z; < *L. nepetifolia* – K; < *L. nepetaefolia* – RAB, S, orthographic variant]

Leonurus Linnaeus 1753 (Motherwort)

(also see ***Chaiturus***)

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.

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 (SC, VA), Mt (GA, VA), Cp (VA), {NC}: roadsides, pastures, disturbed areas; common, introduced from c. Asia. May-August; July-October. Nelson (1993) reports the occurrence of this species in SC. [= RAB, C, F, G, S, W; *? L. cardiaca* ssp. *cardiaca* – K]
* ***Leonurus sibiricus*** Linnaeus, Siberian Motherwort. Cp (VA): disturbed areas; rare, introduced from Asia. May-September. [= C, F, G, K, S]

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; [of the 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; [of the 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 (NC, SC, VA), Pd (NC, VA), Mt (GA, VA): marshes, bottomlands; common (GA Special Concern). June-November. Newfoundland west to British Columbia, south to FL and CA. [= RAB, C, GW, K, S, W, 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 (GA, NC, SC), Mt? (NC?), {VA}: clay-based Carolina bays, other moist habitats; uncommon (NC Watch List). June-November. MA south to FL; disjunct inland around the Great Lakes and (allegedly) in w. NC. [= RAB, C, GW, K, W, 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 (GA, NC, SC, VA): bogs, marshes; uncommon (NC Watch List). 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]

Lycopus cokeri Ahles ex Sorrie, Coker's Bugleweed, Carolina Bugleweed. Cp (NC, SC): sandhill pocosins, boggy streamheads, seepage bogs; uncommon (NC Watch List). 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 (NC, VA): marshes, ditches; uncommon, introduced from Europe. June-November. [= RAB, C, G, K, S, Z; > *L. europaeus* var. *europaeus* – F; > *L. europaeus* var. *mollis* (Kern.) Briq. – F]

Lycopus rubellus Moench, Stalked Bugleweed. Cp (GA, NC, SC, VA), Pd (NC, SC, VA), Mt (GA, VA): marshes, swamp forests, bottomlands; common. 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 (also see *L. angustifolius*); > *L. rubellus* – S; > *L. velutinus* Rydberg – S]

Lycopus uniflorus Michaux, Northern Bugleweed. Mt (NC, SC, VA), Pd (NC, VA): bogs, seeps, wet forests; common. July-October. Newfoundland west to AK, south to w. NC, AR, and CA. [= RAB, C, F, G, S, W, Z; < *L. uniflorus* – GW (also see *L. cokeri*); > *L. uniflorus* var. *uniflorus* – K]

Lycopus virginicus Linnaeus, Virginia Bugleweed. Cp, Pd, Mt (GA, NC, SC, VA): swamps, bottomlands, other wet habitats; common. July-November. MA west to PA, s. IN, MO, and OK, south to n. FL and e. TX. [= RAB, C, F, G, GW, K, S, W, Z]

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.

Macbridea Elliott ex 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 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 (US Species of Concern, GA Special Concern, NC Proposed Threatened). 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]

Macbridea alba Chapman, White Birds-in-a-nest, White Macbridea. Pine savannas. Panhandle FL. [= GW, K, S]

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), Pd (NC, SC, VA): fencerows, disturbed places; uncommon, introduced from Eurasia. Used for cough-syrups in folk medicine. [= RAB, C, F, G, K, S, W]

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): moist, rocky, forested slopes; uncommon (NC Rare, VA Watch List). Late May-June; June-July. A Central and Southern Appalachian endemic: sw. PA and OH south to nw. NC and ne. TN. [= RAB, C, F, G, K, S, W]

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, Pd (NC, SC, VA), Cp (VA): disturbed areas; rare, introduced from 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 (1997)=Z; Harley et al. in Kadereit (2004). Key largely adapted from C and Stace (1997).

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*** *var.* ***arvensis***
3 Leaves subtending the inflorescence mostly cuneate at the base; leaves of the inflorescence relatively broad; [native, though often in weedy situations] ..... ***M. arvensis*** *var.* ***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***
5 Pedicels and clayx glabrous, leaves glabrous or nearly so; plants usually sterile..... ***M. ×piperita*** *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 min 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***
7 Calyx tube pubescent; leaves moderately to densely hairy on the lower surface.
9 Leaves 2-3× as long as wide, broadly cuneate to rounded at the base; leaf serrations sharp; leaf surface nearly planar..... ***M. longifolia***
9 Leaves 1-2× as long as wide, broadly roundec to subcordate at the base; leaf serrations rounded; leaf surface strongly rugose..... ***M. suaveolens***

[Note: The distribution, habitats, phenology, and abundance of all *Mentha* species need herbarium investigation]

* ***Mentha aquatica*** Linnaeus, Water Mint, Lemon Mint. {NC, VA} introduced from Europe. [= C, F, G, S, Z; < *M. aquatica* – K (also see *Mentha ×citrata*)]

Mentha arvensis Linnaeus *var.* ***canadensis*** (Linnaeus) Kuntze, Canada Mint. {NC, VA} [= C; *? M. arvensis* – RAB, misapplied; *? M. gentilis* Linnaeus – RAB; = *M. arvensis* var. *villosa* (Bentham) S.R. Stewart – F; > *M. arvensis* var. *glabrata* (Bentham) Fernald – G; > *M. arvensis* var. *lanata* Piper – G; = *M. canadensis* Linnaeus – S; = *M. arvensis* Linnaeus ssp. *canadensis* (Linnaeus) H. Hara*; < M. arvensis* – K]

* ***Mentha ×gracilis*** Sole (pro sp.) [*Mentha arvensis* × *spicata*], Spearmint. {NC, SC, VA}: introduced from Europe. [= K, Z; *? M. cardiaca* (S.F. Gray) Gerarde ex Baker – RAB; *? M. gentilis* Linnaus (pro sp.) – C; > *M. cardiaca* – F, G; > *M. gentilis* Linnaeus – F]

* ***Mentha longifolia*** (Linnaeus) Linnaeus, Horse Mint. {VA} Introduced from Europe. [= RAB, C, G; > *M. longifolia* (Linnaeus) Hudson var. *longifolia* – F; > *M. longifolia* var. *undulata* (Willdenow) Fiori & Paoletti – F]

* ***Mentha ×piperita*** Linnaeus (pro sp.) *var.* ***citrata*** (Ehrhart) Briq. (pro sp.) [*Mentha aquatica ×spicata*], Lemon Mint. {VA} introduced from Europe. [= Z; = *M. ×citrata* Ehrhart – C; = *M. citrata* – F, G, S; < *M. aquatica* – K]

* ***Mentha ×piperita*** Linnaeus (pro sp.) *var.* ***piperita*** [*Mentha aquatica* × *spicata*], Peppermint. {GA, NC, SC, VA} introduced from Europe. [= C, K, Z; = *M. piperita* – RAB, G, S; > *M. piperita* – F; > *M. crispa* Linnaeus – F]

* ***Mentha ×rotundifolia*** (Linnaeus) Hudson [*Mentha longifolia* × *suaveolens*]. {GA, NC, SC, VA} [= C, K; = *M. rotundifolia* – G, S]

* ***Mentha spicata*** Linnaeus, Spearmint. {GA, NC, SC, VA} introduced from Europe. [= RAB, C, F, G, K, S, Z]

* ***Mentha suaveolens*** Ehrhart, Apple Mint, Pineapple Mint, Round-leaved Mint. {NC, SC} introduced from Europe. [= C, K, Z]

* *Mentha arvensis* Linnaeus var. *arvensis*, Field Mint. introduced from Europe. [= C, F, G; = *M. arvensis* Linnaeus – S, Z; = *M. arvensis* ssp. *arvensis; < M. arvensis* – K]

* *Mentha pulegium* Linnaeus, European Pennyroyal, introduced in MD, PA, and NJ (Kartesz 1999). [= C, G, K] {not keyed at this time}

* *Mentha ×villosa* Hudson (pro sp.) [*Mentha spicata* × *suaveolens*]. Introduced south to PA and KY. [= C, K; *? M. alopecuroides* Hull – F]

Micromeria Bentham
(see *Clinopodium*)

Moldavica
(see *Dracocephalum*)

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, lavendar, 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 lavendar, 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 (GA, SC): disturbed places: rare, introduced from a native range centered in TX. June-July; July-August. [= Y; < *M. citriodora* – RAB, F, G; = *M. citriodora* ssp. *citriodora* var. *citriodora* – K; *? M. dispersa* – S; = *M. citriodora* ssp. *citriodora* – Z]

Monarda clinopodia Linnaeus, Basil Bergamot. Mt, Pd (NC, SC, VA): mesic, forested slopes; common. 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), Pd (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 (where introduced only) (SC Rare). 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, Y, Z; < *M. didyma* – RAB (also see *M. media*)]

Monarda fistulosa Linnaeus *var.* ***brevis*** Fosberg & Artz, Smoke Hole Bergamot, Cedar Glade Bergamot. Mt (VA): limestone outcrops, cliffs, barrens, and glades, and on limestone talus; rare (US Species of Concern). June-August; July-October. Apparently endemic to w. VA 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.). [= X, Y; = *M. fistulosa* ssp. *brevis* (Fosberg & Artz) Scora, comb. nov. ined. – K; < *M. fistulosa* – W]

Monarda fistulosa Linnaeus *var.* ***fistulosa***, Appalachian Bergamot. Mt, Pd (NC, VA): moist wooded slopes, roadsides, woodland edges, old fields; common. 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, 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, Pd (NC, SC), {GA, VA}: moist wooded slopes; common. June-September; August-October. See comments under var. *fistulosa*. ME west to MN, south to GA, AL, and se. TX. [= F, 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 (NC), {GA, VA}: grassy balds, moist slopes, mostly at high elevations; rare (NC Watch List). 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 (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 (NC Watch List). 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, Pd, Mt (GA, NC, SC, VA): maritime forests, dunes, roadsides, rocky or sandy woodlands; common, uncommon in Piedmont and Mountains. Late July-September; September-October. [= C, F, Y; < *M. punctata* – RAB, S, W; = *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 n. IN and s. MO. [= 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 keyed at this time; synonymy incomplete}

Monarda russeliana Nuttall ex Sims, White Beebalm. East to AL and KY. [= G, K; < *M. russeliana* – C, F (also see *M. bradburiana*)] {not keyed at this time; synonymy incomplete}

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): disturbed areas; rare, introduced from 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]

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), Pd (NC, VA), Cp (NC, SC, VA): fencerows, barnyards, disturbed areas; uncommon, introduced from Eurasia. [= RAB, C, F, G, K, S, W]

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, 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, introduced from tropical Asia and tropical Africa. [= C, G, K, S]

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): cultivated in gardens, persistent around gardens or as a waif; commonly cultivated, rarely persistent, introduced from Eurasia. July-September. [= RAB, C, G, K, S]

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, Mt, Cp (GA, NC, SC, VA): moist disturbed areas; common, introduced from 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; > *P. frutescens* var. *frutescens* – F, K; > *P. frutescens* (Linnaeus) Britton var. *crispa* (Bentham) Deane]

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. ..... ***Ph. 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 sharple serrate ..... ***Ph. 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 ..... ***[Ph. 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 ..... ***Ph. 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..... ***Ph. 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) ..... ***Ph. 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 flowers; flowers (16-) 18-37 mm long ..... ***Ph. 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 flowers; flowers (13-) 14-28 mm long ... ***Ph. virginiana*** *ssp.* ***virginiana***
4 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..... ***[Ph. 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..... ***Ph. 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 ..... ***Ph. 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)..... ***Ph. virginiana*** *ssp.* ***virginiana***

Physostegia angustifolia Fernald, Narrowleaf Obedient-plant. Cp (GA): calcareous openings; rare (GA Special Concern). Sw. GA and AL west to KS and TX. [= GW, K, Z]

Physostegia leptophylla Small, Tidal Marsh Obedient-plant, Swamp Obedient-plant. Cp (GA, NC, SC, VA): bottomland hardwood forests, swamps, tidal freshwater or slightly brackish (oligohaline) marshes, rarely wet savannas (GA); uncommon (GA Threatened, SC Rare, VA Watch List). 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, 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 (GA, NC, SC): wet savannas, savanna-swamp ecotones, ditches adjacent to former pinelands; uncommon. 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, 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, Pd, Cp (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]

Physostegia virginiana (Linnaeus) Bentham *ssp.* ***virginiana***, Northern Obedient-plant. Mt, Pd, Cp (NC, SC, VA), {GA}: 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 Québec west to Manitoba, 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]

Physostegia godfreyi Cantino, Apalachicola Dragonhead. Wet savannas and flatwoods, adjacent ditches. Endemic to Panhandle FL. [= GW, K, Z]

Physostegia intermedia (Nuttall) Engelmann & A. Gray. Il, KY, AR, and LA west to OK and TX. Also mapped as widespread in Coastal Plain of GA (Jones & Coile 1988); {investigate}. [= GW, K, Z; = *Dracocephalum intermedium* Nuttall]

Piloblephis Rafinesque 1838

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 (GA Special Concern). S. GA to s. peninsular FL. [= K; = *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, introduced from Eurasia. [= RAB, C, G, K, S]

Prunella vulgaris Linnaeus *var.* ***lanceolata*** (W. Barton) Fernald, American Self-heal. {Mt, Pd, Cp (NC, SC, VA): 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.} 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. {Mt, Pd, Cp (NC, SC, VA): 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. The possible recognition of var. *hispida* also needs assessment} Introduced from Eurasia. 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; > *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; [of 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; [plants from NC northward].....

.....***P. clinopodioides***

5 Leaves 1-2.5× as long as wide, coriaceous; stems and leaves glabrous; [plants from 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; 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; 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; [of the 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; [of 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; [of 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; [of the Mountains] ..... ***P. beadlei***

15 Longer calyx lobes 2.5-3 mm long; [of the 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 (NC, SC, VA), Pd (NC): forests, woodland borders; uncommon (GA Special Concern, VA Watch List). 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, Pd (NC, VA): forests, woodland borders; rare (NC Watch List, VA 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, 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 (GA Special Concern). 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 (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 n. FL, west to s. AL 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, Pd (NC, VA): forests and woodland borders; common (uncommon in NC). 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* – Z; = *P. incanum* (Linnaeus) Michaux ssp. *incanum*]

Pycnanthemum incanum (Linnaeus) Michaux *var.* ***puberulum*** (E. Grant & Epling) Fernald. Mt (NC, SC), 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 – Z]

Pycnanthemum loomisii Nuttall, Loomis's Mountain-mint. Pd, Mt (NC, SC, VA), Cp (NC, VA): forests and woodland borders; rare (VA Watch List). Late June-August; September-October. VA west to IL, south to n. FL. A diploid species (n = 19). [= C, K, Y, Z; < *P. incanum* – RAB; = *P. incanum* var. *loomisii* (Nuttall) Fernald – F; < *P. pycnanthemoides* var. *pycnanthemoides* – G; = *P. incanum* (Linnaeus) Michaux ssp. *loomisii* (Nuttall) Hamer]

Pycnanthemum monotrichum Fernald. Cp (VA): sandy woodlands; rare (VA 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 (NC, SC, VA): balds, woodlands, forests, and forest edges; uncommon (Va Watch List). 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, Cp, Pd (NC, SC, VA): bogs, wet meadows, moist to wet forests; common (uncommon in Piedmont). 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 (SC): wet pine flatwoods; rare. Se. SC south to n. 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, Z; = *Koellia nuda* (Nuttall) Kuntze – S]

Pycnanthemum pycnanthemoides (Leavenworth) Fernald *var.* ***pycnanthemoides***. Mt, 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; = *P. incanum* (Linnaeus) Michaux ssp. *pycnanthemoides* (Leavenworth) Hamer]

Pycnanthemum pycnanthemoides (Leavenworth) Fernald *var.* ***viridifolium*** Fernald. Mt, Pd (NC, SC, VA), Cp (NC, VA): forests and woodland borders; uncommon. July-August. VA and WV south to ec. GA and AL. A tetraploid species (n = 36). [= F, G, K; < *P. incanum* – RAB; < *P. pycnanthemoides* – C, Y; > *Koellia pycnanthemoides* (Leavenworth) Kuntze – S; > *Koellia dubia* (A. Gray) Small – S; = *P. viridifolium* (Fernald) E. Grant & Epling – Z; *P. incanum* (Linnaeus) Michaux ssp. *pycnanthemoides* (Leavenworth) Hamer]

Pycnanthemum setosum Nuttall. Cp (GA, NC, SC, VA): dry pinelands; uncommon (rare in VA) (NC Watch List, VA Rare). Mid June-August; August-October. NJ south to GA (FL?), on the Coastal Plain. 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, Y; > *P. setosum* – F, G; > *P. umbratile* Fernald – F, G; = *Koellia aristata* (Michaux) Kuntze – S; = *P. aristatum* Michaux – Z]

Pycnanthemum tenuifolium Schrader. Mt, Pd, Cp (GA, NC, SC, VA): bogs, wet meadows, moist to wet forests; common. 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, Y; = *P. flexuosum* – G, Z, misapplied; = *Koellia flexuosa* – S, misapplied]

Pycnanthemum torreyi Bentham, Torrey's Mountain-mint. Mt (NC, SC, VA), Pd, Cp (VA), {GA?}: dry rocky woodlands, over mafic, ultramafic, or calcareous rocks, dry powerline rights-of-way; rare (NC Rare, VA Rare). NH west to IL, south to NC.

A tetraploid and hexaploid species (n = 40 and ca. 60). [= 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 (NC, VA), Cp (VA): upland rocky woodlands; common. July-September. Var. *verticillatum* ranges from VT west to MI, south to NC and KY. Var. *pilosum* (Nuttall) Cooperrider ranges from s. Ontario 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). It should be sought in our area. 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 (NC, VA), Cp (VA?, NC?): wet meadows and marshes over calcareous or mafic rocks; uncommon (rare in VA Piedmont and VA Coastal Plain) (GA Special Concern, NC Watch List). 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. Pd (GA): open, mesic forests; rare (GA Special Concern). Reported for NC by Small, as *Koellia albescens*. It is known from nc. GA (Jones & Coile 1988). [= C, F, G, K; = *Koellia albescens* (Torrey & A. Gray) Kuntze – S] {not keyed at this time; synonymy incomplete}

Pycnanthemum floridanum E. Grant & Epling, north to e. GA. [= K] {not keyed at this time; synonymy incomplete}

Pycnanthemum verticillatum (Michaux) Persoon *var.* ***pilosum*** (Nuttall) Cooperrider. {GA}. In c. TN, and reported from a single county in e. TN (Chester, Wofford, & Kral 1997), in se. PA (Rhoads & Klein 1993), and WV (K99). [= C, K; = *P. pilosum* Nuttall – F, G; = *Koellia pilosa* (Nuttall) Britton – S] {not keyed at this time; synonymy incomplete}

Rosmarinus Linnaeus (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, Pd (NC, SC): gardens; commonly cultivated, rarely persistent or established, introduced from Mediterranean Europe. October-December. [= 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 lanceolate, linear, or narrowly elliptic, the base cuneate to attenuate.
  - 5 Leaves canescent, gray; [introduced, rarely persistent from cultivation in gardens] ..... ***S. officinalis***
  - 5 Leaves puberulent, green; [native, of dry woodlands from sc. NC southward and westward].
    - 6 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; [plants of Atlantic and Gulf Coastal Plain and adjacent piedmont, from south-central NC to central FL to southeast LA] ..... ***S. azurea*** *var.* ***azurea***
    - 6 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; [plants of inland and prairie sites, ranging from IL, IA, NE, and eastern CO south to nw. AL, ne. MS, LA, southeastern and central TX]..... ***S. azurea*** *var.* ***grandiflora***
- 4 Leaves rhombic-ovate, the base cordate, truncate, or broadly cuneate.
  - 6 Petiole not clearly differentiated from the leaf blade (leaf tissue decurrent on the petiole for most or all its length); corolla blue; [native, of woodlands] ..... ***S. urticifolia***
  - 6 Petiole clearly differentiated from the leaf blade; corolla blue, white, or scarlet; [introduced, weedy, rare].
    - 7 Corolla scarlet; larger leaves 3-6.5 cm long ..... ***S. coccinea***
    - 7 Corolla blue or whitish; leaves (8-) 12-20 cm long ..... ***S. sclarea***

Salvia azurea Michaux ex Lamarck *var.* ***azurea***, Azure Sage. Cp, Pd (GA, NC, SC), Mt (GA): sandy or rocky woodlands; common (NC Rare). Late August-October; October-November. S. NC south to panhandle FL, west to TX. [= K; < *S. azurea* – RAB, S]

*? ***Salvia coccinea*** P.J. Buchoz ex Etlinger, Scarlet Sage. Cp (GA, SC), Pd (GA): disturbed areas; rare, perhaps only introduced (at least in SC) from farther south and west. May-November. [= RAB, G, K, S]

Salvia lyrata Linnaeus, Lyreleaf Sage. Cp, Pd, Mt (GA, NC, SC, VA): lawns, roadsides, woodlands; common. April-May; May-July. CT west to MO, south to FL and TX. A common and familiar weed. [= RAB, C, F, G, K, S, W]

* ***Salvia officinalis*** Linnaeus, Garden Sage. Cp (VA): cultivated as a garden herb, rarely persistent; rare, introduced from Europe. [= C, F, G, K]

* ***Salvia pratensis*** Linnaeus, Meadow Sage, Meadow Clary. Cp (VA): fields and disturbed areas; rare, introduced from Europe. [= C, F, G, K]

* ***Salvia sclarea*** Linnaeus, Clary. Mt (NC?, VA): cultivated as a garden herb, rarely persistent; rare, introduced from Europe. [= C, G, K, S]

Salvia urticifolia Linnaeus, Nettle-leaf Sage. Pd, Mt (GA, NC, SC, VA), Cp (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, and AL. Quite showy when in flower. [= RAB, C, F, G, K, S, W, Z]

* ***Salvia verbenacea*** Linnaeus, Wild Clary. Mt (VA), {GA, NC?}: fields and disturbed areas; rare, introduced from Europe. [= C, G, K, S]

Salvia azurea Michaux ex Lamarck *var.* ***grandiflora*** Bentham. {GA}: IL, IA, NE, and eastern CO south to nw AL, ne MS, LA, southeastern and central TX. [= F, K; = *S. pitcheri* Torrey ex Bentham – C, G; < *S. azurea* – S; = *S. azurea* ssp. *pitcheri* (Torrey ex Bentham) Epling] {not keyed at this time; synonymy incomplete}

Salvia chapmanii A. Gray. AL and FL. Uncertain status. [= K, S] {not keyed at this time; synonymy incomplete}

* *Salvia reflexa* Hornemann, Lanceleaf Sage, Mintweed. 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 keyed at this time}

* *Salvia verticillata* Linnaeus, Whorled Clary, is introduced as far south as scattered locations in PA (Rhoads & Klein 1993), MD, and WV (Kartesz 1999). [= C, F, G, K] {not keyed at this time}

Satureja

(also see *Clinopodium*)

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.

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 [of the Ridge and Valley (especially shale barrens) of VA, WV, MD] ..... ***Sc. ovata** ssp. **rugosa** var. **rugosa***
13 [of the 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; [of the Mountains and Piedmont] ..... ***Sc. serrata***
28 Stems canescent below inflorescence; calyces stipitate glandular or punctate glandular.
29 Lower lip with 20+ blue spots; calyces stipitate glandular; [of peninsular FL and s GA] ..... ***Sc. arenicola***
29 Lower lip lacking blue spots; calyces punctate glandular; [of s SC-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. **australis***
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; [of the Mountains of AL]..... ***[Sc. alabamensis]***
27 Corollas 11-16 mm long; [of the Coastal Plain of SC and GA]..... ***Sc. altamaha***

*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.

Scutellaria altamaha Small, Altamaha Skullcap. Cp (GA), {NC, SC}: sandy deciduous forests; rare (GA Special Concern). [= K, S, Y; < *S. mellichampii* Small – RAB]

Scutellaria arenicola Small, Sandhill Skullcap. Cp (GA): sandy scrub; rare (GA Special Concern). Endemic to GA and FL (Kartesz 1999). [= K, S, Y]

Scutellaria australis (Fassett) Epling, Southern Skullcap. Pd (GA, NC, SC, VA), Cp (GA): bottomland forests; rare. VA, WV, KY, IN, IL, MO, and KS, south to Panhandle FL, LA, and e. TX. [= G, X; < *S. parvula* – RAB, S; = *S. parvula* Michaux var. *australis* Fassett – F, K]

Scutellaria elliptica Muhlenberg ex Sprengel *var.* ***elliptica***. Mt, Pd, Cp (GA, NC, SC, VA): mesic to dry forests; common. Late May-June; June-July. NY, KY and MO, south to s. GA, Panhandle FL, LA, and e. TX. [= C, F, G, K, W, Y; < *S. elliptica* – RAB; < *S. ovalifolia* – S; = *S. ovalifolia* ssp. *mollis* Epling – X]

Scutellaria elliptica Muhlenberg ex Sprengel *var.* ***hirsuta*** (Short & Peter) Fernald. Mt (GA, NC, VA), Pd (VA): mesic to dry forests; uncommon. Late May-June; June-July. PA and MI south to n. VA, w. NC, nw. GA, s. AL, and e. TX. [= C, F, G, K, W, Y; < *S. elliptica* – RAB; < *S. ovalifolia* – S; = *S. ovalifolia* ssp. *hirsuta* (Short & Peter) Epling – X]]

Scutellaria galericulata Linnaeus, Hooded Skullcap. Mt (NC, VA): spring-fed seepage; rare. 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]

Scutellaria glabriuscula Fernald, Georgia Skullcap. Cp (GA): {habitat}; rare. Sw. GA and FL Panhandle west through s. AL to s. MS. In GA, AL, MS, and FL. [= K, S, Y]

Scutellaria incana Biehler *var.* ***incana***. Pd, Cp (NC, VA): 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, 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. Southern Appalachian endemic: sw. VA south through w. NC, nw. SC, e. TN to n. GA and ne. AL. [= C, F, G, K, W, Y; < *S. incana* – RAB, S; *S. punctata* (Chapman) Leonard – X]

Scutellaria integrifolia Linnaeus. Cp, Pd, Mt (GA, NC, SC, VA): wet pine savannas, seeps in forests, bottomlands, other moist sites; common. May-July; July-August. MA south to FL, west to TX, northward in the interior to OH, KY, and TN. [= C, G, GW, K, S, W, Y; > *S. integrifolia* var. *hispida* Bentham – RAB, F; > *S. integrifolia* var. *integrifolia* – RAB, F]

Scutellaria lateriflora Linnaeus, Mad Dog Skullcap. Cp (NC, SC, VA), Pd, Mt (GA, NC, SC, VA): alluvial forests, bogs, seeps, marshes; common. July-November. Newfoundland west to British Columbia, south to GA and CA. [= RAB, C, F, G, GW, S, W; > *S. lateriflora* var. *lateriflora* – K]

Scutellaria leonardii Epling, Shale-barren Skullcap, Glade Skullcap. Mt (GA, VA), Pd (NC, VA), Cp (VA): limestone glades, diabase barrens; rare (GA Special Concern). April-May; May-June. MA west to MI and ND, south to se. VA, nc. NC, AR, and OK. [= C, G, W, 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, NC?, SC): sandy deciduous forests on river bluffs; rare (GA Special Concern). June; July. Se. SC (se. NC?) south to e. GA. [= S, X, Y; < *S. mellichampii* – RAB; = *S. incana* Biehler var. *australis* (Epling) Collins, comb. nov. ined. – K; = *S. altamaha* Small ssp. *australis* Epling]

Scutellaria montana Chapman, Large-flowered Skullcap. Mt (GA): mesic hardwood (or hardwood-shortleaf pine) forests; rare (US Threatened, GA Endangered). Se. TN south to nw. GA. [= K, S, Y; = *S. serrata* Andrzedowski var. *montana* (Chapman) Penland – F]

Scutellaria multiglandulosa (Kearney) Small ex Harper. Cp, Pd (SC, GA): sandhills, dry sandy bluff forests; rare. SC (Abbeville and Anderson counties) to e. GA, and in Panhandle FL. [= K, S, Y; = *S. integrifolia* Linnaeus var. *multiglandulosa* Kearney – F]

Scutellaria nervosa Pursh, Bottomland Skullcap, Veined Skullcap. Pd (NC, SC, VA), Cp (NC, VA), Mt (VA), {GA}: alluvial forests, mesic forests; uncommon, rare south of VA (GA Special Concern). May-June; June-July. NY, MI, and IA, south to GA, AL, and LA. [= RAB, K, S, W; > *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): dry forests and woodlands; rare. MO south through AR and OK to c. TX; disjunct eastward in s. MS, c. and n. AL, and nw. GA. [= K, W, 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***. {GA, NC, SC, VA}. [= 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; = *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): shale barrens, other dry woodlands; common. [= *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]

Scutellaria ovata Hill *ssp.* ***rugosa*** (Wood) Epling *var.* ***1***, Appalachian Skullcap. Mt (GA, NC, VA): moist boulderfields at high elevations; rare. [*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, 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 (GA, SC), Pd (NC): disturbed areas, introduced from 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]

Scutellaria saxatilis Riddell, Rock Skullcap. Mt (GA, NC, SC, VA): June-August. [= RAB, C, G, K, S, W, X, Z; = *S. saxatilis* var. *saxatilis* – F]

Scutellaria serrata Andrzedowski, Showy Skullcap, Serrate Skullcap. Mt, Pd (NC, VA), {GA, SC?}. Mid May-late June. [= RAB, C, G, K, S, W, 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 (GA): blackland prairies; rare. First reported for GA by Lee Echols in 2005 (pers. comm.). [= K]

Sideritis Linnaeus

A genus of about 140-150 species, herbs and shrubs, of temperate Eurasia. References: Harley et al. in Kadereit (2004).

* *Sideritis romana* Linnaeus, Ironwort, is introduced and naturalized as far south as PA (Rhoads & Klein 1991, Cronquist 1991) and WV (Cronquist 1991). [= C, K] {synonymy incomplete}

Stachys Linnaeus 1753 (Hedge-nettle)

(contributed by John B. Nelson)

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).

Keying Note: This treatment will be revised substantially.

Key 1

1 Fruiting calyx lobes deltoid to broadly triangular.
- 2 Stem sides pubescent.
  - 3 Petioles short to absent, blades mostly rounded to truncate; top of blooming stem stiff, erect ..... ***S. eplingii***
  - 3 Petioles well developed, blades commonly cordate at the base; top of blooming stem frequently flexuous, somewhat lax ..... ***S. cordata***
- 2 Stem sides glabrous.
  - 4 Leaf margins serrate or serrulate, but always with sharp teeth; nodes not bearded; stem angles with scattered, swollen-based, short, retrorse trichomes (not spreading pubescent); [plants of the Mountains or upper Piedmont] ..... ***S. latidens***
  - 4 Leaf margins finely crenate; nodes bearded; stem angles abundantly pubescent with 3-celled, spreading hairs; [of the lower Piedmont of NC] ..... ***S. species 1***

1 Fruiting calyx lobes lanceolate, narrowly triangular, or nearly subulate.
- 5 Leaf blades linear to lanceolate.
  - 6 Stem sides with at least moderate pubescence on the highest sterile internode, moderately to densely pubescent on higher internodes; lower leaf surface abundantly pubescent to velvety-pilose ..... ***S. pilosa***
  - 6 Stem sides without pubescence, except for internodes within the inflorescence, which may bear light villous or glandular hairs; lower leaf surface glabrous or pubescent, but not velvety.
    - 7 Leaf blade margins entire to crenate; plants generally glabrous ..... ***S. hyssopifolia***
    - 7 Leaf blade margins serrulate with at least a few teeth; plants glabrous or pubescent.
      - 8 Stems strict or sparingly branched; leaves sessile or barely petioled, the blades crenate to serrate with shallow teeth ..... ***S. aspera***
      - 8 Stems frequently branched from the upper nodes; leaves obviously petioled, the blades sharply toothed ..... ***S. tenuifolia***
- 5 Leaf blades wider, oblong to elliptic.
  - 9 Petioles poorly developed, essentialy absent ..... ***S. hispida***
  - 9 Petioles obvious, frequently 1/5 the length of the blade.
    - 10 Leaf blades sharply serrate, nearly dentate; stem angles abundantly pubescent with spreading or somewhat retrorse, long (to 3 mm) hairs ..... ***S. clingmanii***

10 Leaf margins crenate to serrulate, but never dentate; stem angles glabrous or pubescent (if the latter, then with scattered, stiffish, retrorse hairs).
11 Plant producing thick, segmented, tuber-like rhizomes; stem sides and calyx usually strongly glandular; [weedy, mostly on the Coastal Plain] ..... ***S. floridana***
11 Plant producing slender rhizomes; stem sides and calyx usually scarcely glandular, or glabrous; [not weedy, mostly of the Piedmont and Mountains].
12 Calyx usually abundantly pubescent with stiff, eglandular hairs; fruiting calyx lobes straight ..... ***S. hispida***
12 Calyx usually glabrous to sparingly pubescent; fruiting calyx lobes frequently curved or curling..... ***S. tenuifolia***

Key 2 (Alternate Key)

1 Petioles obvious (at least some of those in the middle portion of the stem at least 1/5 as long as the leaf blade).
2 Calyx tubes glandular.
3 Leaf blade margins strongly serrate (dentate or nearly so); stem angles copiously pubescent with long (to 3 mm), spreading hairs ..... ***S. clingmanii***
3 Leaf blade margins mostly crenate; stem angles glabrate or pubescent with mostly short, retrorse hairs.
4 Calyx lobes about as long as the tube, lanceolate; leaf blades never greater than 3 cm wide..... ***S. floridana***
4 Calyx lobes shorter than the tube, deltoid; leaf blades frequently > 3 cm wide ..... ***S. cordata***
2 Calyx not glandular, or very slightly so.
5 Calyx glabrous to sparsely pubescent; petioles well-developed, especially in shade forms..... ***S. tenuifolia***
5 Calyx variously hairy, but at least hispidulous, frequently strongly hispid; petioles short or long.
6 Petioles usually well developed; blade margins commonly dentate..... ***S. clingmanii***
6 Petioles frequently short to nearly absent; blade margins toothed, but never dentate ..... ***S. hispida***
1 Petioles short or absent.
7 Leaves linear-lanceolate to narrowly lanceolate, usually widest at or near the base; leaf margins entire to crenulate, rarely serrulate, and then mostly toward the apex.
8 Corolla very pale pink to white; leaf blades abundantly pubescent below with appressed hairs, the surface soft-velvety..... ***S. pilosa***
8 Corolla dark pink; leaf blades variously pubescent or glabrate, but never velvety.
9 Leaf blades narrow, 3-6 mm wide; plants generally glabrous to moderately pubescent; blade margins entire to obscurely crenulate..... ***S. hyssopifolia***
9 Leaf blades broader, 5-8 mm wide; plants frequently hispidulous or at least moderately pubescent, or abundantly hairy; blade margins crenulate to serrulate ..... ***S. aspera***
7 Leaves ovate to elliptic, widest near the center or toward the apex, oblong; leaf margins crenate to sharply serrate for nearly the entire length.
10 Stem sides commonly pubescent above ..... ***S. eplingii***
10 Stem sides glabrous, the angles pubescent.
11 Fruiting calyx lobes lanceolate, about half as long as the calyx tube ..... ***S. hispida***
11 Fruiting calyx lobes deltoid or triangular, shorter than half the length of the calyx tube.
12 Leaf margins serrate or serrulate, but always with sharp teeth; nodes not bearded; stem angles with scattered, swollen-based, short, retrorse trichomes (not spreading pubescent); [of the Mountains or upper Piedmont] ..... ***S. latidens***
12 Leaf margins finely crenate; nodes bearded; stem angles abundantly pubescent with 3-celled, spreading hairs; [of the lower Piedmont of NC] ..... ***S. species 1***

Stachys aspera Michaux, Rough-leaved Hedge-nettle. Cp, Pd (GA, NC, SC, VA), Mt (VA): moist or wet sandy soil of savannas, marshes, or swamp forests; uncommon (VA Rare). June-August; August-September. [= C, G, K; = *S. hyssopifolia* Michaux var. *ambigua* A. Gray – RAB, F, GW, Z; = *S. ambigua* (A. Gray) Britton – S; *? S. grayana* House]

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 (NC 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, Nuttall's Hedge-nettle. Mt (GA, NC, VA), Pd (NC, VA): moist forests, especially alluvial bottomlands or over calcareous rocks; uncommon (rare in NC) (GA Rare, NC Watch List). June-August; September-October. 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. cordata* – C; > *S. subcordata* Rydberg – C, G; = *S. riddellii* House – F, G; > *S. salvioides* Small – S]

Stachys eplingii J. Nelson, Epling's Hedge-nettle. Mt (GA, NC, SC, VA): mesic forests, bogs, wet meadows over calcareous or mafic substrates; rare (GA Rare, NC Rare, VA Rare). June-August; August-September. This species has a

scattered and sporadic range in the southern and central Appalachians, occurring also in the Ozarks. See Nelson & Fairey (1979) for a discussion of the nomenclatural change. [= C, GW, K, W, Z; = *S. nuttallii* – RAB, F, G, S, misapplied]

* ***Stachys floridana*** Shuttleworth ex Bentham, Florida Betony, Rattlesnake-weed. Cp, Pd (GA, NC, SC, VA): disturbed sites, roadsides; uncommon, probably not native, introduced from Florida. April-July; May-August. The common name "Rattlesnake-weed" refers to the moniliform rhizomes. [= RAB, GW, K, S, Z]

Stachys hispida Pursh, Hispid Hedge-nettle. Mt (NC, VA), Pd, Cp (VA), ?? (GA): wet meadows and mesic forests; uncommon (GA Rare). 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, Pd (GA, NC, SC, VA), Mt (VA): moist soils of savannas, marshes, seasonally flooded sinkhole ponds, roadside ditches; uncommon (VA Watch List). June-August; August-September. [= RAB, F, GW, Z; = *S. hyssopifolia* – C, G, K, S, W; *? S. atlantica* Britton]

Stachys latidens Small ex Britton, Broad-toothed Hedge-nettle. Mt, Pd (GA, NC, SC, VA): mesic forests in coves and on mountain slopes, mountain pastures and forest edges; common (GA Rare, SC Rare). June-August; September-October. [= RAB, C, F, G, S; = *S. tenuifolia* Willdenow var. *latidens* (Small ex Britton) J. Nelson – K, W, Z; < *S. tenuifolia* – GW]

Stachys pilosa Nuttall, Woundwort. Mt, Pd (VA), Cp (SC): marl fens, roadsides, banks of waterfowl impoundments; rare, possibly adventive in part from further west, but some populations at least native. [= *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]

Stachys species 1, Yadkin Hedge-nettle. Pd (NC, VA): in sandy alluvium along forest edges in river floodplain; rare.

Stachys tenuifolia Willdenow, Smooth Hedge-nettle. Mt (NC), Pd (VA), Cp (NC, SC, VA): wooded alluvial river bottoms, swamp forests, and roadsides; rare (NC Watch List). June-August; September-October. [= RAB, C, G, K, S; > *S. tenuifolia* var. *tenuifolia* – F, Z; > *S. tenuifolia* var. *perlonga* Fernald – F, Z; > *S. tenuifolia* var. *platyphylla* Fernald – F; < *S. tenuifolia* – GW; = *S. tenuifolia* var. *tenuifollia* – W]

* ***Stachys annua*** (Linnaeus) Linnaeus. Cp (VA): disturbed area; rare, probably only a waif. Reported for VA (Kartesz 1999). [= C, F, G, K] {not keyed at this time}

* *Stachys arvensis* (Linnaeus) Linnaeus. Reported for VA by C, G, and K; documentation uncertain (Virginia Botanical Associates 2006). [= C, F, K] {not keyed}

* ***Stachys byzantina*** K. Koch ex Scheele. Pd (VA): roadside; rare, doubtfully established. Reported for VA (Virginia Botanical Associates 2006). [= C, K; = *S. olympica* Poiret – F, G] {not keyed at this time}

Stachys crenata Rafinesque. Reported for AL, KY, FL (Kartesz 1999). [= K]

* ***Stachys germanica*** Linnaeus. Mt (VA): roadsides; rare, doubtfully established. Reported for VA, TN, FL (Kartesz 1999). [= C, F, G, K]

Stachys hyssopifolia Michaux ***var. lythroides*** (Small) J. Nelson. (GA Rare). E. Panhandle of FL. [= Z]

* *Stachys palustris* Linnaeus. South to MD, PA, NJ. [= K; > *S. palustris* var. *palustris* – C, F, G]

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): moist, rich forests; rare (NC Rare, VA 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]

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 canadense Linnaeus ***var. canadense***. {GA, NC, SC, VA}. [= C, F, G, K; < *T. canadense* – RAB, GW, W; = *T. littorale* Bicknell – S]

Teucrium canadense Linnaeus ***var. hypoleucum*** Grisebach. {GA, NC, SC}. [= K; < *T. canadense* – RAB, GW, W; = *T. nashii* Kearney – S]

Teucrium canadense Linnaeus ***var. occidentale*** (A. Gray) McClintock & Epling. (VA). Reported for VA (Kartesz 1999). {investigate} Occurs at least as far south and east as PA (Rhoads & Klein 1993). [= C, G, K; > *T. occidentale* A. Gray var. *occidentale* – F; > *T. occidentale* A. Gray var. *boreale* (Bicknell) Fernald – F]

Teucrium canadense Linnaeus ***var. virginicum*** (Linnaeus) Eaton. [= C, F, G, K; < *T. canadense* – RAB, GW, W; = *T. canadense* – S]

Teucrium cubense Jacquin var. *cubense*. AL. [= K] {not keyed at this time; synonymy incomplete}

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 (NC), Mt (GA): commonly cultivated and sometimes escaped or persisting; rare, introduced from Eurasia. July-September. [= K; *? Th. serpyllum* Linnaeus – RAB, C, F, G, misapplied]

* ***Thymus pulegioides*** Linnaeus, Lemon Thyme. Pd (VA). [= K]

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). References: Weakley (in prep.)=Z; 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); [restricted to barrier islands, coastal peninsulas, and other maritime situations within 10 km of the ocean].

4 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***

4 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), Pd (NC, SC, VA): shale barrens, outcrops of calcareous or mafic rock, diabase barrens, calcareous dry prairies, disturbed rocky areas; uncommon (NC Rare). August-September. VT and s. Ontario west to MN and NE, south to c. NC, nw. GA, AL, TX, and AZ. Morphology, pollen, and phytogeography suggest the plausible recognition of *Trichostema* section *Orthopodium* (which includes this species andseveral from w. North America) as *Isanthus*, a genus distinct from section *Trichostema* (which includes all other eastern North American species). [= W; = *Isanthus brachiatus* (Linnaeus) Britton, Sterns, & Poggenburg – C, F, K, S; > *Isanthus brachiatus* var. *brachiatus* – G]

Trichostema dichotomum Linnaeus, Common Blue Curls. Cp, Pd, Mt (GA, NC, SC, VA): dry woodlands, disturbed areas, thin soils around rock outcrops; common. August-November. Widespread in e. North America. [= RAB, C, K, S, W, Z; > *T. dichotomum* var. *dichotomum* – F; >< *T. dichotomum* var. *puberulum* Fernald & Griscom – F; = *T. dichotomum* var. *dichotomum* – G]

Trichostema setaceum Houttuyn, Narrowleaf Blue Curls. Pd, Mt, Cp (GA, NC, SC, VA): thin soils around rock outcrops, especially granite flatrocks, dry sandy soils of the Coastal Plain; uncommon (NC Watch List, VA Rare). August-November. CT west to OH, south to FL and TX, primarily on the Coastal Plain. [= RAB, C, F, K, W, 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 (US Species of Concern, NC Rare). August-November. Endemic to barrier islands from slightly north of Cape Hatteras, 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 (GA): maritime dunes, grasslands, and coastal scrub; uncommon. E. GA around the FL peninsula west to s. MS; Bahamas. [= Z; >< *T. dichotomum* var. *puberulum* Fernald & Griscom – F]

Vitex Linnaeus 1753 (Chaste Tree)

A genus of about 250 species, trees and shrubs, tropical to temperate. References: Harley et al. in Kadereit (2004).

1 Leaves palmately compound; plant an upright small tree ..... ***V. agnus-castus***
1 Leaves simple; plant a sprawling and spreading shrub/vine ..... ***V. rotundifolia***

* ***Vitex agnus-castus*** Linnaeus, Chaste Tree. Cp (GA, NC, VA), Pd (GA, NC, VA), Mt (VA): pastures, woodland edges, suburban woodlands; rare, introduced from Mediterranean Europe. June-July. [= RAB, C, G, S; > *V. agnus-castus* var. *agnus-castus* – K; > *V. agnus-castus* var. *caerulea* Rehder – K]
* ***Vitex rotundifolia*** Linnaeus f., Beach Vitex, Roundleaf Chaste-tree. Cp (GA?, NC, SC): coastal dunes; uncommon, planted for ornament and stabilization and now spreading aggressively as an invasive species. See Roecker & Socha (2004) for additional information. The runners are reported to reach 10 m in length. [= K]

LARDIZABALACEAE Decaisne 1839 (Lardizabala Family)

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); 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. Mt, Pd (NC, SC, VA), Cp (GA): escaped from cultivation to roadbanks, suburban woodlands, and floodplains; rare, native of Japan, China, and Korea, potentially invasive and difficult to eradicate. April-June; June-July. [= RAB, C, F, FNA, K]

LAURACEAE A.L. de Jussieu 1789 (Laurel Family)

A family of about 50 genera and 2500-3500 species, trees and shrubs, of tropical, subtropical, and (rarely) warm temperate regions. 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).

* ***Cinnamomum camphora*** (Linnaeus) J. Presl, Camphortree. Cp (GA, NC, SC): disturbed areas; rare, native of eastern Asia, planted as an ornamental and rarely escaped to adjoining areas, such as in Southern Pines, Moore County, NC. April-May. Reported as escaped and apparently naturalized in South Carolina by Hill & Horn (1997). [= FNA, K; = *Camphora camphora* (Linnaeus) Karsten – S]

Laurus Linnaeus 1753 (Laurel, Bay)

A genus of 1-2 species, trees, of Mediterranean Europe, the Canary Islands, Madeira, and the Azores. References: Rohwer in Kubitzki, Rohwer, & Bittrich (1993).

* *Laurus nobilis* Linnaeus, Laurel, Bay, native to the Mediterranean region of Europe and the bay leaf of commerce, is planted as an ornamental and spice, but is not known to escape in our area.

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; 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 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***
  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).
    3 Leaves glabrous beneath; young twigs glabrous ..... ***L. benzoin*** *var.* ***benzoin***
    3 Leaves pubescent beneath, at least on the midrib; young twigs pubescent ..... ***L. benzoin*** *var.* ***pubescens***

Lindera benzoin (Linnaeus) Blume *var.* ***benzoin***, Smooth Northern Spicebush. Mt (GA, NC, VA), Pd (VA): rich alluvial forests, mesic forests on slopes with circumneutral soils, bottomlands, swamps; common. March-April; August-September. The species is widespread in e. North America; var. *benzoin* is northern, ranging south to VA and MO, and in the mountains to GA. 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. [= C, F, G, K; < *L. benzoin* – RAB, FNA, GW, W, Z; < *Benzoin aestivale* (Linnaeus) Nees – S]

Lindera benzoin (Linnaeus) Blume *var.* ***pubescens*** (Palmer & Steyermark) Rehder, Hairy Northern Spicebush. Mt, Pd, Cp (GA, NC, SC, VA): rich alluvial forests, mesic forests on slopes with circumneutral soils, bottomlands, swamps; common. March-April; August-September. Var. *pubescens* is the more southern of the two varieties, ranging through much of se. North America, north to se. VA, sw. VA, s. OH, MI, and MO. Where occurring on upland slopes, *L. benzoin* is an excellent indicator of base-rich soils. [= C, F, G, K; < *L. benzoin* – RAB, FNA, GW, W, Z; < *Benzoin aestivale* (Linnaeus) Nees – S]

Lindera melissifolia (Walter) Blume, Southern Spicebush, Pondberry. Cp (GA, NC, SC), Pd (NC): wet flats and depressions, generally with pocosin shrubs; rare (US Endangered, GA Endangered, NC Endangered, SC Rare). 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). [= RAB, F, FNA, GW, K, Z; = *Benzoin melissaefolium* (Walter) Nees – S]

Lindera subcoriacea B.E. Wofford, Bog Spicebush. Cp (GA, NC, SC, VA), Pd (NC): peaty seepage bogs in headwaters of blackwater streams, in the sandhills and immediately adjacent Piedmont, with other pocosin shrubs; rare (US Species of Concern, GA Special Concern, NC Endangered, SC Rare, VA Rare). 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]

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: Rohwer in Kubitzki, Rohwer, & Bittrich (1993).

Litsea aestivalis (Linnaeus) Fernald, Pondspice. Cp (GA, NC, SC, VA): margins of limesink ponds and Carolina bays, less commonly in wet depressions dominated by shrubs; rare (US Species of Concern, GA Threatened, NC Rare, SC Rare, VA Rare). March-April; May-June. A Southeastern Coastal Plain endemic: e. MD (Dorchester 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]

Persea P. Miller 1754 (Bay)

A genus of about 200 species, trees and shrubs, of Asia and America. The avocado is a member of this genus, *Persea americana* P. Miller. References: 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 gtending 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. Cp (GA, NC, SC): dunes, maritime forests, in dry sandy soils on barrier islands, known only north to Carteret County, NC; rare. 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 in our area and becoming rarer with the destruction of most maritime forests for the construction of vacation homes and tourist accomodations. [= FNA, G, GW, K; < *P. borbonia* – RAB, F (also see *P. palustris*); = *Tamala borbonia* (Linnaeus) Rafinesque – S; = *P. borbonia* var. *borbonia*]

Persea palustris (Rafinesque) Sargent, Swamp Bay. Cp (GA, NC, SC, VA): swamps, pocosins, bay forests, maritime forests, generally in wet peaty soils, but also in fairly dry, sandy soils in maritime forests; common. May-June; September-October. A Southeastern Coastal Plain endemic: DE, e. MD, and se. VA south to FL and west to se. TX. 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; < *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: Rohwer in Kubitzki, Rohwer, & Bittrich (1993).

Sassafras albidum (Nuttall) Nees, Sassafras. Pd, Mt, Cp (GA, NC, SC, VA): a wide variety of forests, old fields, disturbed areas, fencerows; common. March-April; June-July. Widespread in e. United States. The original source of "root beer." [= RAB, C, FNA, G, K, W; > *S. albidum* var. *molle* (Rafinesque) Fernald – F; > *S. albidum* var. *albidum* – F]

LEITNERIACEAE (Corkwood Family)
(see *SIMAROUBACEAE*)

LENTIBULARIACEAE Richard 1808 (Bladderwort Family)

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. Cp (GA, NC, SC): 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; uncommon. 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, Z; *Pinguicula elatior* Michaux]

Pinguicula lutea Walter, Yellow Butterwort. Cp (GA, NC, SC): 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; uncommon (NC Watch List). Late March-May. Se. NC (Pender and New Hanover counties) south to s. FL, west to e. LA. [= RAB, GW, K, S, Z]

Pinguicula primuliflora Wood & Godfrey, Clearwater Butterwort. Cp (GA): clearwater streams and seeps; rare (GA Threatened). Sw. GA, s. AL, Panhandle FL, and s. MS. [= GW, K, Z]

Pinguicula pumila Michaux, Small Butterwort. Cp (GA, NC, SC): pine savannas and wet pine flatwoods; uncommon (rare in NC) (NC Rare). April-May. Se. NC (Carteret and Pender counties) south to s. FL, west to se. TX; and in the Bahamas. [= RAB, GW, K, S, Z]

Pinguicula ionantha Godfrey, Panhandle Butterwort. Pond margins, bogs, flatwoods. Panhandle of FL. [= GW, K, Z]

Pinguicula planifolia Chapman, Chapman's Butterwort. Pond margins, bogs, flatwoods. S. AL, Panhandle of FL, and s. MS. [= GW, K, S, 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 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.

15 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***

15 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***

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.

16 Lower corolla lip 8-10 mm long, about equalling or slightly shorter than the conical 5-9 mm long spur; leaves usually forked twice.....***U. biflora***

16 Lower corolla lip 5-6 mm long, exceeding the blunt 3.5-4.5 mm long spur; leaves usually forked once.....***U. gibba***

Utricularia biflora Lamarck, Longspur Creeping Bladderwort. Cp (GA, NC, SC, VA), Pd, Mt (GA): ponds, lakes, and diches; common. June-October. This species may not be distinct from *U. gibba* (which see for discussion). E. MA south FL, west to TX and OK. [= RAB, C, F, G, GW, W; = *U. pumila* Walter – S, apparently misapplied; < *U. gibba* – K, Y, Z]

Utricularia cornuta Michaux, Horned Bladderwort. Cp (GA, NC, SC), Mt (GA, NC), Pd (GA): shores of limesink ponds (dolines), mountain bogs; rare (NC Watch List). (May-September. Newfoundland and Québec west to n. Ontario, Alberta, 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, Y, Z; = *Stomoisia cornuta* (Michaux) Rafinesque – S]

Utricularia floridana Nash, Florida Bladderwort. Cp (GA, NC, SC): in deep water of natural Carolina bay lakes, other natural lakes, and limesink ponds (dolines); rare (NC Rare, SC Rare). July-August. Se. NC south to c. peninsular FL, west to panhandle FL and sw. GA. [= GW, K, S, Y, Z]

Utricularia foliosa Linnaeus, Flatstem Bladderwort. Cp (GA, NC): in deep water of natural lakes and ponds; rare. 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, Y, Z]

Utricularia geminiscapa Benjamin, Two-flowered Bladderwort, Hidden-fruited Bladderwort. Cp (NC, VA), Mt (VA): beaver ponds, mucky seepages; rare (NC Rare, VA Watch List). Newfoundland and Québec west to n. MI and n. WI, south to PA and sc. NC. [= C, F, G, K, W, Y, Z]

Utricularia gibba Linnaeus, Shortspur Creeping Bladderwort. Cp (GA, NC, SC, VA), Mt (GA, NC, VA), Pd (SC, VA): ponds, lakes, and diches; uncommon. May-September. Québec west to WI, south to FL and LA; also in the West Indies and Central America and apparently in the Old World. 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; < *U. gibba* – K, Y, Z (also see *U. biflora*)]

Utricularia inflata Walter, Swollen Bladderwort, Inflated Bladderwort. Cp (GA, NC, SC, VA), Mt (NC): ponds, lakes, ditches; common. 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, Y, Z; = *U. inflata* var. *inflata* – RAB, F]

Utricularia juncea M. Vahl, Southern Bladderwort. Cp (GA, NC, SC, VA), Pd (NC): shores of limesink ponds (dolines), borrow pits, wet sands; uncommon (VA Rare). July-September. NY (Long Island) and NJ south to FL, west to e. TX and se. AR; also in the West Indies, Central America and South America. [= RAB, C, F, G, GW, K, Y, Z; > *Stomoisia juncea* (M. Vahl) Barnhart – S; > *Stomoisia virgatula* Barnhart – S]

Utricularia macrorhiza Le Conte, Greater Bladderwort. Cp (NC, SC, VA): pools and ponds; rare (NC Watch List, VA Watch List). May-September. Newfoundland west to AK, south to NC, SC, FL, 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, misapplied to American plants]

Utricularia minor Linnaeus, Lesser Bladderwort, Small Bladderwort. Mt (NC): mountain bog at about 1400 meters elevation; rare (NC Rare). Circumboreal, south in North America to NJ, 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. Cp (GA, NC, SC, VA): in floating mats (often algal) in water of limesink ponds (dolines), artificial lakes or beaver ponds; rare (NC Threatened, SC Rare, VA Rare). 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, Y, Z; = *Biovularia olivacea* (Wright ex Grisebach) Kam. – S]

Utricularia purpurea Walter, Purple Bladderwort. Cp (GA, NC, SC, VA): in water of ponds, ditches, other slow-moving water; uncommon (VA Rare). May-September. Nova Scotia and Québec 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, Y, Z; = *Vesiculina purpurea* (Walter) Rafinesque – S]

Utricularia radiata Small, Floating Bladderwort, Small Swollen Bladderwort. Cp (GA, NC, SC, VA), Mt (VA): ponds, depression ponds, lakes, and ditches; uncommon (VA Watch List). May-November. Nova Scotia 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, Y, Z; = *U. inflata* var. *minor* Chapman – RAB, F]

Utricularia resupinata B.D. Greene ex Bigelow, Northeastern Bladderwort, Resupinate Bladderwort. Cp (GA, NC): shores of natural lakes; rare (NC Rare). Nova Scotia 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, Y, Z; = *Lecticula resupinata* (B.D. Greene) Barnhart – S]

Utricularia striata Le Conte ex Torrey, Fibrous Bladderwort. Cp (GA, NC, SC, VA), Mt (VA): ponds, lakes, and ditches; uncommon (VA Rare). May-November. Se. MA south to FL, west to e. TX and e. OK. [= K, Y, Z; = *U. fibrosa* Walter – RAB, C, F, G, GW, S, of uncertain application and likely misapplied]

Utricularia subulata Linnaeus, Slender Bladderwort, Zigzag Bladderwort. Cp (GA, NC, SC, VA), Mt (GA, NC, VA), Pd (GA, NC): moist sands or peats of various kinds of acidic wetlands, including wet pine savannas and flatwoods, shores of limesink ponds (dolines), borrow pits, ditches; common (VA Watch List). March-July (-later). In North America primarily in the Coastal Plain, from Nova Scotia 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, Y, Z; > *Setiscapella subulata* (Linnaeus) Barnhart – S; > *Setiscapella cleistogama* (A. Gray) Barnhart – S]

Utricularia intermedia Hayne, Northern Bladderwort. 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]

LIMNANTHACEAE R. Brown 1838 (False-mermaid Family, Meadow-foam Family)

A family of 2 genera and 8 species, herbs, of temperate North America. References: Bayer & Appel in Kubitzki & Bayer (2003).

Floerkea Willdenow 1801 (False-mermaid)

A peculiar and monotypic genus, an annual herb, endemic to North America.

Floerkea proserpinacoides Willdenow, False-mermaid. Pd, Mt (VA): moist, rich floodplain forests; rare (VA Watch List). April-May. Nova Scotia and Québec west to British Columbia, south to n. VA, TN, and CA. [= C, F, G, K, S, W]

LINACEAE DC. ex Gray 1821 (Flax Family)

A family of about 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; capsule 6-10 mm long; [section *Linum*].
- 2 Inner sepals with minutely ciliate margins; stigmas slender, elongate; capsule 6-10 mm long..... ***L. usitatissimum***
- 2 Inner sepals entire; stigmas capitate; capsule 5-7 mm long.
  - 3 Flowers homostylous (flowers with stigmas at about the level to slightly above the anthers) ..... ***[L. lewisii** var. **lewisii]***
  - 3 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*].
- 4 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*].
  - 5 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***
  - 5 Sepals (3.1-) 3.6-5 (-7.3) mm long, acuminate; inflorescence an open panicle; dried plants pale green..... ***L. sulcatum***
- 4 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*].
  - 6 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.
    - 7 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***
    - 7 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.
      - 8 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***
      - 8 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***
  - 6 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.
    - 9 Margins of the inner sepals with conspicuous stalked glands; mature fruits of dried specimens usually adhering to the plant..... ***L. medium** var. **texanum***

9 Margins of the inner sepals glandless, or with a few inconspicuous, sessile glands; mature fruits of dried specimens usually shattering and falling freely.
10 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***
10 Inflorescence corymbose, some (at least) of the lower branches of the inflorescence elongate, their tips nearly equalling 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. Cp (GA, NC, SC): wet savannas; rare (NC Watch List). 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; < *Cathartolinum floridanum* (Planchon) Small – S]

Linum floridanum (Planchon) Trelease *var.* ***floridanum***, Florida Yellow Flax. Cp (GA, NC, SC): savannas, sandhill seeps; common. 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; < *Cathartolinum floridanum* (Planchon) Small – S]

Linum harperi Small, Harper's Grooved Flax. Cp (GA): dry pinelands; rare (GA Special Concern). 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]

Linum intercursum Bicknell, Bicknell's Yellow Flax. Pd, Mt (GA, NC, SC, VA), Cp (NC, VA): dry to moist places; common. 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 medium (Planchon) Britton *var.* ***texanum*** (Planchon) Fernald, Texas Yellow Flax. Cp, Pd, Mt (GA, NC, SC, VA): dry to moist places; common (rare in Mountains). Var. *texanum* ranges from s. ME MI, and n. IL south to c. FL and TX, and in the West Indies. Var. *medium* is limited to area around the Great Lakes. [= C, F, GW, K, W, Y, Z; < *L. virginianum* var. *medium* Planchon – RAB; < *L. medium* – G; < *Cathartolinum medium* (Planchon) Small – S]

Linum striatum Walter, Ridgestem Yellow Flax. Mt, Cp, Pd (GA, NC, SC, VA): bogs, seepages, other wet places, often growing in *Sphagnum*; common. June-October. MA, PA, MI, and IL south to w. FL, LA, and e. TX. [= RAB, C, G, GW, K, W, Y, Z; > *L. striatum* var. *striatum* – F; = *Cathartolinum striatum* (Walter) Small – S]

Linum sulcatum Riddell, Grooved Yellow Flax. Mt (GA, VA), Pd (NC): dry calcareous places in the mountains of VA (where also somewhat weedy in adjacent disturbed areas), diabase barrens in the Piedmont of NC; rare (NC Rare, VA Watch List). May-August. Primarily a species of the Great Plains of s. Manitoba, 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; = *Linum sulcatum* Riddell var. *sulcatum* – K, Y, Z; = *Cathartolinum sulcatum* (Riddell) Small – S; = *Mesynium sulcatum* (Riddell) A. & D. Löve]

* ***Linum usitatissimum*** Linnaeus, Common Flax. Pd, Cp (NC, SC, VA): disturbed places; rare, 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, Z]

Linum virginianum Linnaeus, Virginia Yellow Flax. Mt, Pd (GA, NC, SC, VA), Cp (VA): dry or moist places; uncommon. June-October. MA, NY, Ontario, MI, and IL south to SC, GA, AL, and MO. [= C, F, G, GW, K, W; = *L. virginianum* var. *virginianum* – RAB; = *Cathartolinum virginianum* (Linnaeus) Reichenbach – S]

Linum lewisii Pursh var. *lewisii*, Prairie Flax, a western blue-flowered species, occurs as a 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 perenne* Linnaeus, Perennial Flax, is 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*)]

LINDERNIACEAE Borsch, K. Müller, & Eb. Fischer 2005 (False-pimpernel Family)

References: Tank et al. (2006).

Lindernia Allioni (False-pimpernel)

A genus of about 80 species, of warm temperate and subtropical regions of the Old and New Worlds. Probably not a member of Plantaginaceae (Albach, Meudt, & Oxelman 2005). References: Cooperrider & McCready (1975)=Z; Qualls (1984)=Y; Lewis (2000)=X.

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 distinct to the base at anthesis and after; [section *Brachycarpae*].
2 Pedicels shorter than or about as long as the subtending leaves..... ***L. dubia*** *var.* ***dubia***
2 Pedicels longer than the subtending leaves (or bracteal leaves in some species).
3 Leaves nearly orbicular; stems creeping ..... ***L. grandiflora***
3 Leaves distinctly longer than wide; stems erect (sometimes decumbent at the base and rooting if knocked down by water).
4 Leaves not glandular punctate; seeds 2-3× as long as wide..... ***L. dubia*** *var.* ***anagallidea***
4 Leaves glandular punctate; seeds ca. 1× as long as wide.
5 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)*
5 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 crustacea*** (Linnaeus) F. Mueller. Cp (GA, SC), Pd (SC), {NC}: lawns; uncommon, introduced from Malaysia. September. [= RAB, GW, K, P, X, Y]

Lindernia dubia (Linnaeus) Pennell *var.* ***anagallidea*** (Michaux) Cooperrider. Cp, Pd, Mt (GA, NC, SC, VA): wet sandy or muddy areas; common (rare in Mountains). 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, X, Y, Z; = *L. anagallidea* (Michaux) Pennell – RAB, F, G, GW, P; = *Ilysanthes inequalis* (Walter) Pennell – S; < *L. dubia* – W]

Lindernia dubia (Linnaeus) Pennell *var.* ***dubia***. Cp, Pd, Mt (GA, NC, SC, VA): wet sandy or muddy areas; common. May-November. Nearly throughout North America, Central America, and South America. [= C, X, Y, Z; = *L. dubia* (Linnaeus) Pennell – RAB, GW; > *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; = *Gratiola dubia* Linnaeus]

Lindernia grandiflora Nuttall. Cp (GA): depressional wetlands; rare. S. GA south to s. FL. [= GW, K, P, X, Y; = *Ilysanthes grandiflora* (Nuttall) Bentham – S]

Lindernia monticola Muhlenberg ex Nuttall, Flatrock Pimpernel, Riverbank Pimpernel. Pd, Mt (GA, NC, SC), Cp (GA): in seasonal seepage on granitic flatrocks, and on river-scoured siliceous rocks; rare (GA Endangered – "*saxicola*", NC Watch List). 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, 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 diffusa (Linnaeus) Wettstein, is reported for SC by Kartesz (1999) on the basis of specimens at NCU, but the specimens so labelled are actually *L. dubia*. {not keyed}

Micranthemum Michaux

The appropriate generic treatment is unclear. If treated (as here) as including *Hemianthus*, a genus of about 14 species, of tropical to warm temperate America.

1 Calyx lobes uneven, 3 of the sinuses extending about halfway to the base of the calyx, the lowermost sinus extending to the base..... ***M. micranthemoides***
1 Calyx lobes even, all of the sinuses reaching nearly to the base of the calyx..... ***M. umbrosum***

Micranthemum micranthemoides (Nuttall) Wettstein, Nuttall's Micranthemum. Cp (VA): muddy, freshwater intertidal shores; rare, possibly extinct (US Species of Concern, VA Rare). NY (Hudson River) south to VA (Chesapeake Bay, Potomac River, James River). [= F, K; = *Hemianthus micranthemoides* Nuttall – C, G, P]

Micranthemum umbrosum (J.F. Gmelin) Blake, Shade Mudflower. Cp (GA, NC, SC, VA): shallow pools, stagnant streams, wet depressions in swamp forests; uncommon (VA Rare). May-October. Se. VA south to FL, west to TX, and south into tropical America. [= RAB, C, F, G, GW, K, P; = *Globifera umbrosa* J.F. Gmelin – S]

LINNAEACEAE (Rafinesque) A. Backlund 1998 (Twinflower Family)

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

A genus of about 30 species, shrubs, primarily of s. and e. Asia.

* ***Abelia ×grandiflora*** (André) Rehder [***chinensis × uniflora***]. Cp (NC): suburban thickets; commonly planted in our area; sometimes persistent or rarely weakly naturalizing, parent species natives of China. [= K]

Kolkwitzia Graebner (Beautybush)

A monotypic shrub, of c. China.

* ***Kolkwitzia amabilis***, Beautybush. Mt (NC): 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, is documented by an early specimen (1892) from Sevier County, TN, presumably from the Great Smoky Mountains. This population (not recently seen) is disjunct from more northern areas. *L. borealis* ssp. *americana* also occurs in several counties in WV along or near the VA border, and the species might be expected in high elevation or cold sites in nw. VA. [= 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]

LOGANIACEAE R. Brown ex Mart. 1827 (Logania Family)
(also see *GELSEMIACEAE, SCROPHULARIACEAE, and TETRACHONDRACEAE*)

As here rather narrowly interpreted, Loganiaceae consists of 12 genera (*Mitreola, Logania,* and *Mitrasacme*) and about 300 species, herbs and subshrubs, of tropical, subtropical, and warm temperate areas of the Old and New Worlds. Genera in our area other than *Mitreola* 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).

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 (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. Cp (GA, SC): clay-based Carolina bays, other Coastal Plain depressional wetlands; rare (GA Special Concern). June-August. Se. SC south to n. FL, and west to s. AL and se. MS (Sorrie & Leonard 1999). [= GW, Y; < *M. sessilifolia* – K, Z; = *Cynoctonum angustifolium* (Torrey & A. Gray) Small – S]

Mitreola petiolata (J.F. Gmelin) Torrey & A. Gray, Caribbean Miterwort. Cp, Pd (GA, NC, SC, VA), Mt (GA): swamps, marshes, ditches, other wet habitats; uncommon (rare in the Piedmont) (VA Rare). 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, Y; = *Cynoctonum mitreola* (Linnaeus) Britton – RAB, C, F, G, S]

Mitreola sessilifolia (J.F. Gmelin) G. Don, Small-leaved Miterwort. Cp (GA, NC, SC), Pd (GA, VA): wet savannas, pocosins, ditches, margins of limesink depressions (dolines); common (VA Rare). Late June-August; September-October. Se. VA south to FL, west to e. TX, and in the Bahama Islands. [= GW, Y; = *Cynoctonum sessilifolium* J.F. Gmelin – RAB, C, F, G, S; < *M. sessilifolia* – K, Z (also see *M. angustifolia*)]

Spigelia Linnaeus (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 marilandica (Linnaeus) Linnaeus, Pinkroot, Wormgrass. Mt (GA, NC, SC), Pd, Cp (GA, SC): woodlands and forests, usually on circumneutral soils; common. May-June; late June-July. SC, sw. NC (Cherokee Co. and Macon Co.), and TN west to s. IN and OK, south to FL and TX; some floras allege its occurrence north to MD, NJ, and PA. *S. marilandica* likely occurs in sw. VA. [= RAB, C, F, G, K, S, W]

Spigelia gentianoides Chapman ex Alphonse de Candolle var. *alabamensis* K. Gould. Dolostone glades of Bibb County, AL (Gould 1996, Allison & Stevens 2001). [= K, Z]

Spigelia gentianoides Chapman ex Alphonse de Candolle var. *gentianoides*. Pine savannas. FL Panhandle. [= K, Z; = *S. gentianoides* – S, Y (var. *alabamensis* not discovered at the time)]

LYTHRACEAE J. St.-Hilaire 1805 (Loosestrife Family)

A family of about 27 genera and 600 species, herbs, shrubs, and trees, primarily tropical (a few warm temperate). References: Graham (1975)=Z. Keys adapted, in large part, from Z.

1 Plant woody or suffrutescent, a shrub or a small tree 1-10 m tall (with peeling, cinnamon-colored bark); petals present, showy, 8-20 mm long.
2 Flowers in axillary clusters; aquatic shrubs with arching suffrutescent or woody stems; leaves opposite or whorled ..... ***Decodon***
2 Flowers in terminal panicles; terrestrial shrubs or small trees with erect woody stems; leaves alternate to subopposite .... ***Lagerstroemia***
1 Plant not woody, an herb 0.1-1.2 m tall; petals absent or present, inconspiscuous or showy, 1-10 mm long.
3 Stems pubescent.
4 Floral tube (hypanthium) swollen obliquely at its base; capsule dehiscing longitudinally along the upper surface .... ***Cuphea***
4 Floral tube (hypanthium) symmetrical; capsule dehiscing septicidally at the apex ..... ***Lythrum***
3 Stems glabrous.
5 Floral tube cylindric to turbinate, about 2× as long as wide ..... ***Lythrum***
5 Floral tube campanulate to globose, about 1× long as wide.
6 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***
6 Flowers or fruits solitary in the leaf axils (never > 1 per axil).
7 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***

7 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***

{add *Punica* and *Trapa* to key}

Ammannia Linnaeus (Toothcup)

A genus of about 25 species, herbs, cosmopolitan. References: Graham (1985)=Y; Graham (1975)=Z. Key based on Y.

1 Style included 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 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]***

Ammannia coccinea Rottböll. Cp, Pd, Mt (GA, NC, SC, VA): marshy areas, ditches, exposed muddy river shores and banks, other wet places; uncommon (VA Watch List). July-October. NJ, OH, IN, IL, IA, and SD south to FL and TX; disjunct in CA; south through Mexico and Central America to n. South America. [= RAB, C, F, GW, K, S, W, Y, Z; > *A. coccinea* ssp. *purpurea* (Lamarck) Koehne – G; > *A. coccinea* – F, GW, S, Z (apparently also including *A. robusta*)]

Ammannia latifolia Linnaeus. Cp (GA, NC, SC, VA): tidal marshes, wet places, ditches; uncommon. 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, K, W, 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. OH and British Columbia south to w. KY, w. TN, LA, TX, CA, Mexico, and Belize; West Indies; introduced in NJ and n. South America. [= C, K, Y; < *A. coccinea* – F, GW, S, Z]

Cuphea P. Browne (Waxweed)

A genus of about 260 species, herbs, of America. References: Graham (1975)=Z.

1 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***
1 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 carthagenensis*** (Jacquin) J.F. Macbride. Cp (GA, NC, SC), Pd (GA): marshes, ditches, wet places; common, native of South America. June-September. [= GW, K, Z; = *C. carthagensis* – RAB (a misspelling); = *Parsonsia balsamona* (Chamisso & Schlechtendahl) Standley – S]

Cuphea viscosissima Jacquin. Pd, Mt (GA, NC, SC, VA), Cp (VA): dry or wet places; uncommon. July-October. NH west to IA and KS, south to c. GA, LA, and e. OK. [= RAB, C, GW, K, W, Z; = *C. petiolata* (Linnaeus) Koehne – F, G; = *Parsonsia petiolata* (Linnaeus) Rusby – 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." {not keyed} [= K, Z; = *Parsonsia procumbens* (Gómez Ortega) Heller – S]

Decodon J.F. Gmelin (Water-oleander, Water-willow)

A monotypic genus, a weak shrub, endemic to e. North America. References: Graham (1975)=Z.

Decodon verticillatus (Linnaeus) Elliott, Water-oleander, Water-willow, Swamp Loosestrife, Peatweed. Cp (GA, NC, SC, VA), Mt (GA, VA): 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; common. July-September. Nova Scotia, Ontario, and MN south to c.

peninsular FL and e. TX. The lower stems are spongy in texture. [= RAB, GW, K, S, W, Z; > *D. verticillatus* var. *verticillatus* – C, F, G; > *D. verticillatus* var. *laevigatus* Torrey & Gray – C, F, G]

Didiplis Rafinesque (Water-purslane)

A monotypic genus, an herb, endemic to e. North America. Perhaps better merged into *Lythrum*. References: Graham (1975)=Z.

Didiplis diandra (Nuttall ex Augustin de Candolle) Wood, Water-purslane. Cp (NC, VA), Pd (SC): stagnant water of pools, streams, and old beaverponds; rare (NC Rare, VA Rare). April-August. VA, IN, and WI south to NC, MS, and LA. [= C, G, GW, K, S, Z; = *Peplis diandra* Nuttall ex Augustin de Candolle – RAB, F; ***Lythrum***]

Lagerstroemia Linnaeus (Crape-myrtle)

A genus of about 53 species, trees, of tropical se. Asia and Australia. References: Graham (1975)=Z.

* ***Lagerstroemia indica*** Linnaeus, Crape-myrtle. Cp, Pd (GA, NC, SC): commonly cultivated, persistent around old plantings, weakly spreading; rare (in the wild), native of Asia. June-September. [= C, K, S, Z]

Lythrum Linnaeus (Loosestrife)

A genus of about 36 species, herbs, cosmopolitan. References: Graham (1975)=Z.

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 Leaves opposite throughout, mostly shorter than to as long as the internodes, 1-4 mm wide ..... ***L. lineare***
  2 Leaves opposite below, alternate above, mostly longer than the internodes, 2-14 mm wide.
    3 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***
    3 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].
      4 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***
      4 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. Mt (GA, VA), Pd (VA): calcareous meadows, marl fens, and disturbed wet calcareous places; rare (VA Rare). June-September. ME, NY, MI, and ND south to n. and w. VA, e. TN, nw. GA, n. AL, n.. AR, ne. OK, and CO. [= F, S, W; = *L. alatum* var. *alatum* – C, G, GW, K, Z]

Lythrum curtissii Fernald, Curtiss's Loosestrife. Cp (GA): calcareous swamps; rare (GA Threatened). June-early September. Sw. GA south to Panhandle FL; the report from Emanuel County, GA (Jones & Coile 1988) is in error. [= GW, K, S, Z]

Lythrum lanceolatum Elliott, Southern Winged Loosestrife. Cp, Pd (GA, NC, SC, VA): moist to wet places; uncommon (VA Rare). 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, Z]

Lythrum lineare Linnaeus, Narrowleaf Loosestrife. Cp (GA, NC, SC, VA): nearly fresh, brackish, and saline marshes; uncommon. July-October. NJ south to FL and west to TX. [= RAB, C, F, G, GW, K, S, Z]

* ***Lythrum salicaria*** Linnaeus, Purple Loosestrife. Mt, Pd (NC, VA), Cp (VA): wet places; uncommon, 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, Z; > *L. salicaria* var. *salicaria* – F; > *L. salicaria* var. *gracilior* Turczaninow – F; > *L. salicaria* var. *tomentosum* (P. Miller) Augustin de Candolle – F]

Punica Linnaeus (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). References: Zohary & Hopf (1994).

* *Punica granatum* Linnaeus, Pomegranate, is reported as cultivated on Hatteras Island (Dare County, NC) (Brown 1959). It is probably not established, but may be persistent. This species has been cultivated in the Old World at least since the 3rd millenium B.C. [= K, S]

Rotala Linnaeus (Toothcup)

A genus of about 44 species, wetland herbs, of temperate to tropical areas. References: Graham (1975)=Z.

Rotala ramosior (Linnaeus) Koehne. Cp, Pd, Mt (GA, NC, SC, VA): marshes, ditches, exposed drawdown muds and silts; common. June-October. Widespread in e. North America, also in the West Indies, Central America, South America, and on the west coast of the United States and Mexico. [= RAB, C, GW, K, S, W, Z; > *R. ramosior* var. *ramosior* – F, G; > *R. ramosior* var. *interior* Fernald & Griscom – F, G]

Trapa Linnaeus (European Water-chestnut)

A genus of 1 highly polymorphic or up to 15 more narrowly defined species, annual aquatic herbs, native of the Old World. Oftwn placed in a monogeneric family, Trapaceae. References: Angiosperm Phylogeny Group (2003).

* ***Trapa natans*** Linnaeus, European Water-chestnut, Water-caltrop. Cp (VA): farm ponds and other stagnant or slow-moving water; rare, introduced from Eurasia and Africa. June-September. [= C, F, G, K]

MAGNOLIACEAE A.L. de Jussieu 1789 (Magnolia Family)

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.), abbreviated as 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. Mt, Pd, Cp (GA, NC, SC, VA): mesic forests, cove forests in the Mountains to at least 1500m in elevation, bottomland forests and swamps; common. April-June; September-October. Widespread in e. North America. An important timber tree in the Southern Appalachians. [= Z; < *L. tulipifera* – RAB, C, F, FNA, G, GW, K, S, W, Z]

Liriodendron tulipifera Linnaeus *var.* ***1***, Coastal Plain Tulip-tree, Southern Yellow Poplar. Cp (GA, NC, SC, VA): blackwater swamps, streamhead pocosins in the fall-line sandhills; uncommon. 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, 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; 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*] ..... ***M. macrophylla***
  2 Leaves green and glabrous beneath; buds and twigs glabrous; [subgenus *Magnolia*, section *Auriculata*].
    3 Stamens 8-15 mm long; leaves (most of them) over 25 cm long; conelike aggregate fruit 6.5-11 (-14) cm long..... ..... ***M. fraseri***
    3 Stamens 4-8 (-10.5) mm long; leaves (most of them) < 25 cm long; conelike aggregate fruit 3.5-5.5 (-6) cm long... ..... ***M. pyramidata***
1 Leaves cuneate to rounded (subcordate) at base.
  4 Leaves evergreen, coriaceous in texture, glossy dark green above as if varnished, rusty tomentose or green beneath; [subgenus *Magnolia*, section *Magnolia*] ..... ***M. grandiflora***
  4 Leaves variably evergreen to deciduous, herbaceous or subcoriaceous in texture, medium green above with a slightly glossy or dull finish; glaucous or green beneath.
    5 Leaves evergreen to deciduous, aromatic when fresh, 8-20 cm long, elliptic, strongly glaucous beneath; [subgenus *Magnolia*, section *Magnolia*].
      6 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***
      6 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***
    5 Leaves deciduous, non-aromatic,10-50 cm long, either ovate or lance-obovate, green beneath.
      7 Leaf base cuneate-attenuate; leaves 15-50 cm long, broader toward the tip, borne clustered on the end of the twig; buds glabrous; [subgenus *Magnolia*, section *Rhytidospermum*, subsection *Rhytidospermum*] .... ***M. tripetala***
      7 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*].
        8 Twigs of the current year glabrous; petals greenish or greenish-yellow; medium to large tree..... ..... ***M. acuminata*** *var.* ***acuminata***
        8 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. Mt, Pd (GA, NC, SC, VA): 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*); common (rare in Piedmont). April-May; July-August. Widespread in e. North America, primarily in or near the Appalachians. The recognition of two varieties is uncertain (see discussion below). [= C, F, G, V, W, X, Y; < *M. acuminata* – RAB, FNA, K, Z; = *Tulipastrum acuminatum* (Linnaeus) Small – S]

Magnolia acuminata (Linnaeus) Linnaeus *var.* ***subcordata*** (Spach) Dandy, Yellow Cucumber-tree, Showy Cucumber Magnolia. Pd (GA, NC, SC): moist to dry slopes and bottomlands over mafic or calcareous rocks; uncommon. Var. *subcordata* ranges from sc. NC south to AL, in the lower Piedmont in our area. 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]

Magnolia fraseri Walter, Fraser Magnolia, Earleaf Umbrella-tree. Mt, Pd (GA, NC, SC, VA): mesic forests; common (uncommon in upper Piedmont only). 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. Cp, Pd (GA, NC, SC, VA): maritime forests, mesic Coastal Plain bluffs and flats, bottomlands, now also widely naturalized, spreading from cultivation into wet to mesic forests; common as an introduction (rare in the Piedmont), rare as a native species in NC (NC Watch List). May-June; October. 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." The pre-Columbian range was apparently from se. NC south to FL, west to e. TX, largely on the Coastal Plain, now somewhat expanded northwards and inland by naturalization from centuries of horticultural planting. 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 macrophylla Michaux, Bigleaf Magnolia. Pd (GA, NC, SC), Mt (VA), Cp (GA, SC*): mesic forests, primarily over limestone, other calcareous sedimentary rocks (calcareous shales, sandstones, etc.), or mafic rocks (east of the Blue Ridge); rare (NC Rare, SC Rare, VA Rare). 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. Cp (GA, SC): mesic forests, especially of bluffs and ravines; rare (GA Watch List, SC Rare). April-May; August. A Southeastern Coastal Plain endemic: c. SC south to panhandle FL, west to e. TX. Sometimes treated as avariety or subspecies of ***M. fraseri***, to which it is clearly closely related, but the distributional and morphological differences are discrete and I therefore prefer specific status. [= RAB, FNA, K, S, 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. Pd, Mt, Cp (GA, NC, SC, VA): mesic forests; common (uncommon in Mountains and Coastal Plain). 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, nw. FL, AL, and MS; also disjunct in the Ouachita Mountains of c. AR and e. OK. [= RAB, C, F, FNA, G, K, S, W, V, X, Y, Z]

Magnolia virginiana Linnaeus ***var. australis*** Sargent, Southern Sweet Bay. Cp (GA, NC?, SC), Pd (GA), Mt (GA): 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; common (rare in Piedmont and Mountains). April-July; July-October. Primarily a species of the Southeastern Coastal Plain: s. SC (se. NC?) south to s. FL, and west to e. TX, rarely extending into adjacent, more interior provinces. Morphological, molecular, and chemical studies have shown strong variation in ***M. virginiana***, but the patterns are not clear based on the limited current studies (Azuma, Thien, & Kawano 1999). Tobe (1998), McDaniel (1966), and Figlar (pers. comm. 2005) recommend the recognition of two varieties; additional study is needed. [= F, Y; < ***M. virginiana*** – RAB, C, FNA, G, GW, K, S, V, W, X, Z]

Magnolia virginiana Linnaeus *var.* ***virginiana***, Northern Sweet Bay. Cp (GA, NC, SC, VA), Pd (NC, VA), Mt (VA): 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; common (rare in Piedmont and Mountains). 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]

MALVACEAE A.L. de Jussieu 1789 (Mallow Family)

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 cacao or chocolate, *Theobroma cacao* Linnaeus, and cola, *Cola acuminata* R. Brown. References: Whetstone (1983)=Z; Bayer et al. (1999); Bayer & Kubitzki in Kubitzki & Bayer (2003).

Subfamily Byttnerioideae: *Melochia*

Subfamily Grewioideae: *Triumfetta*

Subfamily Malvoideae:

Tribe Gossypieae: *Gossypium*

Tribe Hibisceae: *Abelmoschus, Hibiscus, Kosteletzkya, Malvaviscus, Pavonia, Urena*

Tribe Malveae: *Abutilon, Alcea, Althaea, Anoda, Callirhoe, Iliamna, Malva, Malvastrum, Modiola, Napaea, Sida*

Subfamily Sterculioideae: *Firmiana*

Subfamily Tilioideae: *Tilia*

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: Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Abelmoschus esculentus*** (Linnaeus) Moench, Okra, Gumbo. Cp, Pd (GA, NC, SC, VA): frequently cultivated in gardens, rarely persistent or self-seeding the year following; common (in cultivation), rare (as an escape), introduced from Africa. The young capsules are a famous component of southern cooking. [= K, S; = *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 (GA, NC, VA), Pd (NC, SC, VA), Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, introduced from s. Asia. June-October. [= F, G, K, W, 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: Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Alcea rosea*** Linnaeus, Hollyhock. Cp, Pd, Mt (NC, VA) {GA}: roadsides, dumps, frequently cultivated, less commonly escaped or persistent; rare, introduced from Eurasia. Late May-August (rarely later). [= K; = *Althaea rosea* (Linnaeus) Cavanilles – RAB, C, F, G]

Althaea Linnaeus 1753 (Marsh-mallow)

A genus of about 12 species, herbs, Eurasian. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Althaea officinalis*** Linnaeus, Marsh-mallow. Cp (VA): marshes; rare, introduced from 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, 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): disturbed areas; rare, introduced from 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. digitata***
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 digitata*** Nuttall, Finger 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 (GA Special Concern), apparently adventive from its native range in prairies of the Ozark region (nw. AR, sw. MO, se. KS, and ne. OK). [= C, F, G, K, Z]

* ***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; < *C. involucrata* – G]

Callirhoe papaver (Cavanilles) A. Gray, Woods Poppy-mallow. Cp (GA): forest openings; rare (GA Special Concern). Sw. GA and FL west to e. TX and s. AR (Dorr 1990). [= F, G, K, Z; = *Callirrhoë papaver* – S, orthographic variant]

Callirhoe triangulata (Leavenworth) A. Gray, Sand Poppy-mallow, Clustered Poppy-mallow. Cp (GA, SC, NC): sandhills, sandy scrub, and other dry, open habitats; rare (GA Special Concern). Sc. NC south to GA and west to ec. MA (upper Coastal Plain and lower Piedmont); also sw. WI amd ne. IA south to s. IN and s. IL. [= C, F, G, K, Z; *Callirrhoë triangulata* – S, orthographic variant]

Callirhoe alcaeoides (Michaux) A. Gray, Pale Poppy-mallow. Calcareous prairies, glades, and other open habitats. East to c. TN (Chester, Wofford, & Kral 1997), IL, KY, and AL (Dorr 1990, Kartesz 1999) from a primary distribution in NE, KS, OK, and TX. [= C, F, G, K, Z; = *Callirrhoë alceoides* – S, orthographic variant]

Firmiana Marsili (Chinese Parasol-tree, Phoenix Tree)

A genus of about 12 species, trees, of Africa and Asia. References: Brizicky (1966)=Y; Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Firmiana simplex*** (Linnaeus) W. Wight, Chinese Parasol-tree, Phoenix Tree. Cp, Pd (GA, NC, SC, VA): planted and occasionally naturalized nearby; rare, native of se. Asia, probably China. [= C, K, 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: Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Gossypium hirsutum*** Linnaeus, Upland Cotton. Cp (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), introduced from tropical America. [= C, G; *? G. hirsutum* var. *hirsutum* – K; *? G. herbaceum* Linnaeus – F, S; *? G. barbadense* Linnaeus]

Hibiscus Linnaeus 1753 (Hibiscus, Rose-mallow)

A genus of about 200-300 species, trees, shrubs, and herbs, of tropical to warm temperate areas. References: Wise & Menzel (1971); Bayer & Kubitzki in Kubitzki & Bayer (2003). Key based in part on GW.

1 Woody shrub, the stems usually solitary from a creeping rhizome .....***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 1.5-4 cm long; leaves 2-6 cm long, deeply cleft.....***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; 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].....***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].
      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.
        6 Upper leaf surface densely pubescent; capsule densely pubescent.

7 Leaf blades 3-lobed ..... ***H. grandiflorus***
7 Leaf blades unlobed..... ***H. moscheutos*** *ssp.* ***incanus***
6 Upper leaf surface glabrous or very sparsely pubescent; capsule glabrous.
8 Petals white or creamy, with a red or purple base; flower stalk bearing a leaf well above the base (often about halfway along its length) ..... ***H. moscheutos*** *ssp.* ***moscheutos***
8 Petals pink (rarely white), with or without a red or purple base; flower stalk without a leaf, borne in the axil of a leaf..... ***H. moscheutos*** *ssp.* ***palustris***

Hibiscus aculeatus Walter, Savanna Hibiscus, Comfort-root. Cp (GA, NC, SC): pine savannas, dry sandy soils of maritime forest edges; uncommon (rare north of SC) (NC Rare). June-August; July-September. Se. NC south to sc. peninsular FL, west to LA. [= RAB, GW, K, S]

Hibiscus coccineus Walter, Scarlet Hibiscus. Cp (GA, *NC, *SC, *VA), *Pd (*NC): marshes, swamp forests, roadside swales, cultivated as an ornamental in yards; rare, presumably introduced from further south, but sometimes appearing native. Native in FL, s. GA, and s. AL. [= GW, K, S]

Hibiscus grandiflorus Michaux, Large-flowered Hibiscus. Cp (GA): tidal marshes, lakeshores, wet flatwoods and savannas; rare (GA Special Concern). E. GA (Chatham Co., adjacent to the SC border) (Jones & Coile 1988) south to s. FL, west to e. LA. [= GW, K, S]

Hibiscus laevis Allioni, Smooth Rose-mallow, Halberd-leaved Marsh-mallow, Showy Hibiscus. Cp, Pd (GA, NC, SC, VA), Pd (GA), Mt (VA): freshwater marshes, exposed riverbanks, sandbars; common. June-August; August-October. S. PA south to FL, west to TX; north in the interior to around the Great Lakes. [= C, K, W; = *H. militaris* Cavanilles – RAB, F, G, GW, S]

Hibiscus moscheutos Linnaeus *ssp.* ***incanus*** (Wendland f.) Ahles, Eastern Rose-mallow. Cp (GA, NC, SC): marshes; rare. June-September; July-October. S. MD south to c. peninsular FL, west to e. TX. [= RAB, GW; < *H. moscheutos* var. *moscheutos* – C; = *H. incanus* Wendland f. – G, S; < *H. moscheutos* ssp. *moscheutos* – K, in part]

Hibiscus moscheutos Linnaeus *ssp.* ***moscheutos***, Eastern Rose-mallow. Cp, Pd, Mt (GA, NC, SC, VA): marshes; common. June-September; July-October. MD west to s. IN, south to n. FL, and se. TX. [= RAB, GW, W; < *H. moscheutos* var. *moscheutos* – C; = *H. moscheutos* Linnaeus – F, G; < *H. moscheutos* ssp. *moscheutos* – K; *H. oculiroseus* Britton – S]

Hibiscus moscheutos Linnaeus *ssp.* ***palustris*** (Linnaeus) R.T. Clausen, Eastern Rose-mallow. Cp (NC): marshes; rare. June-September; July-October. E. MA south to e. NC; also around the Great Lakes in NY, OH, IN, MI, IL, and Ontario. [= RAB, GW, W; < *H. moscheutos* var. *moscheutos* – C; = *H. palustris* Linnaeus – F, G; < *H. moscheutos* ssp. *moscheutos* – K; *? H. moscheutos* – S]

* ***Hibiscus syriacus*** Linnaeus, Rose-of-Sharon, Althaea. Pd (GA, NC, SC, VA), Cp, Mt (NC, SC, VA): escaped or persistent after cultivation, often spreading by rhizomes; uncommon, introduced from e. Asia. June-September; August-October. [= RAB, C, F, G, K, S, W]

* ***Hibiscus trionum*** Linnaeus, Flower-of-an-hour. Pd (GA, NC, SC, VA), Mt (NC, SC, VA), Cp (VA): fields, roadsides, disturbed areas; common, introduced from Europe. [= RAB, C, G, K, W; = *Trionum trionum* (Linnaeus) Wooton & Standley – S]

Hibiscus lasiocarpos Cavanilles, east to c. TN (Chester, Wofford, & Kral 1997), AL, KY, and GA (F, Kartesz 1999). [= F, S; = *Hibiscus moscheutos* Linnaeus ssp. *lasiocarpos* (Cavanilles) O.J. Blanchard – K] {not keyed at this time; add to synonymy}

Iliamna Greene 1906 (Globe-mallow)

A genus of 7 species, perennial herbs, of North America. Some authors (such as Mabberley 1997) 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 (VA 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]

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: Bayer & Kubitzki in Kubitzki & Bayer (2003).

1 Hairs of the fruit 0.5-1.0 (-1.5) mm long; flowering calyx mostly 6-10 mm long, the bractlets mostly 2.5-6 mm long; petals mostly 1.8-3 cm long; [of VA northward] ..... ***K. virginica* var. *aquilonia***
1 Hairs of the fruit 1.2-2.4 mm long; flowering calyx mostly 8-13 mm long, the bractlets mostly 6-10 mm long; petals mostly 3.2-4.5 mm long; [throughout our area] ..... ***K. virginica* var. *virginica***

Kosteletzkya virginica (Linnaeus) K. Presl ex A. Gray *var.* ***aquilonia*** Fernald, Northern Seashore-mallow. Cp (VA): brackish to freshwater tidal marshes; common. July-October. NY (Long Island) south to VA. While geographic trends are readily apparent, the recognition of infraspecific taxa is made problematic by the non-correlation of various characters. [= C, F, G; < *Kosteletskya virginica* – RAB, orthographic variant; < *K. virginica* – GW, K; < *K. virginica* – S]

Kosteletzkya virginica (Linnaeus) K. Presl ex A. Gray *var.* ***virginica***, Southern Seashore-mallow. Cp (GA, NC, SC, VA): brackish to freshwater tidal marshes; common. July-October. DE south to FL, west to TX; also in the West Indies. [= C; < *Kosteletskya virginica* – RAB, orthographic variant; < *K. virginica* – GW, K; > *K. virginica* var. *virginica* – F, G; > *K. virginica* var. *althaeifolia* Chapman – F, G; >< *K. virginica* – S; > *K. althaeifolia* (Chapman) Rusby – S]

Malva Linnaeus (Mallow)

A genus of about 40 species, herbs, of temperate Eurasia and montane Africa. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

1 Upper leaves deeply 5-7-lobed, the sinuses cut over halfway to the middle; petals 2-3.5 cm long; erect perennial ..... ***M. moschata***
1 Upper leaves less deeply lobed, rarely to as deep as halfway to the middle; petals 0.5-2.5 cm long; prostrate to erect annual or biennial.
  2 Epicalyx of 3 oblong-ovate bractlets; petals reddish purple, 2.0-2.5 cm long; biennial, erect, usually not branched at the base ..... ***M. sylvestris***
  2 Epicalyx of 3 linear or narrowly lanceolate bractlets; petals white or pink, 0.6-1.2 cm long; annual, sprawling, usually branched at the base.
    3 Petals about 2× as long as the sepals ..... ***M. neglecta***
    3 Petals about 1× as long as the sepals ..... ***M. rotundifolia***

* ***Malva moschata*** Linnaeus, Musk Mallow, Rose Mallow. Mt (NC, VA), Pd (VA): pastures, roadsides, barnyards; rare, introduced from Europe. Late May-August. [= RAB, C, F, G, K, W]

* ***Malva neglecta*** Wallroth, Common Mallow, Cheeses. Mt, Pd (GA, NC, VA), Cp (VA) {SC}: pastures, roadsides, barnyards; rare, introduced from Europe. April-October. [= RAB, C, F, G, K, W; = *M. rotundifolia* – S, misapplied]

* ***Malva rotundifolia*** Linnaeus, Small Mallow, Dwarf Mallow, Cheeses. Mt (VA): pastures, roadsides, barnyards; rare, introduced from Europe. [= C, F, G, K, S; = *M. pusilla*, misapplied]

* ***Malva sylvestris*** Linnaeus, Common Mallow, High Mallow, Cheeses. Cp, Pd (NC, SC, VA), Mt (VA): pastures, roadsides, barnyards; rare, introduced from Europe. May-July. [= RAB, C, K, S, W; > *M. sylvestris* var. *sylvestris* – F, G; > *M. sylvestris* var. *mauritiana* (Linnaeus) Boissier – F, G]

* ***Malva parviflora*** Linnaeus. SC, MD, FL, etc. [= K] {not keyed at this time; synonymy incomplete}

* *Malva verticillata* Linnaeus is reported as an introduction as far south as s. PA (Rhoads & Klein 1993), MD, and WV (Kartesz 1999). [= K; > *M. verticillata* var. *verticillata* – C, F, G; > *M. verticillata* var. *crispa* Linnaeus – C, F, G] {not keyed at this time; synonymy incomplete}

Malvastrum A. Gray 1849

A genus of 14 species, herbs, of tropical and warm temperate areas. References: Bates (1967); Bayer & Kubitzki in Kubitzki & Bayer (2003).

Malvastrum hispidum (Pursh) Hochr. 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). [= C, K; *Malvastrum angustum* A. Gray – G, S; *Sphaeralcea angusta* (A. Gray) Fernald – F; = *Sidopsis hispidum* (Pursh) Rydberg; = *Sida hispida* Pursh]

* *Malvastrum coromandelianum* (Linnaeus) Garcke, introduced, south to se. PA (Rhoads & Klein 1993) and NJ (Kartesz 1999). [= K]

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).

* ***Malvaviscus drummondii*** Torrey & A. Gray, Wax-mallow, Turk's-cap Mallow. Cp (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 91993) 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, Z; **= *Hibiscus drummondii*** (Torrey & A. Gray) M.J. Young]

Melochia Linnaeus (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 (GA, NC, SC): sandy fields, especially in low, wet places; uncommon, introduced from the Old World tropics. [= RAB, GW, K, S, Y, Z]
* ***Melochia spicata*** (Linnaeus) Fryxell. Cp (GA): disturbed areas; rare, introduced from tropical America. In GA (Kartesz 1999) and FL (Brizicky 1966). [= K; = *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: Bayer & Kubitzki in Kubitzki & Bayer (2003).

Modiola caroliniana (Linnaeus) G. Don, Bristly-mallow. Cp, Pd (GA, NC, SC, VA): lawns, roadsides, disturbed areas, pondshores; uncommon (adventive in part of its range in our area). Late March-June (sometimes later). Ranging as a native from SC south to FL, west to TX, south into the tropics. [= RAB, C, F, G, GW, K, S]

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 (US Species of Concern, VA 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): disturbed areas; rare, introduced from tropical America. In se. GA (Jones & Coile 1988). [= K, S]
Pavonia spinifex (Linnaeus) Cavanilles, Gingerbush. Cp (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; = *Hibiscus spinifex* Linnaeus]

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; leaves usually truncate to subcordate at the base; [section *Spinosae*].....***S. spinosa***
  2 Mericarps, styles, and stigmas (6-) avg. 10 (-13); leaves usually cuneate to rounded at the base.
    3 Leaves narrowly elliptic to linear, (3-) 4-20× as long as wide; [section *Ellipticifoliae*].....***S. elliottii* *var.* *elliottii***
    3 Leaves elliptic-rhombic, mostly 2-3× as long as wide; [section *Sidae*].
      4 Leaves and branches borne distichously; stipules usually falcate, several-veined .....***S. acuta***
      4 Leaves and branches borne spirally; stipules linear, 1 (-3)-veined.....***S. rhombifolia* *var.* *rhombifolia***

* ***Sida acuta*** Burman f., Broomweed. Cp (GA, SC): disturbed areas; rare, introduced from the Tropics. June-October. [= K, Z; *? S. carpinifolia* Linnaeus f. – RAB, S]

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; 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, Z; > *S. inflexa* Fernald – F, K, Z]

Sida hermaphrodita (Linnaeus) Rusby, Virginia Sida, Virginia-mallow. Mt, 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) (Sp[ooner 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, 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, Z]

* ***Sida spinosa*** Linnaeus, Prickly Sida, Prickly-mallow, False-mallow. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas, wet fields; common, introduced from the Tropics. June-November. [= RAB, C, F, G, K, S, W, Z]

Sida cordifolia Linnaeus. AL and FL. [= K] {not keyed at this time; synonymy incomplete}

Sphaeralcea St.-Hil.
(see *Iliamna*)

Tilia Linnaeus (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), Pd, Cp (VA): rich coves, rocky slopes, metabasalt boulderfileds, rich north-facing river bluffs, calcareous Coastal Plain ravines; common (rare in NC) (NC Watch List). June; August-September. New Brunswick and Manitoba 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; > *T. americana* – F; > *T. neglecta* Spach – F, S; > *T. glabra* Ventenat – S; > *T. truncata* Spach – S]

Tilia americana Linnaeus *var.* ***caroliniana*** (P. Miller) Castig., Southern Basswood, Carolina Basswood. Cp, 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 FL and west to OK and c. TX. [= K, 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, Pd, Cp (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 the scene 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, Z; = *T. heterophylla* Ventenat – RAB, F, W; > *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]

Several European species 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. Three of the more commonly planted species are *T. platyphyllos* Scopoli, *T. cordata* P. Miller, and *T. ×vulgaris* Hayne [*cordata* × *platyphyllos*]. Planted material should be identified by using appropriate manuals of cultivated species.

Triumfetta Linnaeus

A genus of about 70-150 species, trees, shrubs, and herbs, of tropical regions. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Triumfetta semitriloba*** Jacquin. Cp (GA): disturbed areas; rare, introduced from further south. In sw. GA (Jones & Coile 1988) and FL. [= K, S]

Urena Linnaeus (Caesarweed)

A genus of about 6 species, of tropical and subtropical regions. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

* ***Urena lobata*** Linnaeus, Caesarweed, Bur Mallow, Congo Jute. Cp (SC): roadsides and vacant lots; rare, introduced from se. Asia. Introduced to se. SC via landscaping plantings, spreading to vacant lots and raodsides (P. McMillan, pers. comm., 2005). [= GW, K, S]

MARTYNIACEAE Stapf 1895 (Martynia Family)

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. Pd (GA, NC, SC), Cp (GA, VA): disturbed areas; rare, introduced from farther west and south (apparently native to the Mississippi valley). The curious fruits are unmistakable. [= RAB, F, GW, Y; = *P. louisiana* – C, G, orthographic variant; = *Martynia louisiana* Miller – S; > *P. louisianica* ssp. *louisianica* – K, Z]

MELASTOMATACEAE A.L. de Jussieu 1789 (Melastome Family)

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 ..... ***Rh. 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 .....***Rh. nuttallii***
  - 3 Calyx segments acuminate-aristate; floral tube nearly glabrous except along the calyx lobes; surface of seeds pebbled..... ***Rh. petiolata***

1 Anthers curvate, 5-11 mm long.
- 3 Stem nodes and internodes glabrous; stem and foliage blue-green ..... ***Rh. alifanus***
- 3 Stem nodes and usually also the internodes hirsute; stem and foliage green.
  - 4 Sepal lobes aristate, the awn-tip 0.5-1.5 mm long, and also with flaring, yellowish, stiff hairs 3-5 mm long ....***Rh. aristosa***
  - 4 Sepal lobes obtuse to acuminate, not aristate, the hairs shorter and not yellowish or stiff.
    - 5 Leaves 1-5 (-8) mm wide, linear, linear-elliptic, narrowly oblong, or narrowly spatulate.
      - 6 Petals lavender-rose, (10-) 15-20 (-25) mm long; mature hypanthium 10-14 mm long, with glandular hairs; marginal nerves of leaf abaxial surface either absent or obscure and discontinuous .....***Rh. cubensis***
      - 6 Petals white to pink (-rose-purple), (7-) 9-14 mm long; mature hypanthium 6-10 mm long, glabrous or sparsely glandular-hairy; marginal nerves of leaf abaxial surface prominent..... .....***Rh. mariana*** *var.* ***exalbida***
    - 5 Leaves (5-) 7-20 (-35) mm wide, lanceolate, elliptic, or ovate.
      - 7 Four stem faces at mid-stem about equal, almost flat, the angles sharp or winged.
        - 8 Roots tuberous; stem angles at mid-stem conspicuously winged; hypanthium 7-10 mm long, the neck shorter than the body.....***Rh. virginica***
        - 8 Roots not tuberous; stem angles sharp to narrowly winged; hypanthium 10-12 mm long, the neck as long as or longer than the body .....***Rh. mariana*** *var.* ***ventricosa***
      - 7 Four stem faces at mid-stem markedly unequal, one pair of opposite faces broader, convex, darker green, the narrower pair concave or flat, pale.
        - 9 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.....***Rh. mariana*** *var.* ***mariana***
        - 9 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 ..... ***Rh. nashii***

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..... ..... ***Rh. 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..... ***Rh. nuttallii*** **or** ***Rh. petiolata***
  - 3 Longest leaves > 2 cm long, lanceolate, elliptic, or ovate.
    - 4 Rhizomes present, roots not tuberiferous or spongy-thickened.....***Rh. mariana*** *var.* ***ventricosa***

4 Rhizomes absent, roots tuberiferous or spongy-thickened.
5 Stem leaves gradually reduced upward ..... ***Rh. virginica***
5 Stem leaves gradually lengthening from the base to mid-stem..... ***Rh. aristosa***

1 Stem internodes (and nodes) hirsute or glandular-hairy.
6 Leaves linear, narrowly elliptic, or broadest above the middle.
7 Plant bushy-branched..... ***Rh. lutea***
7 Plant simple below the cymose inflorescence.
8 Mature hypanthium 10-14 mm long, with glandular hairs; petals lavendar-rose, 1.5-2.0 cm long..... ***Rh. cubensis***
8 Mature hypanthium 6-10 mm long, glabrous or sparsely glandular-hairy; petals white, 1.2-1.5 cm long..... ***Rh. 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..... ***Rh. mariana*** *var.* ***ventricosa***
10 Rhizomes absent, roots tuberiferous or spongy-thickened ..... ***Rh. 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 ..... ***Rh. 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)..... ***Rh. nashii***

Rhexia alifanus Walter, Smooth Meadow-beauty. Cp (GA, NC, SC): pine flatwoods and savannas, pocosins borders, more able to tolerate merely moist soils than other *Rhexia* species; common. May-September. A Southeastern Coastal Plain species: e. NC south to n. FL and west to se. Texas. Our tallest and showiest *Rhexia*: the unbranched (unless injured), wandlike stems, with strongly ascending, bluish-green, generally entire leaves make this species unmistakeable. [= RAB, GW, K, S, Z]

Rhexia aristosa Britton, Awned Meadow-beauty, Bristly Meadow-beauty. Cp (GA, NC, SC): clay-based Carolina bays, depression meadows, and limesink ponds (dolines); rare (US Species of Concern, GA Special Concern, NC Threatened, SC Rare, VA Rare). 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. [= RAB, C, F, G, GW, K, S, Z]

Rhexia cubensis Grisebach, West Indies Meadow-beauty. Cp (GA, NC, SC): limesink ponds (dolines); rare (NC Rare). June-September. Se. NC south to s. FL and west to sw. MS; also in the West Indies. [= RAB, GW, K, S, Z]

Rhexia lutea Walter, Yellow Meadow-beauty, Golden Meadow-beauty. Cp (GA, NC, SC): wet pine flatwoods and savannas, seepage slopes, and bogs; uncommon. April-July (and later in response to growing-season fire). A Southeastern Coastal Plain species: e. NC south to n. FL and west to se. TX. The only yellow-flowered *Rhexia* and also our bushiest species. [= RAB, GW, K, S, Z]

Rhexia mariana Linnaeus *var.* ***exalbida*** Michaux, White Meadow-beauty. Cp, Pd (GA, NC, SC): wet pine flatwoods and savannas, wet meadows, ditches, and wet roadsides; uncommon. June-September. NC south to FL and west to MS. Merging into *Rh. mariana* var. *mariana* from FL westward, var. *exalbida* appears quite distinct in NC, and it here recognized for convenience. The white flowers and linear leaves are diagnostic. [= RAB; *Rh. lanceolata* – S; < *Rh. mariana* var. *mariana* – GW, K, Z]

Rhexia mariana Linnaeus *var.* ***mariana***, Maryland Meadow-beauty, Dull Meadow-beauty, Pale Meadow-beauty. Cp, Pd, Mt (GA, NC, SC, VA): pine flatwoods, wet meadows, bog margins, ditches, wet roadsides, often weedy; common. May-October. E. MA south to FL, west to TX, and north to s. IN and IL. [= RAB, G, W; < *Rh. mariana* var. *mariana* – F, GW, K, Z (also see *Rh. mariana* var. *exalbida*); > *Rh. mariana* var. *leiosperma* Fernald & Griscom – F; *? Rh. delicatula* Small – S]

Rhexia mariana Linnaeus *var.* ***ventricosa*** (Fernald & Griscom) Kral & Bostick, Swollen Meadow-beauty. Cp (NC, SC, VA), Pd (NC, VA): pine flatwoods and savannas, clearings in cypress-hardwood swamps, ditches, wet roadsides; uncommon. June-September. NJ south to SC. This variety is closely related to *Rh. mariana* var. *interior* (Pennell) Kral & Bostick, occurring west of the mountains. Gleason & Cronquist (1991) prefer to retain *Rh. interior* Pennell at the species level and hedge relative to the distinctiveness of *Rh. ventricosa*. [= GW, K, W, Z; = *Rh. ventricosa* Fernald & Griscom – RAB, F; < *Rh. interior* Pennell – C]

Rhexia nashii Small, Hairy Meadow-beauty. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): wet pine flatwoods and savannas; pondshores, bogs, marshes, ditches, wet roadsides; common (uncommon in Piedmont). May-October. Primarily a Southeastern Coastal Plain species: e. VA south to s. FL and west to se. LA. [= GW, K, S, Z; = *Rh. mariana* var. *purpurea* Michaux – RAB, F, G]

Rhexia nuttallii C.W. James, Nuttall's Meadow-beauty. Cp (GA): pine flatwoods, bogs; rare (GA Special Concern). Coastal Plain of se. GA west to FL Panhandle, south to s. peninsular FL. [= GW, K, Z; = *Rh. serrulata* Nuttall – S]

Rhexia parviflora Chapman, Small-flowered White Meadow-beauty. Cp (GA): limesink pond margins; rare (GA Special Concern). Occurs in sw. GA (Mitchell County) south into Panhandle FL. [= GW, K, S, Z]

Rhexia petiolata Walter, Ciliate Meadow-beauty, Short-stemmed Meadow-beauty. Cp (GA, NC, SC, VA), Pd (GA, SC): wet pine flatwoods and savannas, pocosin borders, and ditches; common (VA Rare). June-September. May-October. A Southeastern Coastal Plain endemic: se. VA south to n. FL and west to se. TX. The flowers are sessile, the petals ascending. [= RAB, C, G, GW, K, Z; = *Rh. ciliosa* Michaux – F, S]

Rhexia virginica Linnaeus, Virginia Meadow-beauty, Deergrass, Handsome Harry, Wing-stem Meadow-beauty. Mt, Cp, Pd (GA, NC, SC, VA): wet pine flatwoods and savannas, pond shores, bogs, and ditches; common (uncommon in NC Piedmont and NC Coastal Plain). May-October. E. Canada and WI south to n. FL and TX. [= C, G, GW, K, W, Z; > ***Rh. virginica*** var. *purshii* (Sprengel) C.W. James – RAB; > ***Rh. virginica*** var. *virginica* – RAB, F; > ***Rh. virginica*** var. *septemnervia* (Walter) Pursh – F; = ***Rh. stricta*** Pursh – S]

Rhexia ×*brevibracteata* Snyder [***Rh. aristosa*** × ***virginica***] is known as a natural hybrid from the Coastal Plain of NJ (Snyder 1996). {not keyed}

Rhexia mariana Linnaeus var. *interior* (Pennell) Kral & Bostick. 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. [= GW, K, Z; < ***Rh. interior*** – C; = ***Rh. interior*** Pennell – F, G] {not keyed at this time; synonymy incomplete}

Rhexia salicifolia Kral & Bostick, Willowleaf Meadow-beauty. Drawdown zones of Coastal Plain depression ponds and interdune swales. S. AL and FL Panhandle. [= GW, K, Z] {not keyed at this time; synonymy incomplete}

MELIACEAE A.L. de Jussieu 1789 (Mahogany Family)

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 (Chinaberry)

A genus of 3 species, trees, of the Old World tropics.

* ***Melia azedarach*** Linnaeus, Chinaberry, Carolina Mahogany, Umbrella-tree, Pride-of-India. Cp, Pd (GA, NC, SC, VA), Mt (NC): disturbed areas, abandoned rural yards and fields; common (rare in the Mountains), native to se. Asia, commonly cultivated in our area (mainly in the Coastal Plain) and commonly escaped. April-May; September-October. Rural children often play with the bony drupes, which are poisonous if ingested. [= RAB, C, F, G, K, S, Z]

MENISPERMACEAE A.L. de Jussieu 1789 (Moonseed Family)

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); 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 *Menispermeae*]..... ***Cocculus***

Calycocarpum (Nuttall) Spach (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. Cp (GA, SC), Pd, Mt (GA): floodplain forests; rare. May-June. Ranging from nw. GA, s. IN, and MO, south to se. SC, e. GA, Panhandle FL, and LA; some of the easternmost occurrences may be adventive or introduced. [= C, F, FNA, G, K, S]

Cocculus A.P. deCandolle (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. Cp, Pd, Mt (GA, NC, SC, VA): moist to dry forests and thickets; common (rare in VA and in the Mountains of GA, NC, and SC). 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; = *Epibaterium carolinum* (Linnaeus) Britton – S]

Menispermum Linnaeus (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. Pd, Cp (GA, NC, SC, VA), Mt (GA, NC, VA): moist nutrient-rich forests, especially on floodplains or lower slopes; common. June-August. Québec west to Manitoba, south to GA and OK. [= RAB, C, F, FNA, G, K, S, W]

MENYANTHACEAE Dumortier 1829 (Buckbean Family)

A family of about 5 genera and 40 species, wetland herbs, of cosmopolitan distribution. References: Wood (1983b)=Z.

1 Leaves trifoliate; inflorescence a raceme ..... ***Menyanthes***
1 Leaves simple; inflorescence an umbel ..... ***Nymphoides***

Menyanthes Linnaeus (Buckbean, Bogbean)

The genus is monotypic, an herb, circumboreal. References: Wood (1983b)=Z

Menyanthes trifoliata Linnaeus, Buckbean, Bogbean. Mt (NC, VA): mountain bogs at high elevations over amphibolite (in the Blue Ridge), boggy marshes over calcareous rocks (in the Ridge and Valley); rare (NC Threatened, VA Rare). May-June. This circumboreal species is widespread in n. North America and n. Eurasia, ranging south in North America to NJ, 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. McDowell (1984) reported the first documentation of the species for NC. [= C, G, K, W, Z; > *M. trifoliata* var. *minor* Rafinesque – F]

Nymphoides Hill (Floating Heart)

A genus of about 20 species, aquatic herbs, cosmopolitan. References: Wood (1983b)=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. Cp (GA, NC, SC, VA): limesink ponds (dolines), other acidic and nutrient-poor water-filled depressions, sluggish streams, beaverponds, primarily in the Outer and Middle Coastal Plain; uncommon (VA Rare). 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. Cp (GA, NC, SC): upland depression ponds, sluggish streams, beaverponds, primarily in the fall-line Sandhills; uncommon (NC Watch List). Widespread (though in many parts of its range local) in e. North America, from Newfoundland and Ontario south to FL and 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. Cp? (SC): ponds and lakes; rare, native of China and India. Apparently first naturalizing in North America in FL in 2000; introduced for water gardens and aquariums.

* ***Nymphoides peltata*** (S.G. Gmelin) Kuntze, Yellow Floating Heart. Pd (NC, VA): ponds; rare, introduced from 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]

MOLLUGINACEAE Hutchinson 1926 (Carpetweed Family)

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 (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. Cp, Pd, Mt (GA, NC, SC, VA): fields, disturbed areas, drawdown zones on river- and pond-shores; common, introduced from tropical America. May-November. [= RAB, C, F, FNA, G, GW, K, S, W, Z]

MORACEAE Lindley 1847 (Mulberry Family)

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); White in SE (in prep.); 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); [tribe *Moreae*].
    3 Leaves entire, unlobed or shallowly 3-lobed; stems usually thorny.
      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.
      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, Cp, Mt (GA, NC, SC, VA): urban lots, disturbed areas, roadsides; common, 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 (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]

***** ***Ficus pumila*** Linnaeus, Climbing Fig. Cp (GA): walls, disturbed areas; rare, introduced from s. Asia. Locally common in Charleston and Savannah, where grown on walls as an ornamental and certainly persisting. [= FNA, K]

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. Cp, Pd, Mt (GA, NC, SC, VA): fields, hedgerows, forests, naturalized from extensive planting in the eighteenth and nineteenth centuries, native of TX, OK, AR, and LA. April-May; October. *Maclura* is a monotypic genus. The large fruits are unmistakeable: 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 rarely used in cabinetry. [= RAB, C, F, FNA, G, K, W; = *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: 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. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas, vacant lots, roadsides, moist forests; uncommon, native of e. Asia. March-May; May-June. [= RAB, C, F, FNA, G, GW, K, S, W; > *M. nigra* Linnaeus – S, misapplied as to our material; > *M. alba* var. *tatarica* (Linnaeus) Seringe]

Morus rubra Linnaeus, Red Mulberry. Cp, Pd, Mt (GA, NC, SC, VA): bottomland forests, mesic slopes, disturbed areas, suburban woodlands; common. 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. [= RAB, C, F, G, GW, K, S, W; > *M. rubra* var. *rubra* – K]

MYRICACEAE Blume 1829 (Bayberry Family)

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 (*Cerothamnus*), 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. Mt (GA, NC, SC, VA), Pd, Cp (NC, VA): 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; common (rare in Piedmont and Coastal Plain) (GA Special Concern, SC Rare). April; August-September. Widespread in ne. North America, south to sc. and w. NC, w. SC, ne. GA, and nc. TN; much more common in the northern parts of its range. [= RAB, C, FNA, K, S, W; > *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 (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 (2002); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

1 Fresh leaves odorless when crushed; flowers unisexual, the staminate and pistillate flowers on different plants; leaves usually entire; [of s. GA south and west]; [subgenus *Cerothamnus*, series *Faya*] .....***Morella inodora***
1 Fresh leaves aromatic when crushed; flowers bisexual, staminate and pistillate on the same plant; 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].....***Morella 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)].....***Morella 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].....***Morella 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]..... ***Morella pensylvanica***

Morella caroliniensis (P. Miller) Small, Pocosin Bayberry, Evergreen Bayberry. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): pocosins, wet savannas and pine flatwoods, sandhill seepage bogs, and other peaty or sandy-peaty wetlands; common. 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. Cp (GA, NC, SC, VA): 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; common. 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. Cp (GA): acid wetlands, especially in wooded, acid, streamhead "bogs" and bayheads, often associated with *Magnolia virginiana, Persea palustris, Cyrilla racemiflora, Cliftonia monophylla*, and *Woodwardia areolata*; rare (GA Special Concern). 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. Cp (NC, VA): 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; uncommon (restricted in NC to barrier islands of Dare and Currituck counties, but locally common there). 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. Cp (GA, NC, SC, VA): savannas, pine flatwoods, relatively moist to extremely dry sites in sandhills (under *Quercus laevis* and *Q. geminata*); common (VA Rare). 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 somewhat different habitats), 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. A varietal distinction might best reflect the relationship of these two taxa, but the appropriate combinations at the varietal level are not available in either *Cerothamnus* or *Morella*. [= *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. Mt (NC): peaty bogs; rare (NC Endangered Species). April; August-September. A circumboreal species, south in North America to NJ, PA, MI, MN, and OR, disjunct from PA and 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]

MYRSINACEAE R. Brown 1810 (Myrsine Family)

The traditional families Primulaceae, Myrsinaceae, and Theophrastaceae have been repartitioned by Källersjö, Bergqvist, & Anderberg (2000) in order to create monophyletic groups. References: Källersjö, Bergqvist, and Anderberg (2000); Ståhl & Anderberg in Kubitzki (2004).

1 Leaves alternate (or with some opposite or subopposite); flowers white.
  2 Flowers axillary, nearly sessile; leaves 3-10 mm long ..... ***Anagallis***
  2 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] ..... ***Lysimachia clethroides***
1 Leaves opposite or whorled; flowers yellow, white, pink, red, or blue.
  3 Leaves in a single terminal whorl; petals 7 ..... ***Trientalis***
  3 Leaves opposite or whorled (if whorled, with several to many whorls); petals 0 or 5.
    4 Leaves > 2 cm long (sometimes less in *L. nummularia*, and then orbicular, about as wide as long); flowers yellow. ..... ***Lysimachia***
    4 Leaves < 2 cm long (and distinctly longer than wide); flowers red, blue, white, or pink.
      5 Flowers on long pedicels; corolla present ..... ***Anagallis***
      5 Flowers nearly sessile; corolla absent ..... ***Glaux***

Anagallis Linnaeus 1753 (Pimpernel)
(also see *Centunculus*)

A genus of 20-28 species, herbs, mostly Old World. References: 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 Flowers red (rarely white); pedicels usually longer than the leaves ..... ***A. arvensis*** *var.* ***arvensis***
  2 Flowers blue; pedicels usually shorter than the leaves ..... ***[A. arvensis*** *var.* ***caerulea]***

* ***Anagallis arvensis*** Linnaeus *var.* ***arvensis***, Scarlet Pimpernel, Common Pimpernel. Cp (GA, NC, SC, VA), Pd (GA, NC, VA), Mt (VA): lawns, fields, disturbed areas; common, introduced from Europe. April-November. [= C, G; < *A. arvensis* – RAB, F, GW, W; = *A. arvensis* ssp. *arvensis* – K, in the narrow sense; = *A. arvensis* ssp. *arvensis* – S]

Anagallis minima (Linnaeus) E.H. Krause, Chaffweed, False-pimpernel. Cp, Mt (GA, SC), 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. [= GW, K; = *Centunculus minimus* Linnaeus – RAB, C, F, G, S, W]

* *Anagallis arvensis* Linnaeus var. *caerulea* (Schreber) Grenier & Godron, Blue Pimpernel, is reported as introduced in PA, KY, OH, and other scattered states north and west of our area (Kartesz 1999). [= C, G; < *A. arvensis* – RAB, F, GW, W; = *A. arvensis* Linnaeus ssp. *foemina* (P. Miller) Schinz & Thellung – K; = *A. arvensis* ssp. *coerulea* Hartman – S]

* *Anagallis monellii* Linnaeus is reported as a waif for Fairfax County, VA by Harvill et al. (1992) and Shetler & Orli (2000). Not keyed. [= K]

Centunculus Linnaeus
[see *Anagallis*]

Glaux Linnaeus 1753 (Sea-milkwort)

A monotypic genus, of north temperate coasts of the Old and New Worlds. *Glaux* appears to be embedded within *Lysimachia* and should be merged into that genus (Hao et al. 2004). References: Hao et al. (2004); Ståhl & Anderberg in Kubitzki (2004).

Glaux maritima Linnaeus, Sea-milkwort. Cp (VA): saline coastal habitats; rare. June-July. The species is interruptedly circumboreal, in North America from Québec south to VA on the east coast, and from British Columbia south to OR on the west coast, also inland in w. North America, from Saskatchewan south to NM. G suggests that *G. maritima* is introduced near its southern limit in the east. [= C, K; > *G. maritima* var. *maritima* – F, G]

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: Coffey & Jones (1980)=Z; Hao et al. (2004); Ståhl & Anderberg in Kubitzki (2004). Key partly adapted from Z.

1 Leaves alternate; flowers white, in a terminal raceme, the tip often lax ..... ***L. clethroides***
1 Leaves opposite or whorled; flowers yellow, borne variously.
2 Leaves nearly round; plant trailing, rooting at nodes ..... ***L. nummularia***
2 Leaves linear, lanceolate, elliptic, or ovate; plant erect (or trailing and rooting at the nodes in *L. radicans*, which has lanceolate leaves).
3 Flowers in a terminal raceme or panicle, subtended by bracts much smaller than the stem leaves.
4 Inflorescence a terminal panicle ..... ***L. fraseri***
4 Inflorescence a terminal raceme.
5 Leaves narrowly ovate, broadest near the base, with 3 prominent veins ..... ***L. asperulifolia***
5 Leaves linear to lanceolate, broadest near the middle, with 1 prominent vein.
6 Leaves linear to narrowly lanceolate, (1-) 2-4 (-8) mm wide; sepals stipitate-glandular .... ***L. loomisii***
6 Leaves lanceolate to elliptic, 7-20 mm wide; sepals glabrous.
7 Flowers in part (the lower) in the axils of well-developed leaves ..... ***L. ×producta***
7 Flowers all in the axils of much reduced linear bracts ..... ***L. terrestris***
3 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*).
8 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 ..... [***L. thyrsiflora]***
8 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.
9 Stem leaves whorled (in adult plants); leaves "punctate" with sinuous, elongate markings (visible with the naked eye, but more readily observed with 10 × magnification).
10 Petals yellow, marked with black lines; sepals 2.5-5 mm long ..... ***L. quadrifolia***
10 Petals plain yellow, not marked with black lines; sepals 5.5-9 mm long ..... ***L. punctata***
9 Stem leaves opposite; leaves not "punctate."
11 Mid-cauline leaves with petioles ciliate their entire length.
12 Mid-cauline leaves 1-2 mm wide; flowers 7-14 mm across; [of ne. AL] ..... ***[L. graminea]***
12 Mid-cauline leaves 4-60 mm wide; flowers 11-26 mm across; [collectively widespread].
13 Mid-cauline leaves ovate to lanceolate, 17-60 mm wide; sepals with 3 (or 6) usually reddish-brown veins ..... ***L. ciliata***
13 Mid-cauline leaves lanceolate to linear, 4-23 mm wide; sepals without reddish-brown veins.
14 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***
14 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***
11 Mid-cauline leaves with petioles pubescent only along basal portion.
15 Rhizomes absent, new shoots arising from crown of rootstock ..... ***L. tonsa***
15 Rhizomes present, new shoots arising from the rhizome.
16 Plant reclining or trailing, rooting at the nodes ..... ***L. radicans***
16 Plant erect, not rooting at the nodes.
17 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***
17 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***

Lysimachia asperulifolia Poiret, Pocosin Loosestrife, "Roughleaf Loosestrife". Cp (NC, SC): low pocosins, high pocosins, streamhead pocosins, savanna-pocosin ecotones, sandhill-pocosin ecotones; rare (US Endangered, NC Endangered, SC 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, apparently 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. [= K; = *L. asperulaefolia* – RAB, GW, S (an orthographic variant)]

Lysimachia ciliata Linnaeus, Fringed Loosestrife. Pd, Mt, Cp (GA, NC, SC, VA): mesic forests, especially bottomlands and coves dominated by hardwoods; common. June-August; August-October. Newfoundland west to AK, south to GA, AL, MS, AR, KS, NE, CO, NM, UT, ID, and OR. [= RAB, C, F, GW, K, W, Z; = *Steironema ciliatum* (Linnaeus) Baudo – G, S]

* ***Lysimachia clethroides*** Duby. Mt (NC): roadsides (cultivated and rarely persistent or escaped); rare, introduced from 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 differs from our other species in its white flowers, in a dense terminal spike (often with secund tip) and alternate leaves. [= C, 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 (GA Rare, NC Endangered, SC 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, GW, K, S, W]

Lysimachia hybrida Michaux, Lowland Loosestrife. Cp (NC, SC, VA), Mt, Pd (NC, VA): mesic hardwood forests, wet areas; rare (NC Watch List, VA Watch List). June-August; September-October. ME and s. Québec west to Alberta and WA, south irregularly to n. FL, AR, NE, and AZ. [= C, F, K, W, Z; = *L. lanceolata* var. *hybrida* (Michaux) A. Gray – RAB, GW; = *Steironema hybridum* (Michaux) Rafinesque ex B.D. Jackson – G, S]

Lysimachia lanceolata Walter, Lanceleaf Loosestrife. Mt, Pd, Cp (GA, NC, SC, VA): mesic to relatively dry forests, forest edges, roadbanks, primarily on circumneutral soils; uncommon. June-August; September-October. NJ, PA, OH, MI, and WI south to GA, panhandle FL, AL, MS, LA, and ne. TX. [= C, F, K, W, Z; = *L. lanceolata* var. *lanceolata* – RAB, GW; = *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 (GA Special Concern). May-June; August-October. Endemic to the outer and middle Coastal plain of NC, SC, and e. GA. [= RAB, GW, K, S]

* ***Lysimachia nummularia*** Linnaeus, Creeping Charlie, Creeping Jenny, Moneywort. Pd (GA, NC, SC, VA), Mt, Cp (NC, SC, VA): lawns, pastures, seepages, other moist, disturbed places; common (uncommon south of VA), introduced from Europe. May-July; August-September. The leaves have many minute, maroon dots. [= RAB, C, F, 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, K; = *L. producta* (A. Gray) Fernald – G, S]

* ***Lysimachia punctata*** Linnaeus, Large Loosestrife, Spotted Loosestrife. Mt (NC): disturbed areas; rare, introduced from Eurasia. June-July; August? First found in NC in 1985 (Weakley *in prep.*). [= C, F, G, K]

Lysimachia quadriflora Sims, Smooth Loosestrife, Four-flowered Loosestrife. Mt (GA, VA), Pd? (NC?): wet meadows and calcareous fens, stream banks; rare (NC Watch List, VA Rare). July-September. MA, s. Ontario, 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). [= C, F, K, W, Z; = *Steironema quadriflora* (Sims) Hitchcock – G]

Lysimachia quadrifolia Linnaeus, Whorled Loosestrife. Mt, Pd (GA, NC, SC, VA), Cp (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. [= RAB, C, F, G, GW, K, S, W]

Lysimachia radicans Hooker, Trailing Loosestrife. Mt, Cp (VA): moist forests, swamps; rare (VA 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 additional documentation is found. [= C, F, K, W, Z; = *Steironema radicans* (Hooker) A. Gray – G, S]

Lysimachia terrestris (Linnaeus) Britton, Sterns, & Poggenburg, Bog-candles, Swamp-candles. Mt (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): bogs, wet meadows, and swamp forests; uncommon. May-July; August-October. Newfoundland west to MN and Saskatchewan, south to SC, GA, e. TN, and sc. TN. [= RAB, C, G, GW, K, S, W; *L. terrestris* var. *terrestris* – F]

Lysimachia tonsa (Wood) Wood ex Pax & R. Knuth, Southern Loosestrife, Appalachian Loosestrife. Pd (GA, NC, SC, VA), Mt (GA, VA): upland forests, especially over calcareous or mafic rocks; rare (NC Watch List, VA Watch List). May-July; August-October. Sc. 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, K, W, Z; =*? Steironema intermedium* Kearney – G; = *Steironema tonsum* (Wood) Bicknell ex Britton – S]

* ***Lysimachia barystachys*** Bunge. Reported from a single county in nc. GA (Jones & Coile 1988). [= K] {investigate; not keyed at this time}

Lysimachia graminea (Greene) Handel-Mazzetti, Grassleaf Yellow-loosestrife. Endemic to ne. AL (Little River Canyon area). [= K, Z; = *Steironema gramineum* Greene – S]

* *Lysimachia japonica* Thunberg, native of Japan and China. Reported for WV (Kartesz 1999). [= K] {investigate; not keyed at this time}

Lysimachia thyrsiflora Linnaeus, Tufted Loosestrife, ranges south to NJ, PA, OH, and MO (Kartesz 1999), and MD (from Big Marsh, Kent County) (Steury, Tyndall, & Cooley (1996). [= C, K; = *Naumburgia thyrsiflora* (Linnaeus) Duby] {not keyed at this time; synonymy incomplete}

* ***Lysimachia vulgaris*** Linnaeus, Garden Loosestrife. Pd (VA): disturbed bottomland, native of Europe. Introduced and naturalized south at least to se. and sc. PA (Rhoads & Klein 1993), WV, KY, MD, and NJ (Kartesz 1999). [= C, K] {not keyed at this time; synonymy incomplete}

Another hybrid has been reported: *L.* ×*radfordii* Ahles, a hybrid of *L. loomisii* × *quadrifolia*. It is intermediate between its parents.

Trientalis Linnaeus 1753 (Starflower)

A genus of 2 species, herbs, north temperate. References: 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 *ssp.* ***borealis***, Starflower. Mt (GA, NC, VA): northern hardwood forests, rich slope forests, often in second-growth areas; uncommon in VA, rare farther south (GA Endangered, NC Rare). 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). [= K; < *T. borealis* – C, F, G, W]

NELUMBONACEAE Dumortier 1829 (Lotus-lily Family)

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. Cp (GA, NC, SC, VA), Pd (VA), Mt (GA, VA): ponds, natural lakes; uncommon. June-September. NY and s. Ontario 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; *N. pentapetala* (Walter) Fernald]

* ***Nelumbo nucifera*** Gaertner, Sacred-lotus, Oriental Lotus-lily, Pink Lotus. Cp (NC, SC), Pd (NC), Mt (GA): ponds and lakes; rare, introduced from Asia. June-September. [= RAB, C, F, FNA, G, GW, K]

NYCTAGINACEAE A.L. de Jussieu 1789 (Four-o'clock Family)

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. 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).

1 Fruit rounded at apex, stipitate-glandular; perennial..... ***B. coccinea***
1 Fruit flat at the apex, glabrous; annual.....***B. erecta***

* ***Boerhavia coccinea*** P. Miller, Wineflower. Cp (NC, SC, VA): disturbed areas, adventive on ballast; rare, introduced from 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. Cp (SC): [= FNA, K, Z] {not keyed at this time} {disentangle *coccinea* and *diffusa*; rewrite key}

Boerhavia erecta Linnaeus, Erect Spiderling. Cp, Pd (GA, NC, SC): sandy fields, roadsides, disturbed areas; uncommon. May-October. NC south to FL, west to TX and AZ, perhaps only introduced in our area. [= 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 cuneate at the base, 2.5-6× as long as wide; [native, of dry sandy habitats in s. SC southward] .....***M. albida***
  2 Leaves cordate at the base, 1-2× as long as wide; [introduced, of disturbed habitats] .....***M. nyctaginea***

Mirabilis albida (Walter) Heimerl, Wild Four-o'clock, Pale Umbrella-wort. Cp (GA, SC): sandhills, adjacent disturbed sandy soils; rare (GA Special Concern). 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. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): disturbed areas, or persistent at former garden sites; uncommon, introduced from tropical America. June-November. [= RAB, C, F, G, K, S, Z]

* ***Mirabilis nyctaginea*** (Michaux) MacMillan, Heart-leaved Umbrella-wort, Wild Four-o'clock. Mt, Pd (NC, VA), Cp (VA): railroad embankments, other disturbed areas; rare, introduced from c. North America. June-October. [= RAB, C, F, K, W, Z; = *Oxybaphus nyctagineus* (Michaux) Sweet – G; = *Allionia nyctaginea* Michaux – S]

Mirabilis linearis (Pursh) Heimerl var. *linearis.* Manitoba and Alberta, south to TN, MS, and CA; scattered elsewhere in e. North America by introduction. [= FNA; < *M. linearis* – C, F, K; < *Oxybaphus linearis* (Pursh) B.L. Robinson – G] {not keyed at this time}

NYMPHAEACEAE R.A. Salisbury 1805 (Water-lily Family)

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. References: Beal (1956)=Z; Wiersema & Hellquist in FNA (1997); Padgett (1999)=Y; 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 < 1/4 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; [blackwater streams and rivers, Panhandle FL and s. AL] ..... ***[N. ulvacea]***
  3 Floating leaf blades 1-2× as long as wide, the sinus > 1/3 as long as the midrib; floating or emersed leaves more abundant than submersed 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 usualy 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, the lobes acute to broadly rounded; leaves mostly emersed..... ***N. advena***
      6 Lower leaf surface densely pubescent; leaves 20-45 cm wide, the lobes broadly rounded; leaves mostly floating ..... ***N. orbiculata***

Nuphar advena (Aiton) R. Brown ex Aiton f., Broadleaf Pondlily. Cp, Pd, Mt (GA, NC, SC, VA): lakes, ponds, natural depression ponds, old millponds, slow-flowing rivers (blackwater and brownwater); common. 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; = *Nuphar luteum* (Linnaeus) Sibthorp & J.E. Smith ssp. *macrophyllum* (Small) E.O. Beal – RAB, GW, W, Z; > *Nuphar advena* – F, G; > *Nuphar fluviatile* (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* Harper – S; = *Nuphar advena* ssp. *advena* – Y]

Nuphar orbiculata (Small) Standley. Cp (GA): quiet waters in blackwater swamps; uncommon (GA Watch List). A Southeastern Coastal Plain endemic: FL north to ne. GA. [= 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 – Y; = *Nuphar luteum* ssp. *orbiculatum* (Small) E.O. Beal – Z]

Nuphar sagittifolia (Walter) Pursh, Narrowleaf Pondlily, Bonnets. Cp (NC, SC, VA): blackwater streams, rivers, and lakes, in swift, sluggish, or stagnant water, extending downriver into freshwater tidal areas; uncommon (NC Rare, VA Rare). 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. [= C, FNA; = *Nuphar luteum* (Linnaeus) Sibthorp & J.E. Smith ssp. *sagittifolium* (Walter) E.O. Beal – RAB, GW, Z; = *Nuphar sagittifolium* – F, G, an orthographic variant; = *Nuphar lutea* J.E. Smith ssp. *sagittifolia* (Walter) E.O. Beal – K; = *Nymphaea sagittifolia* Walter – S]

Nuphar microphylla (Persoon) Fernald. Nova Scotia, Québec, and Manitoba south to s. NJ, se. PA, MI, IL, and MN. [= C, FNA, 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 rubrodisca Morong. New Brunswick, Québec, and Ontario south to NJ, PA, MI, and MN. [= FNA; = *Nuphar* ×*rubrodisca* Morong – C; = *Nuphar* ×*rubrodiscum* Morong – F; = *Nuphar rubrodiscum* – G; = *Nuphar lutea* J.E. Smith ssp. *rubrodisca* (Morong) Hellquist & Wiersema – K]

Nuphar ulvacea (G.S. Miller & Standley) Standley, Sea-lettuce Pondlily. Blackwater streams of Panhandle FL and s. AL. [= 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 variegata Durand in G.W. Clinton. Widespread in ne. North America, south to DE, PA, OH, IN, IL, IA, and NE. [= C, FNA; = *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 (Water-lily)

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 Petals yellow; plants producing stolons .....***N. mexicana***
1 Petals white (to pink); plants not producing stolons.
  2 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***
  2 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 mexicana Zuccarini, Banana Water-lily, Yellow Water-lily. Cp (GA, NC, SC): sluggish or stagnant waters; rare, 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. US and the New World tropics. [= RAB, FNA, K, Z; = *Castalia flava* (Leitner) Greene – S]

Nymphaea odorata W.T. Aiton ***ssp. odorata***, White Water-lily. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): ponds, sluggish waters; common (uncommon in Piedmont and Mountains). June-September. Newfoundland west to Manitoba, 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; >< *N. odorata* var. *odorata* – C; > *N. odorata* var. *odorata* – F, G; > *N. odorata* var. *gigantea* Tricker – C, F, G; > *N. odorata* 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. South to MD, DE, NJ, PA. [= FNA, K, Z; < *N. odorata* var. *odorata* – C; = *N. tuberosa* Paine – F, G]

NYSSACEAE A.L. de Jussieu ex Dumortier 1829 (Tupelo Family)

A family of 1-3 genera and 8-12 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 (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 taxon other than those in our area is *N. ursina* Small [*N. sylvatica* Marshall var. *ursina* (Small) Wen & Stuessy], a 2-5 m tall shrub or small tree related to *N. biflora* and endemic to panhandle FL. 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.

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 (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]..... ***N. biflora***
    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***

Nyssa aquatica Linnaeus, WaterTupelo, Tupelo Gum, Cotton Gum. Cp (GA, NC, SC, VA): river swamps, where inundated for substantial periods of time; common. 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, X, Y, Z; = *N. uniflora* Wangenheim – G]

Nyssa biflora Walter, Swamp Tupelo, Water Gum, Swamp Black Gum. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): 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; common (rare in Piedmont). 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, GW, X, Y]

Nyssa ogeche Bartram ex Marshall, Ogeechee Lime, Ogeechee Tupelo, Ogeechee Plum. Cp (GA, SC): river swamps and wet forests with peaty soils, also in upland depression ponds; common, rare north of GA (SC Rare). April; August-October. A Southeastern Coastal Plain endemic: se. SC south to c. peninsular FL, west to s. AL. [= RAB, GW, K, X, Y, Z; > *N. acuminata* Small – S; > *N. ogeche* – S]

Nyssa sylvatica Marshall, Sour Gum, Black Gum, Pepperidge. Mt, Pd, Cp (GA, NC, SC, VA): dry or mesic upland forests, less commonly in bottomlands, pine savannas, or upland depressions, where occasionally inundated briefly; common. 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, Z; = *N. sylvatica* var. *sylvatica* – RAB, C, GW, X, Y; > *N. sylvatica* var. *sylvatica* – F; > *N. sylvatica* var. *dilatata* Fernald – F; > *N. sylvatica* var. *caroliniana* (Poiret) Fernald – F]

OLEACEAE Hoffmansegg & Link 1813 (Olive Family)

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 60-100 species, primarily tropical. *Ch. pygmaeus* Small is endemic to scrub in peninsular FL. References: Hardin (1974)=Z.

Chionanthus virginicus Linnaeus, Fringe-tree, Old Man's Beard. Pd, Mt, Cp (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. April-May; July-September. NJ, s. PA, s. OH, and MO south to n. FL and e. TX. *Ch. 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. *Ch. 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, 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 (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, X, Y, Z]

Forestiera godfreyi L.C. Anderson, Godfrey's Forestiera. Cp (GA, SC): shell middens, maritime forests over shell substrate; rare (GA Special Concern). Mid January-February; April-May. Se. SC (Beaufort and Charleston counties) to e. GA and n. FL. [= K, X, Y; < *F. pubescens* Nuttall – S, in part (apparently)]

Forestiera ligustrina (Michaux) Poiret in Lamarck, Southern-privet. Cp, Pd (GA, SC): upland forests and slopes along streams, mostly on shell middens or calcareous rocks; rare (SC Rare). E. SC south to n. 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 (GA, SC): calcareous scrub, shell middens, maritime forests and thickets; rare (GA Special Concern, SC 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* – 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): 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, Mt (VA): 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 45-65 species, trees, mostly north temperate (Asia, North America, Europe). References: Hardin & Beckmann (1982)=Z; Miller (1955)=Y; Green in Kadereit (2004).

1 Young twigs 4-angled or narrowly 4-winged; [trees of calcareous woodlands in the Mountains of sw. VA and northward and westward]..... ***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..... ***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.
    3 Leaves minutely papillose 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 (never papillose), 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***

Fraxinus americana, White Ash, American Ash. Mt, Pd, Cp (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 NC, SC, and GA). April-May; August-October. Nova Scotia west to MN, south to FL and TX. A valuable timber tree. The division into 2 taxa, var. americana and var. biltmoreana, needs further study. [= C, K, W, Z; > *F. americana* Linnaeus var. *americana* – RAB, F, G; > *F. americana* Linnaeus var. *biltmoreana* (Beadle) J. Wright ex Fernald – RAB, F, G; > *F. americana* var. *microcarpa* A. Gray – F; > *F. americana* – S, Y; > *F. biltmoreana* Beadle – S, Y]

Fraxinus caroliniana P. Miller, Water Ash, Pop Ash, Carolina Ash. Cp, Pd (GA, NC, SC, VA): deeply to shallowly flooded swamps; common (rare in Piedmont). May; July-October. Se. VA south to 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, Y, Z; > *F. caroliniana* var. *caroliniana* – F; > *F. caroliniana* var. *oblanceolata* (M.A. Curtis) Fernald & Schubert – F; > *F. caroliniana* var. *cubensis* (Grisebach) Lingelsh. – F; > *F. caroliniana* – S; > *F. pauciflora* Nuttall – S]

Fraxinus nigra Marshall, Black Ash. Mt, Pd (VA): seepage swamps and mountain streambanks; rare (VA Watch List). April-May; August-October. Newfoundland and Québec west to Manitoba, south to DE, VA, IN, and IA. [= C, F, G, K, W, Y, Z]

Fraxinus pennsylvanica Marshall, Green Ash, Red Ash. Cp, Pd, Mt (GA, NC, SC, VA): bottomlands and swamps, especially along brownwater rivers and streams; common. April-May; August-October. Nova Scotia west to Alberta, 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; > *F. pennsylvanica* var. *pennsylvanica* – RAB, F, G; > *F. pennsylvanica* var. *austinii* Fernald – F; > *F. darlingtonii* Britton – S; > *F. pennsylvanica* – S; > *F. smallii* Britton – S; *?* *F. pennsylvanica* ssp. *pennsylvanica* – Y]

Fraxinus profunda (Bush) Bush, Pumpkin Ash. Cp, 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) for additional

discussion. The nomenclature is controversial. [= C, GW, K, W, Z; = *F. tomentosa* Michaux f. – RAB, F, G, Y; > *F. profunda* – S; > *F. michauxii* Britton – S]

Fraxinus quadrangulata Michaux, Blue Ash. Mt (GA, VA): mesic to dry calcareous woodlands and forests; rare (GA Special Concern, VA Watch List). April; July-October. S. Ontario west to s. MI and e. KS, south to sw. VA, e. TN, nw. GA, n. AL, and OK. [= C, F, G, K, S, Y, Z]

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, native of w. China, is planted and often persists. Reported for GA (K). [= K]
* *Jasminum multiflorum* (Burmann f.) Andrews, Star Jasmine, is planted and naturalized at least as far north as Jacksonville, Duval County, FL (Wunderlin & Hansen 2004). [= K]
* *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)

A genus of about 40 species, shrubs and trees, of the Old World. I have here largely followed Hardin (1974), though, as he points out, "the taxonomy and nomenclature of our plants seem uncertain in a few cases" and "it is difficult to determine which are really naturalized in our area." It is possible that not all the species treated below are truly naturalized, and that taxonomic changes will be needed. References: Hardin (1974)=Z; Green in Kadereit (2004). The key is based closely on Hardin (1974).

1 Twigs glabrous.
  2 Corolla tube equalling or shorter than the corolla lobes.
    3 Leaves persistent or tardily deciduous, 6-15 cm long ..... ***L. lucidum***
    3 Leaves deciduous, 3-6 cm long ..... ***L. vulgare***
  2 Corolla tube slightly longer than or up to 3× as long as the corolla lobes.
    4 Leaves persistent and glossy, rounded or broadly cuneate at the base; corolla tube slightly longer than the corolla lobes ..... ***L. japonicum***
    4 Leaves deciduous or semi-evergreen, cuneate at the base; corolla tube ca. 3× as long as the corolla lobes ..... ***L. ovalifolium***
1 Twigs pubescent.
  5 Corolla tube equalling or shorter than the corolla lobes.
    6 Flowers sessile or subsessile ..... ***L. quihoui***
    6 Flowers pedicellate.
      7 Twigs densely pubescent; leaves pubescent on the midrib beneath ..... ***L. sinense***
      7 Twigs minutely puberulent; leaves glabrous ..... ***L. vulgare***
  5 Corolla tube slightly longer than or up to 3× as long as the corolla lobes.
    8 Pedicels pubescent; calyx pubescent ..... ***L. obtusifolium***
    8 Pedicels glabrous; calyx glabrous or slightly pubescent at the base.
      9 Leaves 2-6 cm long; twigs conspicuously pubescent ..... ***L. amurense***
      9 Leaves 4-10 cm long; twigs minutely puberulent ..... ***L. japonicum***

* ***Ligustrum amurense*** Carrière, Amur Privet. Pd (NC, VA), Cp, Mt (VA {SC}: disturbed places; rare, native of n. China. [= RAB, C, F, G, K, Z]
* ***Ligustrum japonicum*** Thunberg, Japanese Privet. Cp (GA, NC, SC, VA), Pd (NC, VA): disturbed places; rare, native of Japan and Korea. [= RAB, K, Z]
* ***Ligustrum lucidum*** Aiton f., Glossy Privet. Pd, Cp (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, Z]
* ***Ligustrum obtusifolium*** Siebold & Zuccarini. Cp, Pd (NC, VA), Mt (VA): disturbed places; uncommon, native of Japan. [= C, F, G, K, Z]
* ***Ligustrum ovalifolium*** Hasskarl, California Privet. Cp, Pd (NC, VA): disturbed places; rare, native of Japan. [= RAB, C, F, G, K, S, Z]
* ***Ligustrum quihoui*** Carrière, Wax-leaved Privet. Cp (NC, VA): disturbed places; rare, native of China. [= K, Z]

* ***Ligustrum sinense*** Loureiro, Chinese Privet. Cp, Pd, 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, Z]

* ***Ligustrum vulgare*** Linnaeus, Common Privet. Cp, Pd (NC, VA): disturbed places; rare, native of Europe and n. Africa. [= C, F, G, K, S, Z]

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 (GA, NC, SC, VA): maritime forests and (in GA, SC, and extreme s. NC) dry, sandy forests well inland, and reported for wet habitats as well further south; uncommon (VA Rare). April-May; August-October. Se. VA south to 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 (often a few subopposite), glossy, evergreen leaves. [= RAB, F, G, GW; = *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.

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): commonly planted, persistent and naturalizing around old farms; rare, native of se. Europe. [= C, F, G, K, Z]

ONAGRACEAE A.L. de Jussieu 1789 (Evening-primrose Family)

A family of about 18 genera and 650 species, herbs, shrubs, and rarely trees, cosmopolitan (especially of temperate and subtropical America). References: 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 ..... ***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 ..... ***Gaura***
  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.
      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..... ..... ***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 ..... ***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] ..... ***Ludwigia***
      5 Calyx tube extended beyond the summit of the ovary; sepals deciduous; stamens 8; petals yellow (rarely pink or white); [primarily of uplands] ..... ***Oenothera***

Calylophus Spach

A genus of 6 species, of North America.

Calylophus serrulatus (Nuttall) Raven, east to w. KY. [= K; = *Oenothera serrulata* Nuttall] {not keyed at this time; synonymy incomplete}

Chamerion (Rafinesque) Rafinesque (Fireweed)

There is increasingly strong evidence for the recognition of this group of plants as a genus separate from *Epilobium*. References: Mosquin (1966)=Z; Holub (1972)=Y; Munz (1965)=X.

Chamerion platyphyllum (Daniels) Löve & Löve, Great Willow-herb, Fireweed. Mt (NC, VA): grassy balds, roadsides, disturbed areas; uncommon (NC Rare). 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 *Chamerion 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 *Ch. angustifolium*. The diploid *Chamerion angustifolium* (Linnaeus) Holub is arctic and boreal, extending south in North America to New Brunswick, Québec, Ontario, alpine WY, and British Columbia. The hexaploid is *Chamerion danielsii* D. Löve. [< *E. angustifolium* – RAB, G, GW, W; = *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; < *Chamaenerion angustifolium* (Linnaeus) Scopoli – S; < *Chamerion angustifolium* (Linnaeus) Holub – Y; = *Epilobium angustifolium* Linnaeus ssp. *circumvagum* Mosquin – Z]

Circaea Linnaeus (Enchanter's-nightshade)

A genus of 7-8 species, herbs, of temperate and boreal regions of the Northern Hemisphere. References: Boufford (1983)=Z; Boufford (2005)=Y; Munz (1965)=X; Averett & Boufford (1985); Skvortsov (1979). Key based on Z.

Identification notes: Sometimes confused in vegetative condition with *Phryma*.

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?, NC, VA): 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. 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 Newfoundland and 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, X, Z; < *C. alpina* – RAB, F, G, GW, S, W; = *C. alpina* var. *alpina* – C]

Circaea canadensis (Linnaeus) Hill *ssp.* ***canadensis***, Canada Enchanter's-nightshade. Mt (GA, NC, VA), Pd (GA, NC, SC, VA), Cp (GA, NC, VA): mesic, nutrient-rich forests; common (SC Rare). June-August. Nova Scotia and New Brunswick west to se. Manitoba 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. [=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; > *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): 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 Newfoundland west to Ontario 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*. [= *C. ×sterilis* Boufford – 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, misapplied]

Epilobium Linnaeus (Willow-herb)
(also see *Chamerion*)

Epilobium is a large genus (ca. 200 species), 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 here. There is increasing opinion that *E. angustifolium* and its relatives should be distinguished at the generic level from *Epilobium*, as *Chamerion*. References: Munz (1965)=Z.

1 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 ..... [see ***Chamerion***]
1 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; [section *Lysimachion*].
  2 Stigma 4-cleft; petals 10-15 mm long ..... ***[E. hirsutum]***
  2 Stigma capitate; petals 2-8 mm long.
    3 Leaves lanceolate, distinctly broader below the middle, flat, the larger generally at least 10 mm wide, toothed.
      4 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***
      4 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***
    3 Leaves linear to narrowly lanceolate, broadest near the middle, revolute, the larger generally < 10 mm wide, not toothed.
      5 Pubescence spreading ..... ***E. strictum***
      5 Pubescence appressed.
        6 Upper leaf surface finely and rather densely pubescent ..... ***E. leptophyllum***
        6 Upper leaf surface glabrous or with a few scattered hairs near the midrib ..... ***[E. palustre]***

Epilobium ciliatum Rafinesque *ssp. **ciliatum***, American Willow-herb. Mt (NC, VA): bogs, seeps, disturbed wet places (such as moist edges of logging roads); uncommon (NC Rare). June-September. Newfoundland and Labrador west to AK, south to VA, w. NC, ne. TN, IN, IA, CA, TX, Mexico, Central America; disjunct in Chile and Argentina. [= K; < *E. ciliatum* – RAB, W; = *E. ciliatum* var. *ciliatum* – C; > *E. ciliatum* – F, X, in a narrower sense; > *E. glandulosum* Lehm. var. *adenocaulon* (Hausskn.) Fernald – F; > *E. adenocaulon* Hausskn. var. *adenocaulon* – G, Z]

Epilobium coloratum Biehler, Bronze Willow-herb, Eastern Willow-herb. Mt (GA, NC, SC, VA), Pd, Cp (NC, VA): seepages, moist open places; common (rare in Coastal Plain of NC). 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, W, Z]

Epilobium leptophyllum Rafinesque, Narrowleaf Willow-herb, American Marsh Willow-herb. Mt (NC, VA): bogs, seepages, and boggy meadows; rare (NC Watch List, VA Rare). July-October. Newfoundland and Mackenzie west to British Columbia, south to w. NC, ne. TN, KS, and CA. [= RAB, C, F, G, GW, K, W, Z]

Epilobium strictum Muhlenberg ex Sprengel, Northeastern Willow-herb, Downy Willow-herb, Soft Willow-herb. Pd (VA): moist places; rare (VA Rare). Québec west to MN, south to n. VA, OH, and n. IL. The single record is regarded as questionable. [= C, F, G, K, Z]

* *Epilobium hirsutum* Linnaeus, Hairy Willow-herb, introduced from Eurasia, ranges south to s. PA (Rhoads & Klein 1993) and WV (Kartesz 1999). [= C, F, G, K, Z]

Epilobium palustre Linnaeus, Marsh Willow-herb, ranges south to DE and ne. PA (Rhoads & Klein 1993). [= C, K; > *E. palustre* var. *palustre* – F, G, Z]

Gaura Linnaeus (Gaura)

A genus of about 21 species, herbs, of North America. The flowers of all our species open about sunset and wither early the following morning. The genus is rather weedy; other western species may be expected to turn up in our area as adventive weeds. References: Raven & Gregory (1972)=Z; Munz (1965)=X.

1 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].
  2 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 ..... ***G. filipes***
  2 Mat-forming perennial; petals 7-15 mm long; body of the fruit 8-15 mm long; stipe of the fruit 2-8 mm long ..... ***G. sinuata***
1 Pedicels 0-1 mm long; fruit without a stipe; annual, winter annual, or biennial; [collectively of various habitats and more widespread in our area.
  3 Sepals 2-3.5 mm long; petals 1.5-3 mm long ..... ***G. parviflora***
  3 Sepals 2.5-12 mm long; petals 2.5-9 mm long.
    4 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] ..... ***G. angustifolia***
    4 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] ..... ***G. biennis***

Gaura angustifolia Michaux, 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. [= RAB, K, S, Z; > *G. angustifolia* var. *angustifolia* – X]

Gaura biennis Linnaeus, Biennial Gaura, Northeastern Gaura. Mt (NC, SC, VA), Pd (GA, NC, VA), Cp (GA, SC): roadsides, woodlands, streambanks, disturbed areas; common. 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. [= RAB, K, S, W, Z; *G. biennis* var. *biennis* – C, F, G, X]

Gaura filipes Spach, Threadstalk Gaura. Cp (GA, SC), Pd, 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. [= RAB, C, G, K, W, Z; > *G. filipes* var. *filipes* – F, X; > *G. filipes* var. *major* Torrey & A. Gray – F, X; = *G. michauxii* Spach – S]

* ***Gaura parviflora*** Douglas ex Lehmann, Small-flowered Gaura. Cp (GA, SC), Pd (GA): sandy fields, disturbed areas, and clearings; rare, introduced from further west. 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). [= RAB, F, G, S, Z; = *G. mollis* James – K; > *G. parviflora* var. *parviflora* – X; > *G. parviflora* var. *lachnocarpa* Weatherby – X]

* ***Gaura sinuata*** Nuttall ex Seringe, Texas Gaura. Cp (GA, SC), Pd (GA): sandy fields, disturbed areas, and clearings; uncommon, introduced from further west. April-June. AR and OK south to s. TX, introduced eastward to SC and FL. [= RAB, K, X, Z]

Gaura drummondii (Spach) Torrey & A. Gray. Disjunct eastward in GA (Kartesz 1999). [= K] {not keyed at this time}

Gaura longiflora Spach. East to MD, PA, KY, TN, and AL (Kartesz 1999). [= K; = *G. biennis* Linnaeus var. *pitcheri* Torrey & A. Gray – C, F, G, X; > *G. filiformis* Small – S; > *G. longiflora* – S] {not keyed at this time}

Ludwigia Linnaeus 1753 (Seedbox, Water-primrose, Water-purslane)

A genus of about 82 species, herbs and shrubs, cosmopolitan. References: Peng (1989)=Z; Munz (1965)=X; Nesom & Kartesz (2000)=Q; Zardini, Gu, and 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.

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 equalling 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 *Myrtocarpus*] ..... ***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 (NC Rare, VA 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, Z; > *L. alata* – GW, in part only (also see *L. lanceolata*); > *L. alata* – S, in a narrower sense; > *L. simulata* Small – S]

Ludwigia alternifolia Linnaeus, Alternate-leaf Seedbox. Mt, Pd, Cp (GA, NC, SC, VA): ditches, marshes, open wet places, disturbed wet places; common. May-October. MA west to s. Ontario, s. MI, IA, and KS, south to n. FL and e. TX. [= RAB, G, GW, K, S, W; > *L. alternifolia* var. *alternifolia* – C, F; > *L. alternifolia* var. *pubescens* E.J. Palmer & Steyermark – C, F]

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; = *Ludwigiantha arcuata* (Walter) Small – S]

* ***Ludwigia bonariensis*** (M. Micheli) Hara. Cp (NC, SC): freshwater tidal marshes and adjacent disturbed areas; rare, apparently introduced from 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; = *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 (NC Rare, VA Rare). July-October. NJ south to e. GA (Jones & Coile 1988), in the Coastal Plain. [= RAB, C, F, G, GW, K]

Ludwigia decurrens Walter, Wingstem Water-primrose. Cp, Pd, Mt (GA, NC, SC, VA): swamp forests, ditches; common (rare in VA 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, W; = *Jussiaea decurrens* (Walter) Augustin de Candolle – F, G, S]

Ludwigia glandulosa Walter, Small-flowered Seedbox. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): low forests, marshes, ditches; common (VA Watch List). 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, in a broader sense; = *L. glandulosa* ssp. *glandulosa* – K, 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 (also see *L. hexapetala*); = *L. grandiflora* (Michaux) Zardini, Gu, & Raven – V]

* ***Ludwigia grandiflora*** (Michaux) Greuter & Burdet *ssp.* ***hexapetala*** (Hooker & Arnott) Nesom & Kartesz, Common Water-primrose. Cp (NC, SC), Pd (GA, NC, VA), Mt (VA): ponds, lakes, sluggish waters of ditches or streams; uncommon (but often locally abundant). 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, in part (also see *L. grandiflora*); < *Jussiaea uruguayensis* Cambessedes – F, G; *Jussiaea michauxiana* Fernald – F; = *L. hexapetala* (Hooker & Arnott) Zardini, Gu, & Raven – V]

Ludwigia hirtella Rafinesque, Rafinesque's Seedbox. Cp (GA, NC, SC, VA), Pd (GA), Mt (GA, NC): savannas, rarely in mountain bogs; common (VA Rare). 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, 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, Z; < *L. alata* – GW, in part]

Ludwigia leptocarpa (Nuttall) Hara, Water-willow. Cp (GA, NC, SC, VA), Pd (GA, VA), Mt (GA): riverbanks, marshes, and ditches; common, uncommon in VA (VA Watch List). June-September. VA south to c. peninsular FL, west to e. TX, north in the interior to se. MO and s. IL; and in tropical America. [= RAB, C, GW, K, W; = *Jussiaea leptocarpa* Nuttall – F, G, S]

Ludwigia linearis Walter *var.* ***linearis***, Eastern Narrowleaf Seedbox. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): savannas; common. 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, W, Z]

Ludwigia linearis Walter *var.* ***puberula*** Engelmann & A. Gray, Western Narrowleaf Seedbox. Cp (GA, NC, SC, VA), 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, W, Z]

Ludwigia linifolia Poiret in Lamarck, 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, Z]

Ludwigia maritima 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]

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, 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; > *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, Pd, Mt (GA, NC, SC, VA): moist to wet disturbed areas; common. May-October. Widespread in North America, Eurasia, and Africa. [= RAB, C, GW, K, W; > *L. palustris* var. *americana* (Augustin de Candolle) Fernald & Griscom – F, G; > *L. palustris* var. *nana* Fernald & Griscom – F; = *Isnardia palustris* Linnaeus – S]

*? ***Ludwigia peploides*** (Humboldt, Bompland, & Kunth) Raven *var.* ***glabrescens*** (Kuntze) Shinners. Cp (GA, NC, VA), Mt (VA), Pd (GA, SC, VA): pools, ditches, disturbed places; rare. 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; < *L. peploides* – W, infraspecific taxa not distinguished]

Ludwigia pilosa Walter, Hairy Seedbox. Cp (GA, NC, SC, VA), Pd (NC, VA): ditches, wet places; common, rare in VA (VA Rare). 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, W, Z; < *L. pilosa* – RAB, C, F, G, GW, S (also see *L. ravenii*)]

Ludwigia polycarpa Short & Peter. Pd (VA): {habitat}; rare (VA Watch List). June-September; July-October. MA, CT, and w. VT west to s. Ontario, 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, Z]

Ludwigia ravenii Peng, Raven's Seedbox. Cp (NC, SC, VA): savannas, swamps, marshes, wet open places; rare (NC Watch List, VA 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, 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): ditches, pools, and streams; uncommon (VA Rare). 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; *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 (GA Special Concern, NC Rare, SC Rare). June-October. SC south to panhandle FL and s. AL. [= RAB, GW, K; *Isnardia spathulata* (Torrey & A. Gray) Small – S]

Ludwigia sphaerocarpa Elliott, Globe-fruited Seedbox. Cp (GA, NC, SC, VA): boggy areas, pools, ditches, river marshes, interdune swales, river and pondshores; rare (NC Watch List, VA Rare). 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, 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, Z; = *L. capitata* Michaux]

Ludwigia virgata Michaux, Savanna Seedbox. Cp (GA, NC, SC, VA): wet savannas; common (VA Rare). June-September. Se. VA south to s. peninsular FL, west to panhandle FL and se. AL. [= RAB, C, F, GW, K, S]

Ludwigia peruviana (Linnaeus) Hara, in s. GA (Jones & Coile 1988). Reported for NC (Kartesz 1999). {investigate} [= K; *Jussiaea peruviana* Linnaeus]

The following 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.

L. alata × *pilosa*. Pentaploid, sterile.
L. alata × *suffruticosa*. Pentaploid, sterile.

L. arcuata × *pilosa*.
L. glandulosa × *linearis*. Triploid, sterile.
L. glandulosa × *palustris*. Triploid, sterile.
L. glandulosa × *pilosa*. Tetraploid, fertile.
L. glandulosa × *sphaerocarpa*. Tetraploid, fertile.
L. lanceolata × *pilosa* [= *L.* ×*simulata* Small (pro sp.)]. Tetraploid, fertile.
L. lanceolata × *suffruticosa*. Tetraploid, fertile. Frequent south of our area.
L. linearis × *sphaerocarpa*. Triploid, sterile.
L. microcarpa × *palustris*.
L. pilosa × *ravenii*. Tetraploid, fertile.
L. pilosa × *sphaerocarpa*. Tetraploid, fertile. Frequent.
L. pilosa × *suffruticosa*. Tetraploid, fertile.
L. polycarpa × *sphaerocarpa*. Tetraploid, fertile.

Oenothera Linnaeus 1753 (Evening-primrose)
(also see *Calylophus*)

A genus of about 124 species, herbs, of America (especially temperate regions). This treatment provisional, with further revision likely, especially in the *Oe. fruticosa*-*Oe. tetragona*-*Oe. pilosella* complex. References: Dietrich, Wagner, & Raven (1997)=Z; Dietrich & Wagner (1988)=Y; Munz (1965)=X; Straley (1977)=V. Keys adapted in part from those references.

1 Ovary essentially terete; fruit terete or with 4 rounded ridges; stamens equal in length (except in *Oe. speciosa*).
  2 Flowers white or pink; flower buds nodding; [section *Hartmannia*] ..... ***Oe. speciosa***
  2 Flowers yellow; flower buds erect; [section *Oenothera*]
    3 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*].
      4 Petals acute to rounded at the apex.
        5 Inflorescence dense, with > 2 flowers per spike opening each day; leaves gray-green ..... ***[Oe. clelandii]***
        5 Inflorescence lax, 1-2 flowers per spike opening on each day; leaves green..... ***Oe. curtissii***
      4 Petals truncate to emarginate at the apex.
        6 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].
          7 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..... ***Oe. drummondii*** *ssp.* ***drummondii***
          7 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..... ***Oe. humifusa***
        6 Nonflowering portion of stem not stiff, moderately to sparsely strigillose to sometimes densely villous, and also more orless glandular puberulent; leaves green, sparsely to moderately strigillose and usually villous, deeply lobed to dentate (rarely some of them subentire); [in inland disturbed situations].
          8 Petals 2.5-4 cm long; style 4-7.5 cm long; stigma lobes well elevated above the anthers at anthesis.. ..... ***Oe. grandis***
          8 Petals 0.5-2.2 cm long; style 2-5 cm long; stigma lobes surrounded by the anthers at anthesis .... ***Oe. laciniata***
    3 Fruit thickest near the base, tapering to the apex; seeds borne horizontally in the locules, angled-prismatic, not regularly pitted; [section *Oenothera*, subsection *Oenothera*].
      9 Stigma elevated above the anthers at anthesis; petals 2.5-5 cm long.
        10 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..... ***Oe. argillicola***
        10 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.
          11 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..... ..... ***Oe. glazioviana***
          11 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..... ***Oe. grandiflora***
      9 Stigma surrounded by or below the anthers at anthesis; petals 0.7-2.5 (-3) cm long.
        12 Plant appearing exclusively appressed-pubescent (as seen without magnification).
          13 Apex of the inflorescence curved; free sepal tips subterminal in bud, erect to spreadin; dry capsules usually rusty brown ..... ***Oe. oakesiana***

13 Apex of the inflorescence erect; free sepal tips erect in bud; dry capsules gray-green or dull green.
14 Leaves green to pale green; stems, ovary, floral tube, and sepals sparsely appressed-pubescent ..... ***Oe. biennis***
14 Leaves dull green to gray-green; stems, ovary, floral tube, and sepals densely appressed-pubescent ..... ***Oe. villosa*** *ssp.* ***villosa***

12 Plant appearing **either** glabrous **or** with a mixture of long pustular hairs and appressed pubescence (as seen without magnification).
15 Apex of inflorescence curved; free sepal tips subterminal in bud.
16 Plant (at least the lower portions) predominantly strigillose; leaves dull green to gray-green; dry capsules rusty brown ..... ***Oe. oakesiana***
16 Plant predominantly erect-pubescent or appearing glabrous (as seen without magnification); leaves usually bright green; dry capsules usually dark green or black..... ***Oe. parviflora***
15 Apex of inflorescence erect; free sepal tips terminal or subterminal in bud.
17 Inflorescence conspicuously pubescent ..... ***Oe. biennis***
17 Inflorescence glabrous (or appearing so without magnification).
18 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..... ***Oe. nutans***
18 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 ..... ***Oe. parviflora***

1 Ovary 4-angled or 4-winged (at least near its tip); fruit sharply 4-angled or 4-winged; stamens of two lengths (except *Oe. triloba* and *Oe. macrocarpa* ssp. *macrocarpa*).
19 Leaves all basal, pinnatifid; [section *Lavauxia*] ..... ***Oe. triloba***
19 Leaves in part cauline, entire or toothed.
20 Petals 50-70 mm long; flowers opening in the evening; wings of the fruit 10-25 mm wide; [section *Megapterium*]. ..... ***[Oe. macrocarpa*** *ssp.* ***macrocarpa]***
20 Petals 3-30 mm long; flowers opening in the day; wings of the fruit <3 mm wide; [section *Kneiffia*]
21 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*]..... ***Oe. linifolia***
21 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*].
22 Petals 5-10 mm long; inflorescence usually nodding ..... ***Oe. perennis***
22 Petals 15-30 mm long; inflorescence usually erect.
23 Plant conspicuously pilose-hirsute with hairs 1-3 mm long; free sepal tips 1-4 mm long, divergent .. .. ***Oe. pilosella***
23 Plant either with shorter or appressed pubescence, of glandular or nonglandular hairs; free sepal tips 0-2 (-6) mm long, divergent or not.
24 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.
25 Petals (20-) 25-35 mm long; cauline leaves lanceolate to ovate, 2-7 cm long, 1-3 cm wide, often glaucous beneath..... ***Oe. tetragona*** *var.* ***fraseri***
25 Petals 12-20 (-25) mm long; cauline leaves linear to lanceolate, 2-7 cm long, 0.5-1.0 (-1.5) cm wide ..... ***Oe. tetragona*** *var.* ***tetragona***
24 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.
26 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] ..... ***Oe. riparia***
26 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.
27 Capsule vestiture a mixture of glandular and nonglandular hairs.
28 Cauline leaves not velutinous, 5-10× as long as wide..... ..... ***Oe. tetragona*** *var.* ***brevistipata***
28 Cauline leaves velutinous, 2-4× as long as wide.
29 Petals 7-12 mm long; leaves lance-oblong, obtuse; [of barrens of TN, KY, and AL]..... ***[Oe. tetragona*** *var.* ***sharpii]***
29 Petals 15-20 mm long; leaves lanceolate, acute; [of the Atlantic Coastal Plain]..... ***Oe. tetragona*** *var.* ***velutina***
27 Capsule vestiture strictly nonglandular.

30 Free sepal tips 1-3 mm long, often arching; calyx strigose ..... ***Oe. fruticosa*** *var*. ***unguiculata***

30 Free sepal tips < 1 mm long; calyx various.

31 Capsule body 6-11 mm long, the pubescence rather coarse ..... ***Oe. fruticosa*** *var*. ***fruticosa***

31 Capsule body 3-5 mm long, the pubescence very fine.

32 Capsule body 3.5-4 mm long, strigose-pilose; [of Coastal Plain bogs] ..... ***Oe. fruticosa*** *var*. ***microcarpa***

32 Capsule body 4-5 mm long; very finely strigillose; [of Piedmont rock outcrops] ..... ***Oe. fruticosa*** *var*. ***subglobosa***

Oenothera argillicola Mackenzie, Shale-barren Evening-primrose. Mt (VA): shale barrens and woodlands; uncommon. Sc. PA south through MD to e. WN and w. VA (south to Montgomery County). [= C, F, G, H, K, W, Z; > *Oe. argillicola* var. *argillicola* – X; > *Oe. argillicola* var. *pubescens* Core & Davis – X]

Oenothera biennis Linnaeus, Common Evening-primrose. Mt, Pd, Cp (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; < *Oe. biennis* – RAB, G, S (also see *Oe. nutans*); = *Oe. biennis* var. *biennis* – C, F; > *Oe. biennis* var. *biennis* – F, in a narrower sense; > *Oe. biennis* var. *pycnocarpa* (Atkinson & Bartlett) Wiegand – F; > *Oe. biennis* ssp. *caeciarum* Munz – X; > *Oe. biennis* ssp. *centralis* Munz – 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 *Oe. rhombipetala*, which is restricted to the Great Plains, with scattered occurrences east to AR, IL, and MI. [= K, Y; < *Oenothera 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; < *Oe. drummondii* – RAB, K; < *Raimannia drummondii* (Hooker) Rose ex Sprague & Riley – S; = *Oe. drummondii* var. *drummondii* – X]

Oenothera fruticosa Linnaeus *var*. ***fruticosa***, Southern Sundrops. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, VA): dry forests and woodlands, glades, and rock outcrops; common. April-August. MA west to IN, south to FL and LA. [= F, G, X; < *Oe. fruticosa* – RAB, C; < *Oe. fruticosa* ssp. *fruticosa* – H, K, V, W; > *Oe. fruticosa* var. *linearis* (Michaux) S. Watson – F; > *Oe. 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; < *Oe. fruticosa* – RAB, C; < *Oe. 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; < *Oe. fruticosa* – RAB, C; < *Oe. 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; < *Oe. fruticosa* – RAB, C; < *Oe. fruticosa* ssp. *fruticosa* – H, K, V]

* ***Oenothera glazioviana*** Micheli in Martius, Garden Evening-primrose. Cp, Pd, 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; = *Oe. erythrosepala* Borbás – X]

Oenothera grandiflora L'Héritier ex Aiton. Cp, Pd, 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; = *Oe. laciniata* Hill var. *grandiflora* (S. Watson) B.L. Robinson – RAB, F, G]

Oenothera humifusa Nuttall, Seabeach Evening-primrose, Spreading Evening-primrose. Cp (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, Pd, Mt (GA, NC, SC, VA): disturbed areas; common. February-October. ME west to ND, south to s. FL and TX; also in CA. [= K, W; = *Oe. laciniata* var. *laciniata* – RAB, C, F, G; = *Raimannia laciniata* (Hill) Rose – S; = *Oe. 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, Pd (GA?, NC, SC?, VA): roadsides, openings, forest edges, pastures; common (NC Watch List, VA Watch List). July-October. ME west to MI, south to n. FL, s. AL, and s. MO. [= K, Z; < *Oe. biennis* – RAB, G, S; = *Oe. biennis* Linnaeus var. *austromontana* (Munz) Cronquist – C; = *Oe. biennis* var. *nutans* (Atkinson & Bartlett) Wiegand – F; = *Oe. austromontana* (Munz) Raven, Dietrich, & Stubbe – H, W; = *Oe. biennis* ssp. *austromontana* Munz – X]

Oenothera oakesiana (A. Gray) Robbins ex S. Watson & Coulter. Cp (NC, VA), Pd, Mt (VA): disturbed areas, roadsides; uncommon (VA Watch List). Nova Scotia west to Manitoba, south to e. NC, sc. VA, PA, n. IN, n. IL, and s. MN. [= G, K, Z; =

Oe. parviflora Linnaeus var. *oakesiana* (A. Gray) Fernald – C, F; = *Oe. parviflora* ssp. *parviflora* var. *oakesiana* (A. Gray) Fernald – X]

Oenothera parviflora Linnaeus, Small-flowered Evening-primrose. Mt, Pd (NC, VA), Cp (NC, SC, VA): fields, disturbed areas; uncommon. May-September. Nova Scotia west to Manitoba, south to NC, TN, KY, and MO. Reported for GA (GANHP). [= RAB, G, K, W, Z; > *Oe. parviflora* var. *parviflora* – C, F; > *Oe. parviflora* var. *angustissima* (R.R. Gates) Wiegand – F; > *Oe. parviflora* ssp. *parviflora* var. *parviflora* – X; > *Oe. parviflora* ssp. *angustissima* (R.R. Gates) Munz – X]

Oenothera perennis Linnaeus, Little Sundrops. Mt (NC, SC, VA), Pd (NC, VA), Cp (VA): bogs, sphagnous seeps; uncommon (rare south of VA) (NC Rare, SC Rare). May-August. Nova Scotia west to Manitoba, south to w. NC, nw. SC, KY, and MO. [= RAB, C, G, K, W, X; > *Oe. perennis* var. *perennis* – F; = *Kneiffia perennis* (Linnaeus) Pennell – S]

Oenothera pilosella Rafinesque, Midwestern Evening-primrose. Mt, Pd, Cp (VA): disturbed areas; rare. NH west to Ontario, south to s. VA, KY, n. AL, c. MS, and c. LA. *Oe. sessilis* (Pennell) Munz, treated by Straley (1977) as *Oe. pilosella* ssp. *sessilis* (Pennell) Straley, seems sufficiently distinct to be recognized as a species; it is restricted to Mississippi River Alluvial Plain. [= F, G, X; = *Oe. pilosella* ssp. *pilosella* – C, K, V; > *Kneiffia pratensis* Small – S; = *Oe. fruticosa* Linnaeus var. *hirsuta* Nuttall ex Torrey & A. Gray]

Oenothera riparia Nuttall, Riverbank Evening-primrose. Cp (NC, SC): tidal marshes; rare (NC Rare). June-July. Se. VA (?) south to se. NC and e. SC. Distinct from *Oe. fruticosa*. Present in the freshwater tidal portions of the Waccamaw, Northeast Cape Fear, Black, Greater Pee Dee, and Cape Fear (?) rivers. [< *Oe. fruticosa* – RAB; < *Oe. fruticosa* ssp. *fruticosa* – K, V; = *Kneiffia riparia* (Nuttall) Small – S; = *Oe. tetragona* Roth ssp. *glauca* (Michaux) Munz var. *riparia* (Nuttall) Munz – X]

* ***Oenothera speciosa*** Nuttall, White Evening-primrose. Cp, Pd, Mt (GA, NC, SC, VA): 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, 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 *Oe. fruticosa* (where placed in synonymy by Straley), if it is determined to be valid. [= G; < *Oe. tetragona* – RAB, C; < *Oe. fruticosa* Linnaeus ssp. *fruticosa* – H, K, V, W; = *Kneiffia brevistipata* Pennell – S; = *Oe. tetragona* ssp. *tetragona* var. *brevistipata* – X]

Oenothera tetragona Roth *var.* ***fraseri*** (Pursh) Munz, Appalachian Sundrops. Mt (GA, NC, SC, VA), 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 *Oe. tetragona*. [= F, G, X; < *Oe. tetragona* – RAB, C; > *Oe. tetragona* var. *hybrida* (Michaux) Fernald – F; > *Oe. tetragona* var. *latifolia* (Rydberg) Fernald – F; < *Oe. fruticosa* Linnaeus ssp. *glauca* (Michaux) Straley – H, K, V, W; > *Kneiffia glauca* (Michaux) Spach – S; > *Kneiffia hybrida* (Michaux) Small – S; > *Kneiffia latifolia* Rydberg – S; = *Oe. tetragona* ssp. *glauca* var. *glauca* – X]

Oenothera tetragona Roth *var.* ***tetragona***, Northern Sundrops. Mt, Pd (NC, SC, VA), Cp (VA): dry forests and woodlands, roadsides; common. May-August. Newfoundland west to MI, south to e. VA and MO. [= F; < *Oe. tetragona* – RAB, C; < *Oe. tetragona* var. *tetragona* – G; < *Oe. fruticosa* Linnaeus ssp. *glauca* (Michaux) Straley – H, K, V, W; = *Kneiffia tetragona* (Roth) Pennell – S; = *Oe. 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 *Oe. fruticosa* (where placed in synonymy by Straley), if it is determined to be valid. [= F, G; < *Oe. tetragona* – RAB, C; < *Oe. fruticosa* Linnaeus ssp. *fruticosa* – H, K, V, W; = *Kneiffia velutina* Pennell – S; = *Oe. tetragona* ssp. *tetragona* var. *velutina* – X]

Oenothera triloba Nuttall, Stemless Evening-primrose. Mt (GA, VA): limestone glades, {habitat not known in VA}; rare, perhaps only introduced, 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, Pd (VA): disturbed areas; uncommon, apparently naturalized in our area from an original distribution in the Great Plains. [= K, Z; *? Oe. strigosa* (Rydberg) Mackenzie & Bush – G; *? Oe. biennis* var. *canescens* Torrey & A. Gray – C, F; *? Oe. 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; < *Oe. rhombipetala*, misapplied]

Oenothera macrocarpa Nuttall ssp. *macrocarpa*, Wingfruit Evening-primrose, occurs as a disjunct in c. TN. [= K; < *Oe. missouriensis* Sims – F; < *Oe. macrocarpa* Nuttall – C, G; = *Oe. missouriensis* Sims var. *missouriensis* – X; *? Megapterium missouriense* (Sims) Spach]

Oenothera tetragona Roth var. *sharpii* Munz. Known from the Eastern Highland Rim of TN, AL, and KY. [< *Oe. tetragona* – RAB, C; < *Oe. tetragona* var. *tetragona* – G; < *Oe. fruticosa* Linnaeus ssp. *fruticosa* – H, K, V, W; = *Oe. tetragona* ssp. *tetragona* var. *sharpii* – X]

Many hybrids are known.

OROBANCHACEAE Ventenat 1799 (Broomrape Family)

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).

tribe Gerardieae: *Agalinis, Aureolaria, Dasistoma, Macranthera, Seymeria*.
tribe Orobancheae: *Epifagus, Orobanche*.
tribe Buchnereae, "subtribe Buchneriinae": *Buchnera, Striga.*
tribe Cymbarieae: *Schwalbea*.
"tribe Castillejeae": *Castilleja*.
tribe Rhinantheae: *Conopholis, Melampyrum, Pedicularis.*

1 Plants lacking chlorophyll (parasitic), variously pink, purple, brown, 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 .....***Epifagus***
  2 Stem simple (rarely few-branched); flowers all alike.
    3 Calyx deeply cleft on the lower side; stamens exserted .....***Conopholis***
    3 Calyx either nearly regular, or deeply cleft above and below into 2 lateral halves; stamens included..... ***Orobanche***
1 Plants with chlorophyll (hemiparasitic), with foliage and stems normally green.
  4.....

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 equalling 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 equalling 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 Branches spreading or ascending; stems more-or-less scabridulous; corollas 18-38 mm long.... .....***A. purpurea***
            8 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.
        9 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×).
          10 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***
          10 Upper lip of the corolla erect or reflexed, the throat open; corolla throat densely long-hairy within; [of the Coastal Plain].
            11 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***
            11 Branches ascending to somewhat spreading; pedicels < 3× as long as the leaflike bracts; anterior filaments 7-9 mm long; [widespread].....***A. setacea***

9 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.
- 12 Corolla throat within lacking 2 yellow lines; leaves widen distally to obtuse tips; stem and branches distinctly rough-scabridulous to the touch ..... ***A. obtusifolia***
- 12 Corolla throat with 2 prominent yellow lines; leaves taper to acute or acuminate tips; stem and branches not (or very slightly) scabridulous.
  - 13 Corolla 10-15 mm long, its lobes emarginate or retuse; [of the Piedmont and Mountains, and rarely the upper Coastal Plain] ..... ***A. decemloba***
  - 13 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 (GA, NC, SC): wet pine savannas; rare (GA Special Concern). September-October; October-November. Se. NC south to n. FL, west to e. LA. [= RAB, GW, K, S; = *Gerardia aphylla* Nuttall – P]

Agalinis auriculata (Michaux) S.F. Blake, Earleaf Foxglove. Pd (SC, VA): glades, barrens, and disturbed clearings over mafic rocks, such as diabase and gabbro; rare (US Species of Concern, SC Rare, VA Rare). August; September. OH west to MN, south to n. AL, 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 monotypic 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 (GA Special Concern). [= RAB, S, W; < *A. obtusifolia* – C, K; = *Gerardia decemloba* Greene – F, G, P]

Agalinis fasciculata (Elliott) Rafinesque. Cp (GA, NC, SC, VA), Pd (GA, SC, VA): sandhills, pine savannas, disturbed sandy areas, roadsides; common. 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; = *Gerardia fasciculata* Elliott – F, G; < *A. fasciculata* (Elliott) Rafinesque – GW, K; > *Gerardia fasciculata* ssp. *typica* – P]

Agalinis laxa Pennell. Cp (GA, SC): sandhills; rare. SC south to GA and FL. [= K, S; < *A. divaricata* (Chapman) Pennell – GW; = *Gerardia laxa* (Pennell) Pennell – P]

Agalinis linifolia (Nuttall) Britton. Cp (GA, NC, SC, VA?): Coastal Plain depression ponds, cypress savannas, wet pine savannas; uncommon. August-September; September-October. Se. NC south to s. FL, west to e. LA; disjunct in e. MD and e. DE. [= RAB, C, GW, K, S; = *Gerardia linifolia* Nuttall – F, G, P]

Agalinis maritima (Rafinesque) Rafinesque *var.* ***grandiflora*** (Bentham) Shinners. Cp (GA, NC, SC, VA): tidal marshes; uncommon. July; August. Se. VA south to s. FL, west to s. TX and Tamaulipas; West Indies. [= K, S; < *A. maritima* – RAB, C, GW; = *Gerardia maritima* Rafinesque var. *grandiflora* Bentham – F; < *Gerardia maritima* – G; = *Gerardia maritima* ssp. *grandiflora* (Bentham) Pennell – P]

Agalinis maritima (Rafinesque) Rafinesque *var.* ***maritima***. Cp (NC, VA): tidal marshes; uncommon. July; August. Nova Scotia 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 (GA, NC, SC, VA), Pd (GA, NC, VA): pine savannas, wet pine flatwoods, sandhill seeps, disturbed areas; uncommon. 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 (also see *A. decemloba* and *A. tenella*); = *Gerardia obtusifolia* (Rafinesque) Pennell – F, G, P]

Agalinis plukenetii (Elliott) Rafinesque. Cp, Pd (GA), Mt (SC): sandhills; uncommon. SC south to 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, Pd, Mt (GA, NC, SC, VA): woodlands, roadsides, in a wide variety of open habitats; common. August-October; September-November. Nova Scotia west to MN, south to s. FL and e. TX. [= RAB, K, S, W; < *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, Pd, Mt (GA, NC, SC, VA): sandhills; common. September-October; October-November. NY (Long Island) south to AL. [= RAB, C, K, S, W; = *Gerardia setacea* J.F. Gmelin – F, G, P]

Agalinis tenella Pennell. Cp (GA, NC, SC), Pd (SC): sandhills, other dry woodlands; uncommon (NC Rare). S. NC south to n. FL, west to s. AL. [= RAB, S; < *A. obtusifolia* – K; = *Gerardia tenella* (Pennell) Pennell – P]

Agalinis tenuifolia (Vahl) Rafinesque *var.* ***tenuifolia***. Mt, Pd, Cp (GA, NC, SC, VA): wooded slopes, roadsides; common. August-October; September-November. ME, Ontario, 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. Coastal sand plains. MA south to Baltimore County, MD. [= C, K; = *Gerardia acuta* Pennell – F, G, P] {not keyed at this time}

Agalinis divaricata (Chapman) Pennell, Pineland Agalinis. Cp (GA): sandhills; rare (GA Special Concern). GA (Decatur County) south to c. peninsular FL, west to MS. [= K, S; = *Gerardia divaricata* (Chapman) Pennell – P] {not keyed at this time}

Agalinis filicaulis (Bentham) Pennell, Spindly Agalinis. Cp (GA): wet pine savannas; rare (GA Special Concern). Ga (Tattnall County) and FL west to w. LA. [= K, S; = *Gerardia filicaulis* (Bentham) Chapman – P] {not keyed at this time}

Agalinis filifolia (Nuttall) Rafinesque, Seminole Agalinis. Cp (GA): dry longleaf pine savannas; rare (GA Special Concern). S. GA (east to Liberty County) south to s. FL, west to sw. AL. [= K, S; = *Gerardia filifolia* Nuttall – P] {not keyed at this time}

Agalinis gattingeri (Small) Small ex Britton. barrens, glades, outcrops, woodlands. Ontario, 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, Crisp and Lowndes counties, GA. [= S; < *A. fasciculata* – K; = *Gerardia georgiana* C.L. Boynton – P]

Agalinis harperi Pennell in Small. Cp (GA): wet pinelands; rare. GA south to 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} [> *A. harperi* Pennell in Small – S; > *A. pinetorum* – S; = *A. pinetorum* Pennell – K; *A. delicatula* Pennell; = *Gerardia harperi* (Pennell in Small) Pennell – P] {not keyed at this time}

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 paupercula (A. Gray) Britton var. *paupercula*. South to NJ and PA. Puzzling record for VA in Harvill et al. (1992) is apparently erroneous. {check specimen}. [= 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]

Agalinis pulchella Pennell, Coffee and Ware counties, GA. {Nomenclatural and typification problems} [= K, S; = *Gerardia pulchella* Pennell – P]

Agalinis skinneriana (A. Wood) Britton. Coffee County, TN (Chester, Wofford, & Kral 1997). [= K; = *Gerardia skinneriana* A. Wood – G, P]

Agalinis tenuifolia (Vahl) Rafinesque *var.* ***leucanthera*** (Rafinesque) Pennell. Cp (GA): savannas; rare (GA Special Concern). [= K]

Agalinis tenuifolia (Vahl) Rafinesque var. *macrophylla* (Bentham) Blake. [= K, S; = *Gerardia tenuifolia* Vahl ssp. *macrophylla* (Bentham) Pennell – P]

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]

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 ..... ***Au. pectinata***
- 2 Calyx tube turbinate, glandular-puberulent on the outer surface; capsule ellipsoid; trichomes of the leaves usually nonglandular; leaf lobes usually obtuse.
  - 3 Pubescence of the upper stem entirely non-glandular; calyx lobes 6-10 mm long ..... ***Au. pedicularia*** *var.* ***pedicularia***
  - 3 Pubescence of the upper stem at least in part glandular (sometimes densely glandular); calyx lobes 6-16 mm long.
    - 4 Glandular pubescence of the upper stem dense and long; calyx lobes 8-16 mm long ..... ***Au. pedicularia*** *var.* ***austromontana***
    - 4 Glandular pubescence of the upper stem short, scattered among the nonglandular hairs; calyx lobes 6-10 mm long ..... ***Au. pedicularia*** *var.* ***intercedens***

1 Plant glabrous or pubescent with nonglandular hairs; perennial; seeds 1.3-2.7 mm long, winged.
- 5 Capsule pubescent; inflorescence, pedicels, and/or calyx pubescent with nonglandular hairs; pedicels 1-3 mm at anthesis; flowering May-July ..... ***Au. virginica***
- 5 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.
  - 6 Inflorescence, pedicels, and calyx pubescent (at least sparsely so); pedicels slender, ca. 0.5 m in diameter ..... ***Au. patula***
  - 6 Inflorescence, pedicels and calyx glabrous; pedicels stout, ca. 1 mm in diameter.
    - 7 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 ..... ***Au. laevigata***

7 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.
8 Calyx lobes 2-5 mm long; corolla 3.5-4.0 cm long ..... ***Au. flava* var. *flava***
8 Calyx lobes 5-14 mm long; corolla 3.5-6.0 cm long ..... ***Au. flava* var. *macrantha***

Aureolaria flava (Linnaeus) Farwell *var.* ***flava***, Eastern Smooth Oak-leach. Pd, Mt, Cp (GA, NC, SC, VA): oak forests and woodlands; common. August-September; September-October. ME west to MN, south to GA, FL, and AL. Var. *reticulata* (Rafinesque) Pennell, of the southeastern Coastal Plain, needs additional study. It is alleged to differ in its lower leaves entire, dentate, or divided < ½ way to the midrib (vs. deeply pinnatifid-divided). [= C, G, K; < *A. flava* – RAB, W; > *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]

Aureolaria flava (Linnaeus) Farwell *var.* ***macrantha*** Pennell, Midwestern Smooth Oak-leach. Mt (NC): oak forests and woodlands; rare. S. Ontario and MO south to e. WV, e. TN, w. NC (Fernald 1950), n. AL, and e. LA. August-September; September-October. [= C, G, K; < *A. flava* – RAB, W; = *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. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): oak forests and woodlands; common (uncommon in Piedmont, rare in Coastal Plain). 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. Mt (GA): rich alluvial forests; rare (GA Special Concern). 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. Cp, Pd, Mt (GA, NC, SC): turkey oak sandhills, other dry oak forests and woodlands; common (uncommon in Piedmont and Mountains). May-September; September-October. NC south to 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; = *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 *var.* ***austromontana*** Pennell, Appalachian Annual Oak-leach. Mt (GA, NC, SC, VA), Pd (NC, SC): oak forests and woodlands; common. September-October; November. Sw. VA and se. KY south to nw. SC, ne. GA, and e. TN. The various varieties recognized need additional study; the variation may be too clinal to be practically recognized taxonomically. [= C, G, K; < *A. pedicularia* – RAB; = *Gerardia pedicularia* Linnaeus var. *austromontana* (Pennell) Fernald – F; = *A. pedicularia* ssp. *austromontana* (Pennell) Pennell – P, S; < *A. pedicularia* – W]

Aureolaria pedicularia (Linnaeus) Rafinesque *var.* ***intercedens*** Pennell. Mt (NC?, VA): oak forests and woodlands; rare. September-October; November. MA west to w. NY, south to w. VA and s. WV. [= C, G, K; < *A. pedicularia* – RAB; = *Gerardia pedicularia* Linnaeus var. *intercedens* (Pennell) Fernald – F; = *A. pedicularia* ssp. *intercedens* (Pennell) Pennell – P; < *A. pedicularia* – W]

Aureolaria pedicularia (Linnaeus) Rafinesque *var.* ***pedicularia***, Northern Annual Oak-leach. Pd, Cp (NC, VA), Mt (VA): oak forests and woodlands; common. September-October; November. ME west to NY and e. MN, south to e. NC, WV, and n. IL. [= C, G, K; < *A. pedicularia* – RAB, W; = *Gerardia pedicularia* Linnaeus var. *pedicularia* – F; > *A. pedicularia* ssp. *caesariensis* Pennell – S; > *A. pedicularia* ssp. *carolinensis* Pennell – P, S]

Aureolaria virginica (Linnaeus) Pennell, Downy Oak-leach, Virginia Oak-leach. Cp, Pd, Mt (GA, NC, SC, VA): oak forests and woodlands; common. May-July; August-September. MA west to MI, south to FL and AL. [= RAB, C, G, K, W; = *Gerardia virginica* (Linnaeus) Britton, Sterns, & Poggenburg – F; > *A. virginica* – P, S; > *A. microcarpa* Pennell – P, S]

Buchnera Linnaeus (Bluehearts)

{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: 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; leaf veins (below) consisting of 3 major and 2 minor ones (narrow leaves may only have 3 total veins); leaf teeth usually well developed, rarely absent; 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] ..... ***B. americana***

1 Leaves narrowly oblanceolate to lanceolate, rounded at tip; leaf veins (below) consisting of 1 major and 2 minor ones (narrow leaves may only have 1 vein); leaf teeth usually crenate but may be absent; 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].....***B. floridana***

Buchnera americana Linnaeus, Prairie Bluehearts, American Bluehearts, Plains Bluehearts. Mt, Pd (GA, NC, VA), Cp (GA?, VA): dry (seasonally moist) rocky, gravelly, or clayey soil of limestone glades, glades over mafic rock (such as diabase, gabbro, etc.), wet meadows, sandy roadsides; rare (GA Special Concern, NC Rare, VA Rare). July-September; August-October. NY and s. Ontario west to MI, IL, MO, and s. KS, south to c. NC, GA, 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; < *B. americana* – K (also see *B. floridana*)]

Buchnera floridana Gandoger, Savanna Bluehearts, Florida Bluehearts. Cp (GA, NC, SC): pine savannas, flatwoods, seepage bogs, sandy roadsides; uncommon. April-October; May-November. Se. VA (?) 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; >< *B. americana* – K; > *B. longifolia* Sw. – K, by misattribution; = *B. floridana* – P (also see *B. longifolia*); > *B. floridana* – S; > *B. breviflora* Pennell – S, by misattribution; > *B. elongata* Sw. -- S]

Castilleja Mutis ex Linnaeus f. (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. Key based on Allison & Stevens (2001).

1 Bracts deeply lobed, red (rarely yellow), mostly > 2 cm long; [widespread in our area]..... ***C. coccinea***
1 Bracts mostly entire, yellow, < 2 cm long; [endemic to c. AL] ..... ***[C. kraliana]***

Castilleja coccinea (Linnaeus) Sprengel, Eastern Indian Paintbrush. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (NC, SC): woodlands, fens, barrens, rock outcrops, meadows, wet pastures, grassy openings, usually over mafic rocks; uncommon, rare in Coastal Plain (GA Special Concern, SC Rare, VA Watch List). April-May; May-June. Widespread in e. North America. [= RAB, C, F, G, GW, K, P, S, W]

Castilleja kraliana J. Allison, Cahaba Paintbrush, is endemic to dolomitic Ketona glades in Bibb Co., c. AL (Allison & Stevens 2001).

Conopholis Wallroth (Squawroot)

A genus of 2 species, parasitic herbs, of e. North America and sw. North America south to Central America. The other species is *C. alpina* Liebmann, ranging from AZ, NM, and TX south to Panama, and divided into two varieties. References: Haynes (1971)=Z; Thieret (1971)=Y.

Conopholis americana (Linnaeus) Wallroth, Squawroot. Mt, Pd, Cp (GA, NC, SC, VA): rich, moist forests, under *Quercus* species; common (rare in Coastal Plain, rare in Piedmont south of VA). March-June. Nova Scotia west to WI and south to c. peninsular FL, AL, and TN. 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, Y, Z]

Dasistoma Rafinesque (Mullein Foxglove)

A monotypic genus, a hemiparasitic herb, endemic to se. North America. The genus is sometimes spelled '*Dasystoma*.' References: Pennell (1935)=P.

Dasistoma macrophylla (Nuttall) Rafinesque, Mullein Foxglove. Pd (SC), Mt (GA, VA): xeric to dry-mesic woodlands and bluffs, over limestone or diabase; rare (GA Special Concern, SC Rare, VA Rare). July-September. WV, OH, s. WI, IA, and NE, south to w. VA, nc. SC, nw. GA, c. AL, MS, LA, and nc. TX. First reported for VA by Wieboldt et al. (1998). [= RAB, C, G, K, P, S; = *Seymeria macrophylla* Nuttall – F, GW; = *Dasystoma macrophylla*, an orthographic variant]

Epifagus Nuttall (Beechdrops)

Epifagus is a monotypic genus, parasitic herb on the roots of *Fagus*, of e. North America. References: Thieret (1971)=Z.

Epifagus virginiana (Linnaeus) W. Barton, Beechdrops. Mt, Pd, Cp (GA, NC, SC, VA): moist to rather dry forests under *Fagus grandifolia*; common. September-November. Nova Scotia west to WI, south to FL and LA. [= RAB, C, F, G, K, W, Z; = *Leptamnium virginianum* (Linnaeus) Rafinesque – S]

Macranthera Nuttall ex Bentham (Flameflower)

A monotypic genus, a hemiparasitic herb, of se. North America. References: Pennell (1935)=P.

Macranthera flammea (Bartram) Pennell, Flameflower, Hummingbird-flower. Cp (GA): pitcherplant bogs; rare (GA Special Concern). July-September. Nearly restricted to the East Gulf Coastal Plain (e. GA 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]

Melampyrum Linnaeus (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.

1 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. Mt (NC, VA), Cp (VA): dry soils; uncommon? May-July; August-September. Québec west to MN, south to VA, NC, and TN. Our 3 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 Labrador west to British Columbia, 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; < *M. lineare* var. *typicum* – P; < *M. lineare* – S]

Melampyrum lineare Desrousseaux *var.* ***latifolium*** Barton, Appalachian Cow-wheat. Mt (GA, NC, SC, VA): dry soils in ridgetop woodlands, in thin soils around rock outcrops; common. Late April-July; August-September. MA and NY south to n. GA, mostly in the Appalachians. [= C, F, G, K, P; < *M. lineare* – RAB, W; = *M. latifolium* (Barton) Muhlenberg ex Britton - S]

Melampyrum lineare Desrousseaux *var.* ***pectinatum*** (Pennell) Fernald, Pine-barren Cow-wheat. Cp (VA): dry sandy areas; rare. May-July; August-September. E. MA to se. VA, on the Coastal Plain. [= C, F, G, K, P; < *M. lineare* – RAB, W]

Orobanche Linnaeus (Cancer-root, Broomrape)

A genus of about 150 species, parasitic herbs, of mainly north temperate regions. References: Musselman (1982)=Z; Thieret (1971)=Y; 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 ..... ***O. ludoviciana***

2 Calyx 2-4-lobed, rarely 5-lobed, but then the fifth lobe minute and much smaller than the other lobes; [section *Orobanche*].

3 Calyx divided to the base into 2 lateral halves, these usually 2-lobed, the 4 lobes long-attenuate or caudate ..... ***O. minor***

3 Calyx tubular, with 4 (-5) lobes about the length of the calyx tube ..... ***O. ramosa***

*? ***Orobanche ludoviciana*** Nuttall, Prairie Broomrape. Pd, Mt (VA): pastures, parasitic on composites, often with clovers; rare, uncertain whether native or introduced from farther west (VA Watch List). OH, IN, Saskatchewan, and CA, south to TX and n. Mexico. [= F, G, Z; > *O. ludoviciana* var. *ludoviciana* – C; > *O. ludoviciana* ssp. *ludoviciana* – K]

* ***Orobanche minor*** J.E. Smith, Lesser Broomrape. Cp (GA, NC, VA), Pd, Mt (NC, VA): cultivated fields, parasitic on various hosts, especially *Trifolium*; rare, introduced from Eurasia. [= RAB, C, F, G, K, S, Z]

* ***Orobanche ramosa*** Linnaeus, Branching Broomrape. Mt (NC): habitat in our area not known; rare (known in our area only from a single collection in 1884), introduced from Asia. As discussed by Musselman (1984), the identity is somewhat presumptive, and the precise location uncertain. [= C, F, G, K]

Orobanche uniflora Linnaeus, Cancer-root. Mt, Pd, Cp (GA, NC, SC, VA): sandy streambanks and riverbanks, rich forests; uncommon (SC Rare). April-May. Nearly throughout s. Canada and the United States. [= RAB, F, G, K, W, Z; > *O. uniflora* var. *uniflora* – C; = *Thalesia uniflora* (Linnaeus) Britton – S]

Pedicularis (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. Mt, Pd, Cp (NC, SC, VA): moist to dry forests and woodlands, streambanks; common (rare in the Coastal Plain). April-May; May-July. ME, Québec, and Manitoba south to FL, 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; > *P. canadensis* var. *canadensis* – F; > *P. canadensis* var. *dobbsii* Fernald – F; > *P. canadensis* ssp. *canadensis* – K]

Pedicularis lanceolata Michaux, Swamp Lousewort. Mt (NC, VA), Pd, Cp (VA): springheads and swampy areas, over calcareous or mafic rocks; rare (NC Rare, VA Watch List). August-October; September-October. Widespread in ne. North America, south to NC, e. TN, w. TN, and MO. [= RAB, C, F, G, GW, K, P, S, W]

Schwalbea Linnaeus (Chaffseed)

The genus is monotypic, a hemiparasitic herb, of se. North America. References: Pennell (1935)=P.

Schwalbea americana Linnaeus, Chaffseed. Cp (GA, NC, SC, VA): savannas, sandhill-pocosin ecotones (in the uphill portions), mesic loamy-soil slopes or swales in sandhill longleaf pine woodlands; rare (US Endangered, GA Endangered, NC Endangered, SC Rare, VA Rare). May-June; August. Formerly rather widespread in e. North America, primarily in the Coastal Plain, from e. MA, south to 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, and FL. 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, P; > *S. americana* – P; > *S. australis* Pennell – P, S]

Seymeria Pursh (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. Cp (GA, NC, SC, VA), Pd (GA, SC): dry to moist pinelands, wet pine savannas, sandhills, other dry woodlands; common, rare in VA (VA Rare). 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; = *Afzelia cassioides* J.F. Gmelin – S]

Seymeria pectinata Pursh *ssp.* ***pectinata***, Comb Seymeria. Cp (GA, NC, SC): dry pinelands, sandhills; rare (NC Rare). 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; = *S. pectinata* ssp. *typica* – P; = *Afzelia pectinata* (Pursh) Kuntze ssp. *pectinata* – S]

Striga Loureiro (Witchweed)

A genus of about 40 species, hemiparasitic herbs, of tropical to temperate regions of the Old World.

* ***Striga asiatica*** (Linnaeus) Kuntze, Witchweed. Cp (NC, SC): cultivated fields, parasitic on the roots of corn and other grasses; rare, introduced from 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]

Tomanthera Rafinesque
(see *Agalinis*)

OXALIDACEAE R. Brown 1818 (Wood-sorrel Family)

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 (2004)=Z; Eiten (1963)=Y; Lourteig (1979)=X; Robertson (1975)=Q; Cocucci in Kubitzki (2004).

1 Plant acaulescent; leaves basal; flowers white, pink, or purple.
  2 [section *Oxalis*] ..... ***O. montana***
  2 [section *Ionoxalis*].
    3 [naturalized] ..... ***O. rubra***
    3 [native] ..... ***O. violacea***
1 Plant caulescent; leaves alternate; flowers yellow; [section *Corniculatae*].
O. corniculata, O. corymbosa, O. dillenii, O. grandis, O. priceae *ssp.* ***colorea, O. priceae*** *ssp.* ***priceae, [O. priceae*** *ssp.* ***texana], O. stricta***

* ***Oxalis corniculata*** Linnaeus, Creeping Lady's-sorrel. Cp, Pd (NC, SC, VA), Mt (NC, VA?), {GA}: gardens, disturbed areas; uncommon. February-December. [= *O. corniculata* – RAB, C, F, K, Q, Y; = *O. repens* Thunberg – G; > *Xanthoxalis corniculata* (Linnaeus) Small – S; > *Xanthoxalis langloisii* Small – S; > *O. corniculata* var. *corniculata* – Z; > *O. corniculata* var. *atropurpurea* Planchon – Z]

* ***Oxalis corymbosa*** Augustin de Candolle. {GA, SC}. native of South America. See Kartesz (1999). [= Q, Z; = *Oxalis debilis* Kunth var. *corymbosa* (Augustin de Candolle) Lourteig – K]

Oxalis dillenii Jacquin, Southern Yellow Wood-sorrel. Cp, Pd, Mt (GA, NC, SC, VA): [= C, K; > *O. dillenii* – RAB; > *O. florida* var. *florida* – RAB; > *O. florida* Salisbury var. *filipes* (Small) Ahles – RAB; = *O. stricta* Linnaeus – G, misapplied; > *O. dillenii* ssp. *dillenii* – Q, W, Y, Z; > *O. dillenii* Jacquin ssp. *filipes* (Small) Eiten – Q, W, Y, Z; > *O. florida* – F; > *O. filipes* – F; > *Xanthoxalis filipes* (Small) Small – S; > *Xanthoxalis brittoniae* (Small) Small – S]

Oxalis grandis Small, Great Yellow Wood-sorrel. Mt (GA, NC, SC, VA), Pd (NC, VA): rich moist forests; common (rare in Piedmont). May-June. [= RAB, C, F, G, K, Q, W, Y; = *Xanthoxalis grandis* (Small) Small – S]

Oxalis montana Rafinesque, American Wood-sorrel, White Wood-sorrel. Mt (GA, NC, VA): spruce-fir forests, northern hardwood forests, at high elevations; uncommon (GA Special Concern). Closely related to the Eurasian *O. acetosella*, and sometimes treated as merely a geographic phase. [= F, K, S; < *O. acetosella* Linnaeus – RAB, C, G, W; = *O. acetosella* ssp. *montana* (Rafinesque) Hultén ex D. Löve – Q]

Oxalis priceae Small *ssp.* ***colorea*** (Small) Eiten. Pd (GA, NC, SC, VA), Cp (GA, NC, SC): [= 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]

Oxalis priceae Small *ssp.* ***priceae***. {GA}. In TN, GA (Eiten 1963). [= 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]

* ***Oxalis rubra*** St. Hilaire. Cp, Pd (GA, NC, SC, VA): native of South America. [= RAB, K, Q; *? Ionoxalis martiana* (Zuccarine) Small – S, misapplied; = *O. articulata* Savigny ssp. *rubra* (St. Hilaire) Lourteig]

Oxalis stricta Linnaeus, Common Yellow Wood-sorrel. Mt, Pd, Cp (GA, NC, SC, VA): May-October. [= RAB, C, K, Q, W, 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]

Oxalis violacea Linnaeus, Violet Wood-sorrel. Pd, Mt (GA, NC, SC, VA), Cp (GA?, NC, SC, VA): dry forests; common. MA, VT, MI, SD, and CO south to FL, TX, and AZ. [= RAB, C, G, K, Q, W, Z; > *O. violacea* var. *violacea* – F; > *O. violacea* var. *trichophora* Fassett – F; = *Sassia violacea* (Linnaeus) Holub; = *Ionoxalis violacea* (Linnaeus) Small – S]

Oxalis illinoensis Schwegman, Illinois Wood-sorrel. KY, IN, and IL. [= K]
Oxalis priceae Small ssp. *texana* (Small) Eiten. In GA (GANHP, Kartesz 1999); not in GA (Ward 2004). [= K, Q, Y]

PAEONIACEAE (Berchtold & J. Presl) Rudolphi 1830 (Peony Family)

Paeonia Linnaeus (Peony)

* *Paeonia lactiflora* Pallas, Peony, is "cultivated and occasionally persisting around old home sites" at least as far south as sc. and se. PA (Rhoads & Klein 1993). [= K]

PAPAVERACEAE A.L. de Jussieu 1789 (Poppy Family)

References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

1 Flowering stem scapose, leaves basal only; petals 8-16, white; [subfamily *Chelidonioideae*] ..... ***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*] ..... ***Macleaya***
  2 Inflorescence not a panicle; petals present, 4-6.
    3 Leaves and fruits prickly; [subfamily *Papaveroideae*] ..... ***Argemone***
    3 Leaves and fruits not prickly.
      4 Sepals connate; leaves ternately dissected into linear segments; sap watery; [subfamily *Eschscholzioideae*] .... ***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... ***Chelidonium***
          6 Stigma lobes, placentae, and capsule valves (2-) 3-4; style ca. 1 cm long; fruit ellipsoid, pubescent . ..... ***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*] ..... ***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*] ..... ***Papaver***

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. Cp (GA, NC, SC): sandy roadsides and disturbed areas; uncommon. April-May (sporadically later). This species is apparently native to the southeastern United States, presumably including our area. 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; < *A. alba* Lestib. f. – G, S, misapplied]

* ***Argemone mexicana*** Linnaeus, Mexican-poppy, Mexican Prickly-poppy. Cp (GA, NC, SC): sandy roadsides and disturbed areas; rare, native of s. FL, West Indies, and maybe Mexico and Central America. April-May (sporadically later). [= RAB, C, FNA, G, K]

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. Mt (GA, NC, VA), Pd, Cp (VA): moist slopes, shaded roadsides, rocky forests; common (rare south of VA), introduced from Eurasia. April-July. First reported for GA (Rabun County) by Stiles & Howel (1998). [= RAB, C, F, FNA, G, S, W; > *Ch. majus* var. *majus* – K]

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. Cp (GA, NC, SC), Pd (NC, SC): roadsides, disturbed areas; uncommon, introduced from w. North America. May-August. [= FNA, K; < *Eschscholtzia californica* – RAB, F, orthographic variant]

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).

* ***Glaucium flavum*** Crantz, Yellow Horned-poppy, Sea-poppy. Cp, Pd (VA): disturbed areas; rare, introduced from Mediterranean Europe. June. [= C, F, FNA, G, K]

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. Pd, Cp (VA), Mt (NC) {SC}: moist streambanks, persistent or escaped from cultivation; rare, introduced from e. Asia. Reported as naturalized in TN by Kral (1981). [= C, F, FNA, G, K] {check Castanea 38: 114-116, 302-304 for SC report}

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).

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 dubium*** Linnaeus, Long-headed Poppy. Mt, Pd, Cp (NC, SC, VA): roadsides, fields, disturbed areas; uncommon, introduced from Europe. April-June. [= RAB, C, F, FNA, G, K, S, W, Z]
* ***Papaver hybridum*** Linnaeus, Rough Poppy. Mt (NC) {SC}: disturbed areas; rare, introduced from Eurasia. May-June. [= RAB, FNA, K, Z]
* ***Papaver orientale*** Linnaeus, Oriental Poppy. Cp (VA): rare, introduced from sw. Asia. [= FNA, G, K, Z]
* ***Papaver rhoeas*** Linnaeus, Corn Poppy, Field Poppy, Red Poppy, Shirley Poppy, Common Poppy. Mt (VA), Pd (NC, VA) {SC}: disturbed areas; rare, introduced from Eurasia and n. Africa. May. [= RAB, C, F, FNA, G, K, Z]
* ***Papaver somniferum*** Linnaeus, Opium Poppy, Common Poppy. Pd (NC, VA), Cp, Mt (NC): disturbed areas; rare, introduced from Mediterranean Europe and Asia Minor. May-June. [= RAB, C, F, FNA, G, K, S, Z]

* *Papaver argemone* Linnaeus is reported from PA (Rhoads & Klein 1993, Kiger & Murray in FNA 1997), VA, and MD (Kiger & Murray in FNA 1997). {herbarium verification} [= FNA]

Other species are cultivated and may be found in our area persistent, escaped, as waifs, or as naturalized populations.

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. Mt, Pd, Cp (GA, NC, SC, VA): moist nutrient-rich forests; common (uncommon in Coastal Plain of GA, NC, and SC). March-April; April-May. Nova Scotia west to MN and Manitoba, south to FL and OK. 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; > *S. canadensis* var. *canadensis* – F; > *S. canadensis* var. *rotundifolia* (Greene) Fedde – F]

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. Mt (GA, VA): moist forests over calcareous rocks (such as limestone); rare (GA Rare, VA Rare). March-April. W. PA (where perhaps only introduced) to s. MI and WI, south to sw. VA, e. TN, nw. GA, sc. TN, and AR. [= C, F, FNA, G, K, S, W]

PARNASSIACEAE Gray 1821 (Grass-of-Parnassus Family)

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 suggested. 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).

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. Pd (GA, SC), Cp (GA, NC, SC): in moist open areas, such as seepage on granitic flatrocks, ditches, seasonally wet depressions; rare (SC Rare). February-April. Se. NC and SC south to GA, 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; *Pyxidanthera spatulata* Muhlenberg, nomen nudum, not validly published]

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 NJ (?), VA, WV, MO 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. Mt (GA, NC, SC, VA), Pd (GA, VA), Cp (VA): bogs, sphagnous seeps, brookbanks, generally in more acidic habitats than *P. grandifolia*, up to elevations over 6,000 feet; uncommon, rare in VA Piedmont and Coastal Plain (SC Rare). (July-) August-October. VA, WV, and AR south to GA and TX, primarily in the Appalachian and Ozarkian highlands. [= RAB, C, F, G, GW, K, S, W]

Parnassia caroliniana Michaux, Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright. Cp (NC, SC): wet longleaf pine, pond pine, or pond cypress savannas (especially but not strictly where shallowly underlain by coquina limestone), sandhill seepage bogs; rare (US Species of Concern, NC Endangered, SC Rare). September-November (-December). Se. and sc. NC south through SC to 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]

Parnassia grandifolia Augustin de Candolle, Bigleaf Grass-of-Parnassus, Limeseep Parnassia, Undine. Mt (GA, NC, SC, VA), Cp (NC): fens, gravelly seepages, 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; rare (GA Special Concern, NC Rare, SC Rare, VA Rare). September-October. NJ (?), VA, WV, and s. MO 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]

Parnassia glauca Rafinesque, American Grass-of-Parnassus. South to NJ, s. PA (Rhoads & Klein 1993), OH, IN, IA, and SD (Kartesz 1999). [= C, F, G, K]

PASSIFLORACEAE A.L. de Jussieu ex Kunth 1817 (Passionflower Family)

A family of about 17 genera and 575 species, vines, shrubs, and trees, of tropical and warm temperate regions, especially America.

Passiflora Linnaeus (Passionflower)

A genus of about 430-520 species, vines, shrubs, and trees, of tropical and warm temperate America and Asia. References: Ulmer & MacDougal (2004)=Z.

1 Leaves entire, herbaceous in texture; petioles without 2 glands near the junction of the petiole and the blade; berry 0.8-1.5 cm long; [subgenus *Decaloba*; supersection *Decaloba*] .....***P. lutea* var. *lutea***
1 Leaves serrulate, thick and subcoriaceous in texture; petioles with 2 glands near the junction of the petiole and the blade; berry 2-7 cm long.
2 Petals blue (to nearly white), 30-40 mm long; berry 4-7 cm long; calyx subtended by 3 bracts; [native, widespread and common in our area]; [subgenus *Passiflora*; supersection *Passiflora*] ..... ***P. incarnata***
2 Petals white to yellowish, 6-8 mm long; berry 2-3 cm long; calyx not subtended by bracts; [introduced, very rare in our area]; [subgenus *Decaloba*; supersection *Bryonioides*].....***P. morifolia***

Passiflora incarnata Linnaeus, Maypops. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, fencerows, thickets, fields; common. May-July (-later); July-October. N. VA and sw. PA west to OK, south to FL and TX. Certainly one of our most interesting and beautiful flowers. [= RAB, C, F, G, K, S, W, Z]

Passiflora lutea Linnaeus *var. **lutea***, Yellow Passionflower. Cp, Pd, Mt (GA, NC, SC, VA): woodlands, forests, thickets, maritime forests; common. June-September; August-October. Var. *lutea* ranges from PA, WV, and TN south to FL and AL. Var. *glabriflora*, differing in the calyx, petioles, and stems glabrous (vs. pilose in var. *lutea*) is more western, ranging from OH west to OK, south to AL and TX. [= C, F, G; < *P. lutea* – RAB, K, S, W, Z]

* ***Passiflora morifolia*** Masters. Pd (SC): thickets; rare, introduced from South America. May-July; July-October. [= RAB, K, Z; *? P. warmingii* Masters – S]

* *Passiflora gracilis* Jacquin ex Link is reported for SC (Kartesz 1999). {investigate – not in SC Plant Atlas} [= K] {not keyed at this time}

PAULOWNIACEAE Nakai 1949 (Paulownia Family)

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 (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, Pd, Mt (GA, NC, SC, VA): roadsides, disturbed areas, roadcuts, forests; common, introduced from China. April-May; September-October. *Paulownia* is becoming something of 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]

PENTHORACEAE Rydberg ex Britton 1901 (Ditch-stonecrop Family)

A family of one genus and 2 species, herbs, of e. North Americaand 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).

Penthorum Linnaeus (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: Haskins & Hayden (1987)=Z.

Penthorum sedoides Linnaeus, Ditch-stonecrop, American Penthorum. Pd, Cp, Mt (GA, NC, SC, VA): shores, drawdown areas, moist forests, moist disturbed areas, ditches; common. June-October. Widespread in e. North America. [= RAB, C, F, G, GW, K, S, W, Z]

PHRYMACEAE Schauer 1847 (Lopseed Family)

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).

Glossostigma Wight & Arnott

A genus of 7-8 species of aquatics, native to Australia, East Africa, India, and New Zealand. References: Les, Capers, & Tippery (2006)=Z.

* *Glossostigma cleistanthum* W.R. Barker. Aquatic in oligotrophic lakes and reservoirs. Introduced, naturalized, and invasive in NJ, PA, CT, and RI (Les, Capers, & Tippery 2006). Native of Australia. [= Z]

Mazus Loureiro

A genus of 10-15 species, herbs, of Asia to Australia.

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): lawns; rare, introduced from e. Asia. April-June. [= C, K; = *M. miguelii* – RAB, misspelling; *? M. reptans* N.E. Brown]
* ***Mazus pumilus*** (Burmann f.) Steenis. Cp, Pd (GA, NC, SC, VA): lawns; rare, introduced from e. Asia. December-June. [= C, K; *? M. japonicus* (Thunberg) Kuntze – RAB, F, G, P]

Mimulus Linnaeus (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)=Z.

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, Pd (GA, NC, SC, VA), Mt (GA, VA): marshes, bottomlands, ditches; common. 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, Z]

Mimulus moschatus Douglas ex Lindley, Muskflower, Musky Monkey-flower. Mt (NC, VA): streambanks, brookbanks, saturated soil of springs; rare (NC Watch List, VA Rare). July; August. Newfoundland and Québec 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; > *M. moschatus* var. *moschatus* – K]

Mimulus ringens Linnaeus *var*. ***ringens***, Allegheny Monkey-flower. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): marshes, bogs, wet meadows, bottomlands; common. June-September. Nova Scotia and Québec west to Saskatchewan, south to c. GA, LA, OK, and CO. [= G, K; < *M. ringens* – RAB, C, GW, S, W; > *M. ringens* var. *minthodes* (Greene) A.L. Grant – F, Z; > *M. ringens* var. *ringens* – F, Z; = *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, Pd, Cp (GA, NC, SC, VA): bottomland forests, nutrient-rich slopes, in the Coastal Plain primarily in places underlain by coquina limestone ("marl") and essentially absent from the more acidic portions of the NC 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 Québec west to

Manitoba, south to FL and TX; var. *asiatica* Hara occurs in e. Asia. The fruits "lopped down" against the stem are unmistakable. [= Z; < ***Ph. leptostachya*** – RAB, C, G, K, S, W; > ***Ph. leptostachya*** var. ***leptostachya*** – F; > ***Ph. leptostachya*** var. ***confertifolia*** Fernald – F]

Torenia Linnaeus (Bluewings)

A genus of about 40 species of the Old World tropics.

* *Torenia fournieri* Linden ex E. Fournier, Bluewings, Wishbone-flower. Reported for Jackson County, NC, as a "sporadic waif growing in plant beds from overwintering seeds" (Pittillo & Brown 1988). Reported for other southeastern states (Florida, Louisiana) by Kartesz (1999). [= K]

PHYLLANTHACEAE Martinov 1820 (Leaf-flower Family)

References: Webster (1994); Chase et al. (2002).

1 Woody shrub; stamens 5-6.....***[Leptopus]***
1 Annual herb; stamens 3.....***Phyllanthus***

Leptopus Dcne. (Maidenbush)

Generic boundaries uncertain at this time (Wurdack et al. 2004). References: Wurdack et al. (2004).

Leptopus phyllanthoides (Nuttall) G.L. Webster, Maidenbush. Disjunct in AL from a main distribution in the Ozarks (AR, MO, OK) and TX. [= K; *Andrachne phyllanthoides* (Nuttall) Coulter – F, G]

Phyllanthus Linnaeus (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: Rossignol, Rossignol, & Haicour (1987)=Z; Webster (1970)=Y; Govaerts, Frodin, & Radcliffe-Smith (2000)=X.

1 Plant with leaves uniformly distributed on the stem and branches, alternate and distichous; flowers produced on ultimate and penultimate orders of branches, the ultimate branches not deciduous; [subgenus *Isocladus*].....***Ph. caroliniensis*** *ssp.* ***caroliniensis***
1 Plant lacking leaves on the main stem, the penultimate order of branches with scales borne in spiral phyllotaxy, the ultimate order of branches deciduous, bearing normal leaves alternately and distichously; flowers produced only on the ultimate, deciduous branches.
  2 Stamens 5, filaments free; fruiting pedicels capillary, 3-7 mm long; seeds densely papillose; [subgenus *Kirganelia*].....***Ph. tenellus***
  2 Stamens 3, filaments connate into a column 0.1-0.15 mm long; fruiting pedicels thick, 0.5 mm long; seeds with 12-15 transverse ridges and sometimes 1-3 pits; [subgenus *Phyllanthus*].....***Ph. urinaria*** *ssp.* ***urinaria***

Phyllanthus caroliniensis Walter *ssp.* ***caroliniensis***, Carolina Leaf-flower. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, moist woodlands, forests, and fields, often in seasonally wet, muddy places; common (rare in VA Mountains). July-November. PA and IL south to 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. [= K, X, Y; < ***Ph. caroliniensis*** – RAB, F, G, W; = ***Ph. caroliniensis*** var. ***caroliniensis*** – C; < ***Ph. carolinensis*** – GW, orthographic error; = ***Ph. caroliniensis*** – S]

* ***Phyllanthus tenellus*** Roxburgh, Mascarene Island Leaf-flower. Pd (GA, NC), Cp (GA, NC, SC): disturbed areas, in and around greenhouses; rare, native to 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). [= GW, K, Y; *? Ph. amarus* – RAB, misapplied (misidentified); > *Ph. tenellus* var. *tenellus* – X]

* ***Phyllanthus urinaria*** Linnaeus *ssp.* ***urinaria***, Chamber Bitter. Cp (GA, NC, SC, VA): gardens and roadsides, apparently preferring nitrogen-rich soils; rare, introduced from 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). [= X, Z; < ***Ph. urinaria*** – GW, K, Y]

* *Phyllanthus fraternus* G.L. Webster, introduced in SC (Kartesz 1999). {investigate} [= K, X]

Several other species have been previously but erroneously reported for our area. *Phyllanthus amarus* Schumacher, Gale-of-wind, Carry-me-seed, reported by RAB for NC and SC, was misidentified and actually represents ***Ph. tenellus*** (Webster 1970); see above. Reports of ***Ph. niruri*** Linnaeus from NC and SC also proved to be ***Ph. tenellus*** (Webster 1970). *Phyllanthus pentaphyllus* Wright, Fivepetal Leaf-flower, unlikely to be correctly labeled from Darlington County, SC (as also indicated by RAB), is likewise here excluded.

PHYTOLACCACEAE R. Brown 1818 (Pokeweed Family)

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).

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]..... ***Ph. 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] ..... ***Ph. rigida***

Phytolacca americana Linnaeus, Common Pokeweed. Pd, Mt, Cp (GA, NC, SC, VA): in a wide variety of natural and disturbed habitats, usually associated with exposed mineral soil; common. 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, X, Y; < ***Ph. americana*** – RAB, GW (also see ***Ph. rigida***); = ***Ph. americana*** var. ***americana*** – FNA, K, Z]

Phytolacca rigida Small, Maritime Pokeweed. Cp (GA, NC, SC, VA): dune slacks, dune slopes, edges of tidal marshes, disturbed areas on barrier islands, xeric sandhills near the coast; rare (NC Watch List). 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 ***Ph. rigida*** to a variety of ***Ph. americana***, but it seems distinct at the species level, at least in our area. [= S, X, Y; < ***Ph. americana*** – RAB, GW; = ***Ph. americana*** var. ***rigida*** (Small) Caulkins & Wyatt – FNA, K, Z]

PIPERACEAE C.A. Agardh 1824 (Pepper Family)

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 pellucida*** (Linnaeus) Kunth. Cp (GA): disturbed areas; rare, 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]

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

PITTOSPORACEAE R. Brown 1814 (Pittosporum Family)

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 (GA?, NC, SC?): frequently planted on barrier islands, at least persisting and apparently naturalizing; rare, introduced from 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, Z]

PLANTAGINACEAE A.L. de Jussieu 1789 (Plantain Family)

As newly and radically recircumscribed, a family of about 120 genera. References: Albach, Meudt, & Oxelman (2005); Olmstead et al. (2001); Schwarzbach in Kadereit (2004); Fischer in Kadereit (2004).

"subfamily Antirrhinoideae"
"tribe Cheloneae": *Chelone, Collinsia, Penstemon*.
"tribe Antirrhineae": *Antirrhinum, Chaenorrhinum, Cymbalaria, Kickxia, Linaria, Misopates, Nuttallanthus*.
"subfamily Gratioloideae":
"tribe Gratioleae":
"subtribe Gratiolinae": *Amphianthus, Bacopa, Gratiola, Mecardonia, Scoparia, Sophronanthe*.
"subtribe Dopatriinae": *Limnophila*.
"tribe Limoselleae": *Limosella*.
"tribe Stemodieae": *Leucospora*.
"subfamily Digitalidoideae":
"tribe Digitalideae": *Digitalis.*
"tribe Veroniceae":
"subtribe Veroniciinae": *Veronica, Veronicastrum*.
tribe Plantaginae: *Plantago.*
tribe Callitricheae: *Callitriche*

Amphianthus Torrey (Pool-sprite)

A monotypic genus, an herb, endemic to se. North America. Apparently actually a modified *Gratiola* and to be transferred there (D. Estes, pers. comm., 2006). References: Hilton & Boyd (1996); Patrick, Allison, & Krakow (1995).

Identification notes: *Amphianthus* somewhat resembles *Callitriche*, but has floating leaves in single pairs rather than in a whorl.

Amphianthus pusillus Torrey, Pool-sprite, Snorkelwort. Pd (GA, SC): vernal pools on granitic flatrocks; rare (US Threatened, GA Threatened, SC Rare). April. Endemic to granitic flatrocks of ec. AL, nc. GA (17 counties), and sc. SC. Hilton & Boyd (1996) discuss the ecology and population ecology of this remarkable plant in detail. [= RAB, GW, K, P, S; **= *Gratiola species 1***]

Antirrhinum Linnaeus (Snapdragon)
(also see *Misopates*)

A genus of about 20 species, herbs, of Mediterranean Europe. References: Sutton (1988)=Z.

1 Corolla 25-40 mm long; calyx lobes ovate; leaves to 15 mm wide.....***A. majus***
1 Corolla 10-13 mm long; calyx lobes linear; leaves to 5 mm wide .....***[A. orontium]***

* ***Antirrhinum majus*** Linnaeus, Common Snapdragon. Mt, Pd (VA): cultivated, rarely persistent or naturalized; rare, introduced from Mediterranean Europe. July. [= C, G, K, P, Z]

* *Antirrhinum orontium* Linnaeus, Lesser Snapdragon, is introduced at least far south as se. PA (Rhoads & Klein 1993) and KY (Pennell 1935). [= C, K, P, Z]

Bacopa Aublet (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).

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. Cp (GA, NC, SC, VA), Pd (GA, SC): wet shores, tidal muds; common, rare north of SC (NC Watch List, VA Rare). 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; = *Hydrotrida caroliniana* (Walter) Small – P, S]

Bacopa innominata (Gómez Maza) Alain, Tropical Water-hyssop. Cp (GA, NC, SC, VA): freshwater tidal muds, shallow water; rare (NC Rare, SC Rare, VA Endangered). June-September. MD south to c. peninsular 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, 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 (GA, NC, SC, VA): freshwater tidal marshes, muddy shores, streams and pools; uncommon (VA Watch List). 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; = *Bramia monnieri* (Linnaeus) Drake – P, S]

* ***Bacopa repens*** (Swartz) Wettstein, South American Water-hyssop. Cp (SC): freshwater pools; rare, presumably introduced from its native range in 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 (NC Watch List, VA 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); 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. verna***

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. nuttallii***
    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***. Cp, Pd, Mt (GA, NC, SC, VA): pools, slow-moving streams, ditches; common (uncommon in Piedmont and Mountains). March-October. Greenland west to AK, south to 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, Z; > *C. heterophylla* – F; > *C. anceps* Fernald – F, Y; = *C. heterophylla* ssp. *heterophylla* – K; > *C. heterophylla* var. *heterophylla* – Y]

Callitriche nuttallii Torrey. Cp, Pd (NC): low fields; rare. NC, c. TN, and OK south to FL, AL, and TX. [= GW, Y, Z; = *C. pedunculosa* Nuttall – K]

Callitriche peploides Nuttall. Cp (GA, SC): low fields, ditches; rare. April-June. SC south to FL, west to TX; disjunct inland in TN, AR; e. Mexico south to Costa Rica. [= RAB, GW, K, S; > *C. peploides* var. *peploides* – Y]

* ***Callitriche stagnalis*** Scopoli. Pd, Mt (VA): ponds, stagnant water, wet soil; uncommon, 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. Cp, Pd, Mt (GA, NC, SC, VA): ditches, low fields, wet paths; rare. April-June. MA to KS, south to FL, TX, and Mexico. [= C, GW, K, S, W, Z; = *C. deflexa* A. Braun – RAB, Y; > *C. deflexa* var. *austinii* (Engelmann) Hegelmann – F, G]

Callitriche verna Linnaeus. Cp, Pd, Mt (VA): ponds, lakes, stagnant streams, wet soil; rare. Circumboreal, in North America south to n. VA, WV, IL, TX, and CA; South America. The nomenclatural debate between *C. palustris* and *C. verna* is difficult to resolve. [= G, W, Y, Z; = *C. palustris* – C, F, K, S]

Chaenorrhinum (Augustin de Candolle ex Duby) Reichenbach
(Dwarf Snapdragon, Lesser Toadflax)

A genus of about 21 species, herbs, of Mediterranean Europe. References: Sutton (1988)=Z.

* ***Chaenorrhinum minus*** (Linnaeus) Lange *ssp.* ***minus***, Dwarf Snapdragon, Lesser Toadflax. Mt, Cp (VA), Pd (GA, NC, VA): disturbed areas; common, rare south of VA, introduced from Eurasia. June-November. [= Z; *? Chaenorrhinum minus* – C, F, G, K, P, W]

Chelone Linnaeus (Turtlehead)

A genus of about 4 species, perennial herbs, of e. North America. References: Nelson, Elisens, & Benesh (1998).

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 ..... ***Ch. cuthbertii***
1 Leaves with petioles 0.5-1.5 cm long (or subsessile in *Ch. 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 ..... ***Ch. 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 ..... ***Ch. glabra***
    3 Corolla purple throughout; staminodium white ..... ***Ch. obliqua***

Chelone cuthbertii Small, Cuthbert Turtlehead. Mt (GA, NC, SC, VA), Pd (NC), Cp (NC, VA): bogs, sphagnous swamps, seeps; uncommon (GA Special Concern). 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, Pd, Cp (GA, NC, SC, VA): streambanks, seeps, swamp forests; common. August-October; September-November. 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; > *Ch. glabra* var. *dilatata* Fernald & Wiegand – F, P; > *Ch. glabra* var. *elatior* Rafinesque – F, G, P, S; > *Ch.*

glabra var. *elongata* – F, G, P, S; > *Ch. glabra* var. *ochroleuca* Pennell & Wherry – F, G, P, S; > *Ch. glabra* var. *glabra* – F, G, S; > *Ch. glabra* var. *chlorantha* (Pennell & Wherry) Pennell – P; > *Ch. glabra* var. *typica* – P; > *Ch. chlorantha* Pennell & Wherry – S; > *Ch. montana* (Rafinesque) Pennell & Wherry var. *montana* – S; > *Ch. montana* var. *elatior* (Rafinesque) Small – S]

Chelone lyonii Pursh, Appalachian Turtlehead. Mt, 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; = *Ch. lyoni* – F, G, P, S, orthographic variant]

Chelone obliqua Linnaeus, Purple Turtlehead. Cp (GA, NC, SC, VA), Pd, 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; > *Ch. obliqua* var. *obliqua* – K; > *Ch. obliqua* var. *typica* – P; > *Ch. obliqua* var. *erwiniae* Pennell & Wherry – K, P]

Collinsia Nuttall (Blue-eyed Mary)

A genus of about 20 species, herbs, of North America (especially diverse in w. North America).

Collinsia verna Nuttall, Eastern Blue-eyed Mary. Mt (VA): nutrient-rich, moist bottomlands and forested slopes; rare (VA Rare). April-May. NY west to s. WI, south to w. VA, nc. TN (Chester, Wofford, & Kral 1997), KY, and AR. [= C, F, G, K, P, S, W]

Cymbalaria Hill (Kenilworth-ivy)

A genus of about 9 species, herbs, of Europe west to c. Asia. References: Sutton (1988)=Z.

* ***Cymbalaria muralis*** P.G. Gaertner, B. Meyer, & Scherbius *ssp.* ***muralis***, Kenilworth-ivy. Mt (NC, VA), Pd (VA): naturalized on walls and rock outcrops near plantings; rare, 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). [= Z; < *C. muralis* – C, F, G, K, P; = *C. cymbalaria* (Linnaeus) Wetts.; = *Linaria cymbalaria* (Linnaeus) P. Miller]

Digitalis Linnaeus (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.

1 Corolla 2-3 cm long, the lower median lobe much longer than the others ..... ***D. lanata***
1 Corolla 4-5.5 cm long, the lower median lobe only slightly longer than the others ..... ***[D. purpurea]***

* ***Digitalis lanata*** Ehrhart, Grecian Foxglove, Hairy Foxglove. Pd (SC): naturalized along roadside; rare, introduced from Mediterranean Europe. May-June. Reported for South Carolina by Hill & Horn (1997). [= C, F, G, K, P]

* *Digitalis purpurea* Linnaeus, Digitalis, Common Foxglove, is introduced and established at scattered locations as far south as PA (Rhoads & Klein 1993). [= C, P; > *D. purpurea* var. *purpurea* – K; > *D. purpurea* var. *alba* – 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. Under study currently by Dwayne Estes.

1 Flowers and fruits sessile or subsessile, the pedicels < 1 mm long; perennial.
  2 Leaves linear-subulate; corolla 2-3× as long as the calyx ..... ***[see Sophronanthe hispida]***
  2 Leaves ovate; corolla 1-1.5 × as long as the calyx ..... ***[see Sophronanthe pilosa]***
1 Flowers and fruits on definite pedicels; annual or perennial.
  3 Leaves cuneate at the base; annual.
    4 Pedicels stout, erect, 1-5 (-12) mm long; [section *X*] ..... ***G. virginiana***
    4 Pedicels slender, spreading, 10-45 mm long; [section *Y*].
      5 Corolla 15-20 mm long; leaves oval or oblanceolate ..... ***G. floridana***
      5 Corolla 8-12 mm long; leaves elliptic, rhombic-lanceolate, or lanceolate ..... ***G. neglecta***

3 Leaves clasping or subclasping-rounded at the base; perennial; [section *Gratiola*].
6 Calyx subtended by 0 (-1) bractlet; corolla lobes white; corolla tube greenish yellow, conspicuously veined ..... ***G. ramosa***
6 Calyx subtended by 2 bractlets; corolla lobes white or yellow-orange; corolla tube greenish yellow and conspicuously veined, or orange and not conspicuously veined.
7 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***
7 Corolla lobes white to lavender, corolla tube greenish yellow, usually conspicuously veined; sepals and flower stalks densely glandular-puberulent.
8 Leaves triangular to lanceolate, margins entire, or with a few teeth toward the tip; corolla veined with brown lines; sepals linear-lanceolate ..... ***G. brevifolia***
8 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***

Gratiola aurea Pursh, Yellow Hedge-hyssop, Golden-pert. Cp (GA, NC, SC): blackwater river banks, pondcypress savannas in Carolina bays; uncommon. May-September. Newfoundland and Québec south in the Coastal Plain to panhandle FL; disjunct around the Great Lakes and inland in NY, Ontario, IL, and ND. [= RAB, C, F, G, GW, K, S; > *G. lutea* Rafinesque var. *typica* – P; > *G. lutea* var. *obtusa* (Pennell) Pennell – P]

Gratiola brevifolia Rafinesque. Cp (GA): wet places; uncommon. 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]

Gratiola floridana Nuttall. Mt, Pd, Cp (GA): {habitats}; 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), panhandle FL, AL, and MS. [= GW, K, P, S]

Gratiola neglecta Torrey, Mud-hyssop. Cp (NC, SC, VA), Pd, Mt (GA, NC, SC, VA): ditches, wet areas, bottomlands; common. May-July. Québec and ME west to British Columbia, south to GA, TX, and AZ. [= RAB, C, G, GW, K, P, S, W; > *G. neglecta* var. *neglecta* – F]

Gratiola ramosa Walter. Cp (GA, NC, SC): wet pine savannas, marshes, pond margins; ditches; common. May-June. Se. NC south to s. FL, west to sw. LA; disjunct (at least historically) in e. MD. [= RAB, C, F, G, GW, K, P, S]

Gratiola virginiana Linnaeus. Cp, Pd (GA, NC, SC, VA), Mt (GA): sluggish streams, bogs, wet areas; common. 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; > *G. virginiana* var. *virginiana* – F, K, P; > *G. virginiana* var. *aestuariorum* Pennell – F, K, P]

Gratiola viscidula Pennell. Cp, Pd (NC, SC, VA), Mt (GA, NC, SC): bogs, wet areas, ditches, margins of Coastal Plain ponds; common (uncommon in Mountains). June-November. DE, MD and e. VA, south to c. SC and ne. GA; disjunct in s. OH, WV, e. TN, MO, and n. 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; > *G. viscidula* var. *viscidula* – G; > *G. viscidula* var. *shortii* Pennell – G, P; > *G. viscidula* var. *typica* – P]

Gratiola species 2. Endemic to granite flatrocks of GA (and othyer states?). Under study by Dwayne Estes. {not keyed at this time}

Gratiola species 3. Endemic to TN cedar glades. Under study by Dwayne Estes. {not keyed at this time}

Kickxia Dumortier (Fluellen, Cancerwort)

A genus of about 47 species, herbs, of Mediterranean Europe west to c. Asia. References: Sutton (1988)=Z.

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, introduced from 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), Cp (VA), {GA?}: disturbed areas; uncommon, introduced from Eurasia. May-November. [= Z; < *K. elatine* – RAB, C, F, G, K, P, S]

* ***Kickxia spuria*** (Linnaeus) Dumortier, Round-leaved Fluellen, Female Fluellen. Cp (NC): ballast near old port (Wilmington); rare, perhaps onlya waif, introduced from s. Europe. July. [= RAB, C, F, G, K, P, S; > *K. spuria* ssp. *spuria* – Z]

Leucospora Nuttall (Leucospora)

A genus of 2 species, herbs, of e. North America and Coahuila, Mexico. *Leucospora* may not be distinct from *Stemodia*.

* ***Leucospora multifida*** (Michaux) Nuttall, Leucospora, Narrowleaf Paleseed. Cp (NC), {GA, VA}: moist to wet, sandy margins of an artificial depressional wetland; rare (NC Watch List). S. Ontario 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, and se. PA) probably represent recent introductions. [= C, G, GW, K, P, S; = *Conobea multifida* (Michaux) Bentham – F; = *Stemodia multifida* (Michaux) Sprengel]

Limnophila R. Brown

A genus of about 37 species, of tropical regions of the Old World.

* ***Limnophila sessiliflora*** (Vahl) Blume. Cp (GA): {habitat}; rare. Reported as introduced in sw. GA (Jones & Coile 1988). [= K]

Limosella Linnaeus (Mudwort, Awl-leaf)

A genus of about 11 species, aquatic herbs, of cosmopolitan distribution.

Limosella australis R. Brown, Mudwort, Awl-leaf. Cp (NC, VA): fresh or slightly brackish tidal flats; rare (NC Rare, VA Rare). June. Newfoundland and Québec 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 (Yellow-toadflax)
(also see *Nuttallanthus*)

A genus of about 150 species, of temperate regions of Eurasia. References: Sutton (1988)=Z.

* ***Linaria vulgaris*** P. Miller, Butter-and-eggs, Yellow Toadflax, Wild-snapdragon. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp (NC, VA): fields, pastures, roadsides, disturbed areas; common (uncommon in Piedmont of NC, rare in Coastal Plain of NC), introduced from Europe. [= RAB, C, F, G, K, P, W, Z; = *Linaria linaria* (Linnaeus) Karsten – S]

* *Linaria maroccana* Hooker f., Moroccan Toadflax. Introduced in VA and WV. [= K] {investigate; not keyed at this time; synonymy incomplete}

Mecardonia Ruiz & Pavón (Mecardonia)

A genus of about 10 species, of tropical, subtropical, and warm temperate regions of America.

1 Peduncles > 10 mm long; sepals < 2 mm wide ..... ***M. acuminata*** *var.* ***acuminata***
1 Peduncles < 10 mm long; sepals > 2 mm wide ..... ***[M. acuminata*** *var.* ***microphylla]***

Mecardonia acuminata (Walter) Small *var.* ***acuminata***, Mecardonia. Cp, Pd (GA, NC, SC, VA), Mt (GA): marshes, ditches, bottomland forests, wet disturbed areas; common. July-September; August-October. DE and MD south to s. 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]

Mecardonia acuminata (Walter) Small *var.* ***microphylla*** (Rafinesque) Pennell. Cp (GA): margins of Coastal Plain ponds; rare (GA Special Concern). 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]

Misopates Rafinesque (Weasel's-snout)

A genus of about 8 species, herbs, of Mediterranean Europe and n. Africa west to c. Asia.

* ***Misopates orontium*** (Linnaeus) Rafinesque, Weasel's-snout, Lesser Snapdragon. Pd (VA): cultivated, persistent or possibly naturalized; rare, introduced from Eurasia. [= K; = *Antirrhinum orontium* Linnaeus – C, G]

Nuttallanthus D.A. Sutton (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." *Nuttalanthus* is American; *Linaria* is Eurasian. References: Sutton (1988)=Z. 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, Pd, Mt (GA, NC, SC, VA): 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. March-May. 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]

Nuttallanthus floridanus (Chapman) D.A. Sutton, Florida Toadflax. Cp (GA): dry, sandy places; uncommon. E. GA south to FL and west to MS. [= K, Z; = *Linaria floridana* Chapman – P, S]

* ***Nuttallanthus texanus*** (Scheele) D.A. Sutton, Texas Toadflax. Cp (GA, NC, SC, VA), Pd (NC, SC): disturbed soils of roadsides and fields; uncommon, introduced from further southwest. March-May. Ranging as a native species in sc. and sw. North America and in temperate South America; introduced elsewhere (as in our area). [= K, Z; < *Linaria canadensis* (Linnaeus) Dumortier – RAB, W; = *Linaria canadensis* var. *texana* (Scheele) Pennell – C, F, G, S; = *Linaria texana* Scheele – P]

Penstemon Mitchell 1769 (Beard-tongue, Penstemon)

A genus of about 250 species, perennila herbs and shrubs, of w. North America, e. North America, and (a single species) ne. Asia. References: Clements, Baskin, & Baskin (1998)=Z. Key based in part on Z.

1 Cauline leaves bipinnatifid; basal leaves sessile; [section *Dissecti*]..... ***P. dissectus***
1 Cauline leaves entire or toothed; basal leaves petioled.
2 Inflorescence with many nodes; anther cells dehiscing by short proximal slits; [section *Multiflori*].....***P. multiflorus***
2 Inflorescence with<10 nodes; anther cells dehiscing their entire length.
3 Corolla glandular-pubescent within; [section *Tubiflori*] ..... ***[P. tubiflorus]***
3 Corolla pubescent with non-glandular hairs within; [section *Graciles*].
4 Throat of corolla more-or-less closed by a palate formed by the upward arch of the corolla lip.
5 Buds yellow-purple; corolla violet-purple with white lobes (fading white when dried); leaves essentially glabrous.....***P. hirsutus***
5 Buds yellow; corolla creamy white; leaves pubescent..... ***[P. tenuiflorus]***
4 Throat of corolla open.
6 Corolla differentiated (above the calyx) into a basal tube and a dilated or inflated throat, with little ridging of the floor; anterior lobes of the corolla essentially equalling the posterior lobes.
7 Corolla white, lined with purple.
8 Stems pubescent; inflorescence glabrous or slightly glandular-pubescent ..... ***[P. alluviorum]***
8 Stems glabrous; inflorescence glandular-pubescent .....***P. digitalis***
7 Corolla purple to violet.
9 Sepals long-attenuate, to 12 mm long; leaves finely serrate; corolla 20-35 mm long..... ..... ***P. calycosus***
9 Sepals < 8 mm long; leaves obscurely serrate; corolla lobes strongly deflexed; corolla 15-22 mm long.....***P. laevigatus***
6 Corolla only gradually and slightly dilated upward, the floor strongly ridged; anterior lobes of the corolla projecting beyond the posterior lobes.
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 (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, SC): sandhills, dry sandy roadsides; common. May-July; July-August. Se. VA south to FL, west to 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]

Penstemon calycosus Small. Mt (GA, NC, SC, VA): limestone ledges, other woodlands; rare (GA Special Concern). 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, Pd (GA, NC, SC, VA), Cp (VA): woodlands, glades, forest edges, roadsides; common. 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; > *P. canescens* var. *typicus* – P; > *P. canescens* var. *brittonorum* (Pennell) Pennell – P; > *P. brittonorum* Pennell – S; > *P. brevisepalus* Pennell – F, G, P, S]

*? ***Penstemon digitalis*** Nuttall ex Sims, Tall White Beardtongue. Mt (NC, SC, VA), Pd, Cp (VA): alluvial forests, moist fields, disturbed areas; common. May-June; July-August. Nova Scotia 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, Z]

Penstemon dissectus Elliott, Georgia Beardtongue, Grit Beardtongue. Cp (GA): Altamaha Grit outcrops, sandhills; rare (GA 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, Mt (VA): dry woodlands, forests, and fields; uncommon. May-July. Québec and ME west to MI and WI, south to VA and KY. [= C, F, G, K, P, S, W, Z]

Penstemon laevigatus Aiton, Eastern Beardtongue. Cp, Pd, Mt (GA, NC, SC, VA): low meadows, bottomlands, forest edges; common. May-June; July-August. ME west to MI, south to s. GA, MS, and AR. [= RAB, F, G, GW, K, P, W, Z; < *P. laevigatus* – C (also see *P. calycosus*); *P. pentstemon* (Linnaeus) MacM. – S]

Penstemon laxiflorus Pennell. {GA}: {habitat}. C. GA and n. AL west to c. OK and c. TX. [= K, P, Z; < *P. australis* – S; = *P. australis* Small ssp. *laxiflorus* (Pennell) Bennett]

Penstemon multiflorus Chapman ex Bentham. Cp (GA): {habitat}; uncommon. S. and e. GA south to FL. [= K, P, S, Z]

Penstemon pallidus Small, Eastern White Beardtongue. Cp (GA, NC, VA), Pd, Mt (GA, VA): limestone and shale barrens, other dry, disturbed areas; uncommon (GA Special Concern). 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 (GA Special Concern). 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 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, F, G, P, Z, orthographic variant; > *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 and ditches]; [section *Palaeopsyllium*] .... ***P. sparsiflora***

* ***Plantago aristata*** Michaux, Buckhorn Plantain. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas, especially dry, barren, exposed soil, such as clay soils denuded by bull-dozing; common, introduced from farther west. Late April-July. [= RAB, C, F, G, K, S, W, 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 (NC Endangered, VA Rare). March-April; May-June. NY and s. Ontario 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 (GA, NC, SC, VA), Pd (GA, NC, SC): fields, roadsides, disturbed areas; common (VA Watch List). March-May. Se. VA and MO south to FL and TX; adventive at scattered sites further north (at least as far north as NY). [= RAB, C, F, G, K, S, W, Y, Z; = *P. hybrida* W. Bart. – GW]

* ***Plantago lanceolata*** Linnaeus, English Plantain, Rib-grass. Cp, Pd, Mt (GA, NC, SC, VA): lawns, roadsides, disturbed areas; common, introduced from Europe. April-November. [= RAB, C, K, S, W, 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 (GA, NC, SC, VA), Pd, Mt (GA, NC, VA): lawns, roadsides, disturbed areas; uncommon, introduced from 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, 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* (Augustin de Candolle) Pilger]

Plantago maritima Linnaeus *var.* ***juncoides*** (Lamarck) A. Gray, Seaside Plantain. Cp (VA): salt marshes; rare (VA 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): 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, Mt (NC, VA): disturbed areas; rare, inroduced 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 (NC), Pd (VA) {GA, SC}: roadsides, disturbed areas; uncommon, probably introduced from 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, 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. Cp, Pd, Mt (GA, NC, SC, VA): 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, Z; > *P. rugelii* var. *rugelii* – K; > *P. rugelii* var. *asperula* Farwell – K]

Plantago sparsiflora Michaux, Pineland Plantain. Cp (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 (US Species of Concern, GA Special Concern, NC Endangered, SC 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." [= RAB, GW, K, S, X, Z]

Plantago virginica Linnaeus, Virginia Plantain. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, lawns, disturbed areas; common. Late March-June. MA and NY west to SD, south to FL and TX. [= RAB, C, G, K, S, W, Z; > *P. virginica* var. *virginica* – F; > *P. virginica* var. *viridescens* Fernald – F]

Plantago wrightiana Decaisne, Wright's Plantain. Cp (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 GA, AL, MS, TX, and Mexico, the original distribution unclear. [= K, Z; = *P. hookeriana* Fischer & C.A. Meyer var. *nuda* (A. Gray) Poe – RAB, W]

Scoparia Linnaeus (Goat-weed, Sweet-broom)

A genus of about 20 species, herbs, of tropical and subtropical America.

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. Cp (GA, SC): disturbed places; uncommon, rather weedy and the original distribution unclear. May-October. [= RAB, GW, K, P, S]

* ***Scoparia montevidensis*** (Sprengel) R.E. Fries *var.* ***glandulifera*** (Fritsch) R.E. Fries. Cp (NC): on ballast; rare, introduced from South America, probably no longer present. [= K, P]

Sophronanthe Bentham

The two taxa included here are not part of *Gratiola*; it remains to be determined whether *Tragiola* Small & Pennell should be recognized as distinct from *Sophronanthe* (Estes, pers. comm. 2004).

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. Cp (GA): dry pinelands; uncommon. 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]

Sophronanthe pilosa (Michaux) Small. Cp, 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; > *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. 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 equalling 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 wuth 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 (GA, NC), Mt (GA), {VA}: lawns and disturbed areas; rare, native of Eurasia. [= C, F, G, K, P, Z; < *V. agrestis* – RAB, G]

Veronica americana Schweinitz ex Bentham, American Speedwell, Brooklime. Mt (NC, VA), Pd (VA), {SC}: bogs, marshes, streamsides; uncommon (rare south of VA). May-June; July. Newfoundland west to AK, south to NC, TN, TX, and CA; ne. Asia. [= RAB, C, F, G, K, P, S, W, Y]

Veronica anagallis-aquatica Linnaeus, Water Speedwell. Mt (NC, VA), Cp (NC, VA), Pd (VA): bogs, marshes, streamsides, ditches; uncommon (rare south of VA). May-June; July. Circumboreal, south in North America to FL, TX, and CA; some occurrenmces probably represnt introductions of European material. Some authors interpret V. anagallis-aquatica as being non-native in North America. [= C, F, G, P, Y; < *V. anagallis-aquatica* – RAB, C, K, W, Z]

* ***Veronica arvensis*** Linnaeus, Corn Speedwell, Wall Speedwell. Mt, Pd, Cp (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, native of Eurasia. March-June. [= RAB, C, F, G, K, P, S, W, Z]

* ***Veronica beccabunga*** Linnaeus, European Brooklime. Mt (VA?): wet places; rare, native of Europe. South to MD, WV, and perhaps VA. [= C, F, G, K, P, Y, Z]

* ***Veronica chamaedrys*** Linnaeus, Germander Speedwell. Mt (NC), Pd (VA): golf course, lawns; rare, native of Eurasia. [= RAB, C, F, G, K, P; *V. chamaedrys* ssp. *chamaedrys* – Z]

* ***Veronica dillenii*** Crantz. Mt (VA): {habitat}; rare, native of Europe. [= C, G, K, P, Z; < *V. verna* Linnaeus – F]

* ***Veronica hederifolia*** Linnaeus, Ivyleaf Speedwell. Pd (GA, NC, SC, VA), Cp (NC, SC, VA), Mt (NC, VA): lawns, fields, disturbed areas; common, native of Europe. March-May. [= K, W; *V. hederaefolia* – RAB, C, F, G, P, S, orthographic variant; *V. hederifolia* ssp. *hederifolia* –Z]

* ***Veronica officinalis*** Linnaeus, Common Speedwell, Gypsyweed, Heath Speedwell. Mt (GA, NC, VA), Pd (NC, VA), Cp (NC, SC, VA): May-August. [= RAB, C, G, P, S, W, Z; *V. officinalis* var. *officinalis* – F, K; *V. officinalis* var. *tournefortii* (Vill.) Reichenbach – F, K]

Veronica peregrina Linnaeus *var. **peregrina***, Common Purslane Speedwell. Mt, Pd, Cp (GA, NC, SC, VA): fields, roadsides, disturbed areas; common. April-May. Nova Scotia and ND south to FL and TX; AK south to OR (perhaps only as an introduction?); South America. [= C, F, G, S; *V. peregrina* ssp. *peregrina* – K; < *V. peregrina* – RAB, W, Z; *V. peregrina* var. *typica* – P]

* ***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. Québec 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 (NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, VA): lawns, fields, roadsides, disturbed areas; common, native of Eurasia. March-June. [= RAB, C, F, G, K, P, S, W, Z]

* ***Veronica polita*** Fries. Pd (NC, VA), Mt, Cp (VA): 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), NC, and VA (Kartesz 1999). It is similar to *V. agrestis* and has been much confused with it. [= C, F, K, S, Z; < *V. agrestis* – RAB, G; *V. didyma* Tenore – P, misapplied]

Veronica scutellata Linnaeus, Narrowleaf Speedwell. Mt (VA), {NC?}: marshes; rare. May-September. Circumboreal, south in North America to VA, NC?, TN, and CA. In ne. TN (Chester, Wofford, & Kral 1997). [= C, G, K, P, W, Y, Z; *V. scutellata* var. *scutellata* – F]

* ***Veronica serpyllifolia*** Linnaeus *var.* ***serpyllifolia***, Thymeleaf Speedwell. Mt, Pd, Cp (GA, NC, SC, VA): meadows, lawns, roadsides, other disturbed areas; common (rare in Coastal Plain), native of Eurasia. April-June. [= C, G; *V. serpyllifolia* ssp. *serpyllifolia* – K, Z; < *V. serpyllifolia* – RAB, F, S, W; = *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 filiformis* J.E. Smith, Creeping Speedwell. In WV, MD, and scattered in PA (Rhoads & Klein 1993). [= C, F, G, K, P, Z]

* *Veronica longifolia* Linnaeus, Garden Speedwell, Longleaf Speedwell. In WV, scattered in PA (Rhoads & Klein 1993), KY, and in MD (F). native of Europe. [= C, F, G, K, 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 (Culver's-root)

A genus of 2 species, herbs, of e. North America and e. Asia.

Veronicastrum virginicum (Linnaeus) Farwell, Culver's-root. Mt (GA, NC, VA), Pd (GA, NC, SC, VA): streambanks, bogs, wet meadows, dryish soils in areas with prairie affinities; uncommon (NC Watch List, SC Rare). July-August. VT west to Manitoba, south to nc. and nw. GA, w. FL Panhandle, 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]

PLATANACEAE Dumortier 1829 (Plane-tree Family)

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, and perhaps best 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); 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 *var.* ***occidentalis***, Sycamore, Plane-tree. Pd, Mt, Cp (GA, NC, SC, VA): riverbanks and alluvial forests, streambanks, sometimes weedy on rocky roadcuts; common (in the Mountains present only along the larger rivers, except in the Ridge and Valley of VA, uncommon in the Coastal Plain except along brownwater rivers). April-May; September-November. Var. *occidentalis* ranges from s. ME west to s. Ontario, MI, and MN, south to w. FL and TX; var. *palmeri* (Kuntze) Nixon & Poole ex Geerinck occurs from central TX south into Coahuila. One of the largest trees in e. North America, and probably the largest that is widespread in the Piedmont of our area. [= Z; < *P. occidentalis* – RAB, C, FNA, G, GW, K, S, W; > *P. occidentalis* var. *occidentalis* – F; > *P. occidentalis* var. *glabrata* (Fernald) Sargent – F]

PLUMBAGINACEAE A.L. de Jussieu 1789 (Leadwort Family)

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 (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 (GA, NC, SC, VA): tidal marshes, especially in hypersaline flats; common. August-October. Along the coast from Labrador south to 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, 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]

PODOSTEMACEAE Richard ex C. Agardh 1822 (Riverweed Family)

A family of about 47 genera and 280 species, aquatic herbs, of tropical, subtropical, and rarely temperate regions of the New World and Old World. References: Graham & Wood (1975).

Podostemum Michaux (Riverweed)

A genus of about 18 species, reduced aquatic herbs, of tropical to temperate America. References: Graham & Wood (1975)=Z; Philbrick & Crow (1983).

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. Mt, Pd, Cp (GA, NC, SC, VA): attached to rocks and dams in rapidly or slowly flowing water; common (rare in Coastal Plain). May-July. Nova Scotia, ME, and Québec 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, Z; = *Podostemon ceratophyllum* - GW, orthographic variant; > *Podostemon ceratophyllum* – S, orthographic variant; > *Podostemon abrotanoides* Nuttall – S]

POLEMONIACEAE A.L. de Jussieu 1789 (Jacob's-ladder Family)

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*].....***Phlox***
1 Leaves compound.
  2 Leaf segments linear, ca. 1 mm wide; corolla red or yellow; [tribe *Gilieae*] .....***Ipomopsis***
  2 Leaf segments ovate or elliptic, 5-16 mm wide; corolla blue; [tribe *Polemoniae*]..... ***Polemonium***

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). References: Grant (1956)=Z; Wilken in Kubitzki (2004).

Ipomopsis rubra (Linnaeus) Wherry, Standing-cypress. Cp (GA, NC, SC), Pd (GA*?, NC*), Mt* (NC*): sandhills, sand rims of Carolina bays, roadbanks, disturbed areas; rare (NC Watch List, SC Rare). June-August; August-September. Sc. NC south to 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). Another example of the affinities of the Sandhill flora to that of the dry sw. United States. [= RAB, K, W, Z; = *Gilia rubra* (Linnaeus) A.A. Heller – C, F, G, S]

Phlox Linnaeus 1753 (Phlox)

A genus of about 70 species, herbs (to subshrubs), of temperate North America (with 1 species in ne. Asia). This treatment is probably no closer to the truth than the diversity of previous ones; some will even consider it a regression, in its (provisional) acceptance of many of Wherry's infraspecific taxa. He studied the genus more carefully than anyone since, and it seems premature to reduce to synonymy without further critical study many of the entities which he recognized. As Wherry (1955) wrote "when it becomes realized how difficult from one another some of them are, the writer will no doubt be classed as a 'splitter;' then workers who revel in drawing up tables of 'synonymy' are going to have a field day. It is deemed of importance, however, to record the presence in nature of all material which may be of value in future studies by cytogenetic, serologic, or other specialized techniques. When multiple taxa get relegated to 'synonymy' under a few comprehensive ones, their very existence is likely to be overlooked." 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, 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 1.5-4 mm long, the cleft portion 0.5-2 mm long.
  - 3 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 ..... ***Ph. nivalis*** *var.* ***hentzii***
  - 3 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 ..... ***Ph. nivalis*** *var.* ***nivalis***
- 2 United portion of the style 5-12 mm long, the cleft portion ca. 1 mm long.
  - 4 Inflorescence glandless (rarely glandular); corolla tube ca. 10.5 mm long; petal notch generally ca. 1.0 mm deep (range 0-3.0 mm); [of high elevations]..... ***Ph. subulata*** *var.* ***subulata***
  - 4 Inflorescence glandular (rarely glandless); corolla tube ca. 10.5-12 mm long; petal notch generally ca. 1.5 mm deep (range 0.5-3.0 mm); [of low to high elevations].
    - 5 Corolla tube ca. 12 mm long; petal blades ca. 8.5 mm long, ca. 6 mm wide; flowers mostly purple (to pale lavender); [mostly of moderate to high elevation calcareous or mafic rocks] ..... ***Ph. subulata*** *var.* ***australis***
    - 5 Corolla tube ca. 10.5 mm long; petal blades ca. 7.5 mm long, ca. 5 mm wide; flowers mostly pale lavender; [mostly of low elevation acidic gneisses and shales] ..... ***Ph. subulata*** *var.* ***brittonii***

1 Stems herbaceous, erect or decumbent; leaves (at least the larger) > 25 mm long and/or > 5 mm wide, generally lacking axillary of leaves.
- 6 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).
  - 7 Upper leaves alternate; annual; corolla red, white, or variegated; [alien, mostly naturalized in dry sandy soils of roadsides, fields, and disturbed areas]..... ***Ph. drummondii***
  - 7 Upper leaves opposite or subopposite; perennial; corolla blue, lavender, or pink; [native, mostly of forests, woodlands, or roadbanks].
    - 8 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.
      - 9 Petal blade notched, the sinus usually 0.5-3 mm deep ..... ***Ph. divaricata*** *var.* ***divaricata***
      - 9 Petal blade entire ..... ***Ph. divaricata*** *var.* ***laphamii***
    - 8 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.
      - 10 Cymes open, the lowest branches elongate, > 1 cm long; corolla usually glandular-pubescent or pilose (rarely glabrous); pedicels 1-8 (-12) mm long..... ***Ph. pilosa*** *ssp.* ***pilosa***
      - 10 Cymes compact, the lowest branches short, < 0.5 cm long; corolla glabrous; pedicels 1-6 mm long.
        - 11 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 ..... ***Ph. amoena***
        - 11 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..... ***Ph. lighthipei***
- 6 Style long, (12-) 14-26 mm long, the united portion 3-30× as long as the cleft portion; stamens equalling or exceeding the corolla tube (thus in part exserted).
  - 12 Plants forming colonies by rhizomes, stolons, and/or prostrate sterile shoots with evergreen to semi-evergreen leaves; flowering shoots 1-4 (-5) dm tall.
    - 13 Plants with rhizomes and stolons tipped with clustered, evergreen, linear to lanceolate leaves 3-12 cm long, 5-10 (-12) mm wide ..... ***Ph. buckleyi***

13 Plants with prostrate sterile shoots with scattered, semi-evergreen, spatulate to obovate leaves 1.5-4.5 cm long, 5-16 mm wide ..... ***Ph. stolonifera***

12 Plants not colony-forming by rhizomes or stolons; flowering shoots (3-) 5-20 dm tall.

14 Leaf margin ciliate-serrulate; lateral veins of the leaves readily apparent, these joining to form a connecting vein parallel to the leaf margin.

15 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..... ***Ph. amplifolia***

15 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..... ***Ph. paniculata***

14 Leaf margin smooth or slightly rough; lateral veins of the leaves not readily apparent, not forming a connecting vein parallel to the leaf margin.

16 Flowering shoots arising from decumbent stems; nodes below the inflorescence 3-5 ..... ***Ph. latifolia***

16 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..... ***Ph. maculata*** *var.* ***maculata***

18 Nodes 16-35, crowded; upper leaves lanceolate to ovate-oblong; truncate to subcordate at the base; flowering late summer..... ***Ph. 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 subcampanulate, the sepals narrow with a well-developed midrib, the junction-membranes firm, broad and flat (to slightly plicate-keeled).

20 Main leaves ca. 12× as long as wide; sepals 7-9 mm long; ultimate cymules 5-7-flowered ..... ***Ph. glaberrima*** *var.* ***glaberrima***

20 Main leaves ca. 6× as long as wide; sepals 8-12 mm long; ultimate cymules 3-flowered ..... ***Ph. glaberrima*** *var.* ***triflora***

19 Calyx subcylindric, the sepals fairly broad, with a rather weak midrib, the junction-membranes thin, narrow, becoming markedly plicate-keeled.

21 Largest leaves low on the stem, the leaves markedly reduced upward in size and also widely spaced ..... ***Ph. carolina*** *ssp.* ***angusta***

21 Largest leaves well above the midpoint of the stem, the leaves neither markedly reduced upward in size nor markedly more widely spaced.

22 Plant (5-) 7.5-20 tall, with (12-) 15-25 nodes below the inflorescence..... ***Ph. carolina*** *ssp.* ***alta***

22 Plant 4-10 dm tall, with 6-12 (-15) nodes below the inflorescence..... ***Ph. carolina*** *ssp.* ***carolina***

Phlox amoena Sims, Hairy Phlox, Chalice Phlox. Mt, Pd (GA, NC, SC), Cp (GA, SC): dry woodlands and forests, roadbanks, sandhills; common. April-June; June-July. W. NC west to s. KY, south to n. FL and MS. [= C, F, G, S, W; = *Ph. amoena* ssp. *amoena* – K, Z; < *Ph. amoena* – RAB, in part only (also see *Ph. lighthipei*)]

Phlox amplifolia Britton, Broadleaf Phlox. Mt (GA, NC, VA): moist forests, particularly over mafic rocks; rare (GA Special Concern, NC Watch List, VA Rare). 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, Z]

Phlox buckleyi Wherry, Swordleaf Phlox, Shale-barren Phlox. Mt (VA): shale woodlands and woodland edges, shaley roadbanks; rare (VA Rare). May-June. Endemic to w. VA and e. WV. [= C, F, G, K, W, Z]

Phlox carolina Linnaeus *ssp.* ***alta*** Wherry, Giant Phlox. Mt (GA, NC, SC), Pd (GA, NC): forests, woodlands, woodland borders; common? May-July. C. NC and se. TN south to c. GA. [= K, Z; < *Ph. carolina* – RAB, G, S, W]

Phlox carolina Linnaeus *ssp.* ***angusta*** Wherry, Narrowleaf Phlox. Cp (SC), Pd, Mt (NC, SC) {GA}: woodlands and woodland borders: uncommon? May-October. Sw. NC and e. SC south to panhandle FL, west to e. TX, north in the interior to w. TN, s. IL and s. MO. [= K, Z; < *Ph. carolina* – RAB, G, S, W]

Phlox carolina Linnaeus *ssp.* ***carolina***, Thick-leaf Phlox. Mt, Pd, Cp (NC, SC, VA) {GA}: woodlands, woodland borders, barrens, and forests; common. May-July. W. NC and s. MO south to panhandle FL and s. MS. [= K, Z; < *Ph. carolina* – RAB, G, S, W]

Phlox divaricata Linnaeus *var.* ***divaricata***, Eastern Blue Phlox, Timber Phlox. Mt (GA, NC, VA), Pd, Cp (GA, VA): moist deciduous forests in circumneutral soils; uncommon (rare in VA Coastal Plain). April-May. VT and Québec west to MI, south to NC, GA, and TN. [= C, F, G; = *Ph. divaricata* ssp. *divaricata* – K, Z; < *Ph. divaricata* – RAB, S, W]

Phlox divaricata Linnaeus *var.* ***laphamii*** A.W. Wood, Western Blue Phlox. Cp (GA, NC, VA?), Pd, Mt (GA): moist deciduous forests in circumneutral soils; rare. April. WI west to MN, south to GA and TX, and apparently with scattered populations eastward, as along the Roanoke River in NC. [= C, F, G; = *Ph. divaricata* ssp. *laphamii* (A.W. Wood) Wherry – K, Z; < *Ph. divaricata* – RAB, S, W]

* ***Phlox drummondii*** Hooker, Annual Phlox, Drummond Phlox. Cp (GA, NC, SC, VA), Pd (NC): dry sandy soils of roadsides, fields, disturbed areas; common, introduced from TX. April-July. Wherry recognized 3 subspecies in *Ph.*

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; > ***Ph. drummondii*** spp. *drummondii* – K, Z]

Phlox glaberrima Linnaeus *var.* ***glaberrima***, Piedmont Smooth Phlox. Pd (NC, SC, VA), Mt (NC, Cp (SC): wet forests and woodlands, especially bottomlands; uncommon. April-June; June-July. Sc. VA south to c. SC and w. NC, apparently endemic to our area. [= ***Ph. glaberrima*** ssp. *glaberrima* – RAB, K, Z; < ***Ph. glaberrima*** – C, F, G, S, W]

Phlox glaberrima Linnaeus *var.* ***triflora*** (Michaux) Reveal & Broome, Appalachian Smooth Phlox. Mt (GA, NC, SC, VA), Pd (GA, NC, SC), Cp? (GA?): wet woodlands and forests, especially bottomlands; uncommon. April-June; June-July. MD west to s. OH and s. IN, south to c, NC, c. GA, and n. AL. [= ***Ph. glaberrima*** ssp. *triflora* (Michaux) Wherry – RAB, K, Z; < ***Ph. glaberrima*** – C, F, G, S, W]

Phlox latifolia Michaux, Mountain Phlox, Appalachian Phlox. Mt, Pd (NC, SC, VA): moist forests, woodlands, woodland borders, and barrens; uncommon. May-June; July. PA to NC and ne. TN in the Appalachians; disjunct in OH and IN. [= K; *? **Ph. ovata*** Linnaeus – RAB, C, F, G, S, W, Z, misapplied]

Phlox lighthipei Small, Lighthipe's Phlox. Cp (GA, SC): dry to moist sandy soils; rare? April-May; June-July. S. SC south to n. FL. [= S; = ***Ph. amoena*** ssp. *lighthipei* (Small) Wherry – K, Z; < ***Ph. amoena*** – RAB]

Phlox maculata Linnaeus *var.* ***maculata***, Northern Meadow Phlox. Mt, Pd (NC, SC, VA), {GA}: moist forests and openings; uncommon? June-July. S. Québec west to MN, south to c. NC, KY, and IA. [= F, G; = ***Ph. maculata*** ssp. *maculata* – K, Z; < ***Ph. maculata*** – S]

Phlox maculata Linnaeus *var.* ***pyramidalis*** (J.E. Smith) Wherry. Leafy Meadow Phlox. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): moist forests and openings; uncommon. July-September. PA, OH, s. IN, and se. MO, south to NC, n. GA, and TN. [= ***Ph. maculata*** ssp. *pyramidalis* (J.E. Smith) Wherry – RAB, K, Z; =*? **Ph. maculata*** var. *purpurea* Fernald – F; < ***Ph. maculata*** – S]

Phlox nivalis Loddiges ex Sweet *var.* ***hentzii*** (Nuttall) Wherry, Trailing Phlox. Pd, Cp (GA, NC, SC, VA): rock outcrops, thin soils of rocky woodlands, roadbanks; common, rare in VA (VA Rare). March-May. Sc. VA west to n. AL, south to c. peninsular FL and s. AL. [= RAB; < ***Ph. nivalis*** – C, F, S, W; < ***Ph. hentzii*** – G (also see var. *nivalis*); = ***Ph. nivalis*** ssp. *hentzii* (Nuttall) Wherry – K, Z]

Phlox nivalis Loddiges ex Sweet *var.* ***nivalis***, Pineland Phlox. Cp, Pd (GA, NC, SC), Mt (NC): sandhills, other dry woodlands, roadbanks; common. March-May. Nc. NC south to panhandle FL. A third taxon, ***Ph. nivalis*** ssp. *texensis* Lundell is endemic in e. TX. [= RAB; < ***Ph. nivalis*** – C, F, S, W (also see var. *hentzii*); < ***Ph. hentzii*** – G; = ***Ph. nivalis*** ssp. *nivalis* – K, Z]

Phlox paniculata Linnaeus, Garden Phlox. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (NC, VA): streambanks, moist forests, woodlands, and woodland borders; common (rare in Coastal Plain and Piedmont south of VA). 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, Z]

Phlox pilosa Linnaeus *ssp.* ***pilosa***, Downy Phlox. Cp (NC, SC, VA), Pd (NC, VA), Mt (VA): dry to mesic woodlands and forests, roadbanks; uncommon, rare in VA (VA Rare). April-May; May-June. Ssp. *pilosa* ranges from CT west to WI, IA, and KS, south to c. peninsular FL and TX. Several other subspecies are more southern or western. [= K, Z; = ***Ph. pilosa*** var. *pilosa* – C, F, G; < ***Ph. pilosa*** – RAB, S, W]

Phlox stolonifera Sims, Creeping Phlox. Mt, Pd (GA, NC, SC, VA): moist forests; uncommon, rare in Piedmont. 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, Z]

Phlox subulata Linnaeus *var.* ***australis*** Wherry, Southern Moss Phlox, Southern Mountain-pink. Mt (NC, VA), Pd (VA): dry and exposed rock outcrops, rocky flood-scoured riversides; uncommon, rare south of VA (NC Rare). April-May. W. VA and e. WV south to w. NC and e. TN; also in OH, w. WV, and n. KY. The varieties of ***Ph. subulata*** seem morphologically confluent; they need more study. [< ***Ph. subulata*** var. *australis* – G (also see var. *brittonii*); < ***Ph. subulata*** – RAB, W; < ***Ph. subulata*** var. *setacea* (Linnaeus) Brand – C; < ***Ph. subulata*** var. *brittonii* – F; = ***Ph. subulata*** ssp. *australis* (Wherry) Wherry – K, Z; = ***Ph. subulata*** – S]

Phlox subulata Linnaeus *var.* ***brittonii*** (Small) Wherry, Alleghany Moss Phlox, Alleghany Mountain-pink. Mt (VA): dry woodlands and rock outcrops, over a wide variety of rocks, including in and around shale barrens; uncommon? April-May. Sc. PA south through w. MD to w. VA and e. WV. [< ***Ph. subulata*** var. *setacea* – C; < ***Ph. subulata*** var. *brittonii* – F (also see ***Ph. subulata*** var. *australis*); < ***Ph. subulata*** var. *australis* – G; = ***Ph. subulata*** ssp. *brittonii* (Small) Wherry – K, Z; = ***Ph. brittonii*** Small – S]

Phlox subulata Linnaeus *var.* ***subulata***, Northern Moss Phlox. Mt (NC): rock outcrops of circumneutral rocks; rare (NC Rare). May. NY west to MI, south to MD and WV, and rarely to w. NC. [= F; < ***Ph. subulata*** var. *subulata* – C (also see var. *brittonii*); = ***Ph. subulata*** var. *ciliata* Wherry – G; = ***Ph. subulata*** ssp. *subulata* – K, Z]

Phlox bifida Beck var. *bifida*. In TN and KY according to Kartesz (1999) but not according to Wherry {investigate}. [= *Phlox bifida* Beck ssp. *bifida* – K, Z] {not keyed at this time; synonymy incomplete}

Phlox bifida Beck var. *stellaria* (A. Gray) Wherry. In c. TN (Chester, Wofford, & Kral 1997). [= *Phlox bifida* Beck ssp. *stellaria* (A. Gray) Wherry – K, Z] {not keyed at this time; synonymy incomplete}

Phlox carolina Linnaeus *ssp.* ***turritella*** Wherry. In SC (Kartesz 1999) {?} and GA and southwestward to FL, AL, MS, and e. LA. [= K, Z] {not keyed at this time}

Phlox floridana Bentham. Cp (GA): sandhills; common? Sw. GA and se. AL south to FL Panhandle and w. peninsula. [= K, S, Z]

Phlox glaberrima Linnaeus var. *interior* Wherry. East to KY, TN, AL, and perhaps GA (Kartesz 1999). {investigate} [= *Phlox glaberrima* Linnaeus ssp. *interior* (Wherry) Wherry – K, Z; < ***Ph. glaberrima*** – C, F, G, S] {not keyed at this time}

Phlox pilosa Linnaeus ssp. *deamii* Levin. Endemic to IN, KY, and TN. [= K; < *Ph. pilosa* ssp. *pulcherrima* – Z] {not keyed at this time; add to synonymy}

Phlox pilosa Linnaeus ***ssp. detonsa*** (A. Gray) Wherry. Cp, Pd (GA): Nw. GA south to c. peninsular FL, west on the Coastal Plain to e. TX. [= K, Z] {not keyed at this time; add to synonymy}

Phlox pilosa Linnaeus ssp. *ozarkana* (Wherry) Wherry. East to TN (Kartesz 1999), or to GA (Wherry). {investigate} [= K, Z] {not keyed at this time; add to synonymy}

Phlox pulchra Wherry, Alabama Phlox. Endemic to c. AL. [= K, Z]

Polemonium Linnaeus 1753 (Jacob's-ladder)

A genus of about 25 species, of temperate regions of North America and Eurasia. References: 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. Mt (GA, NC, VA), Pd (NC, VA), Cp (VA): moist, nutrient-rich forests, such as bottomlands and rich slopes; uncommon, rare south of VA (NC Watch List). 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]

Polemonium reptans Linnaeus var. *villosum* E.L. Braun occurs in the Appalachian Plateau and vicinity, in s. OH and e. KY. [= C, K; < *P. reptans* – F, G]

Polemonium vanbruntiae Britton occurs in calcareous fens and swamps from ME, VT, and n. NY south to se. PA, sw. PA, and e. WV. [= K; = *P. van-bruntiae* – C, F, G, orthographic variant]

POLYGALACEAE R. Brown 1814 (Milkwort Family)

A family of ca. 17 genera and 1000 species, trees, shrubs, woody vines, and herbs, nearly cosmopolitan. References: Miller (1971b).

Polygala Linnaeus (Milkwort)

A genus of about 500 species, trees, shrubs, and herbs, nearly cosmopolitan in distribution. References: Smith & Ward (1976)=Z.

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 Lobes of lower petal (keel) < 0.7 mm long; fresh flowers bright orange or bright lemon-yellow; bracts of the inflorescence 1-3.5 mm long; plants to 40 cm tall..... ***P. lutea***
    3 Lobes of lower petal (keel) > 1.5 mm long; fresh flowers lemon-yellow to greenish yellow; bracts of the inflorescence 4.5-6.5 mm long; plants to 15 cm tall..... ***P. nana***
  2 Inflorescence a terminal, many-branched cyme, the many individual branches loosely to densely flowered.
    4 Fresh flowers cream-white to greenish-white; [of GA southward] ..... ***P. balduinii var. balduinii***
    4 Fresh flowers bright yellow; [collectively widespread in the Coastal Plain of our area].
      5 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***
      5 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).
- 6 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***
- 6 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].
  - 7 Leaves whorled, at least at the principal lower nodes; annual, from a slender taproot; [subgenus *Polygala*].
    - 8 Racemes 3-6 mm in diameter, pointed in outline.
      - 9 Racemes 2-5 cm long, becoming interrupted below through persistence of the fruits on the axis; wings equalling the fruit ..... ***P. ambigua***
      - 9 Racemes 0.5-1.5 cm long, the fruits falling promptly, thus the inflorescence compact and truncate below; wings shorter than the fruit.
        - 10 Seeds finely pubescent; pedicels ¼-⅓ as long as the fruit; raceme peduncles 0.5-4 cm long..... ..... ***P. verticillata*** *var.* ***isocycla***
        - 10 Seeds hirsute; pedicels ⅓-½ as long as the fruit; raceme peduncles 2-7 cm long..... ..... ***P. verticillata*** *var.* ***verticillata***
    - 8 Racemes 8-15 mm in diameter, rounded in outline (somewhat rounded in *P. hookeri*).
      - 11 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***
      - 11 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.
        - 12 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***
        - 12 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.
          - 13 Larger leaves (2-) 3-7 mm wide; raceme peduncles 0-0.5 cm long; racemes 7-15 mm in diameter..... ***P. cruciata*** *var.* ***aquilonia***
          - 13 Larger leaves 1.5-3 (-4) mm wide; raceme peduncles 0-4 cm long; racemes 12-20 mm in diameter..... ***P. cruciata*** *var.* ***cruciata***
  - 7 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.
    - 14 Leaves glaucous, somewhat succulent, linear; corolla 7-10 mm long, > 2× as long as the wings; [subgenus *Polygala*]..... ***P. incarnata***
    - 14 Leaves green, herbaceous, usually broader than linear; corolla < 5 mm long, roughly equal to or shorter than the wings.
      - 15 Annual, the stems solitary; [subgenus *Polygala*].
        - 16 Corolla about 0.5× as long as the wings..... ***P. sanguinea***
        - 16 Corolla about 1× as long as the wings.
          - 17 Inflorescence bracts dropping from the axis promptly following flowering..... ***P. mariana***
          - 17 Inflorescence bracts persistent.
            - 18 Wings 3-5 mm long; pedicels 1.5-2.5 mm long; racemes 8-13 mm in diameter..... ..... ***P. curtissii***
            - 18 Wings 2-2.5 mm long; pedicels 0.5-1.5 mm long; racemes 5-6 mm in diameter..... ..... ***P. nuttallii***
      - 15 Perennial or biennial, usually several stems arising together from a rhizome or taproot.
        - 19 Wings white, 2-3 mm long; flowers sessile or subsessile; plants from a thick crown; [subgenus *Polygala*].
          - 20 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***
          - 20 Larger leaves mostly 2-15 mm wide; capsules 2.5-3.5 mm long; seeds ca. 2.5 mm long..... ..... ***P. senega*** *var.* ***senega***
        - 19 Wings pink, 4-7 mm long; flowers pedicelled; plants from a taproot.
          - 21 Corolla keel entire at the tip; wings 5-7 mm long, reniform-orbicular; plants lacking cleistogamous flowers; [subgenus *Hebeclada*]..... ***P. grandiflora*** *var.* ***grandiflora***
          - 21 Corolla keel fringed at the tip; wings 4-6 mm long, elliptic; plants producing cleistogamous flowers in loose subterranean or surficial racemes; [subgenus *Polygala*].
            - 22 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***
            - 22 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, Pd (GA, NC, SC, VA), Cp (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; > ***P. verticillata*** var. ***dolichoptera*** Fernald – F; < ***P. verticillata*** – W]

Polygala balduinii Nuttall *var. **balduinii***, White Milkwort, Baldwin's Milkwort. Cp (GA): wet pine savannas; rare (GA Special Concern). E. GA south to s. FL, west to s. MS; e. TX; Cuba. Var. *carteri* (Small) R.R. Smith & D.B. Ward occurs in s. FL. [= GW, Z; < *Polygala balduinii* – K; = *Pilostaxis baldwinii* (Nuttall) Small – S, orthographic variant; = *Pylostachya balduinii* (Nuttall) Small]

Polygala brevifolia Nuttall, Shortleaf Milkwort, Little-leaf Milkwort. Cp (GA, NC, SC, VA): pine savannas, pocosin margins; rare (VA Rare). June-October. NJ south to FL, west to s. MS. [= RAB, C, F, G, GW, K, S]

Polygala cruciata Linnaeus *var. **aquilonia*** Fernald & Schubert, Northern Drumheads. Cp?, Mt (NC, SC, VA): damp or wet soil in openings; uncommon. 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]

Polygala cruciata Linnaeus *var. **cruciata***, Southern Drumheads. Cp (GA, NC, SC, VA): pine savannas, bogs, pocosins; common. June-October. Se. VA south to FL, west to TX, inland north to KY. [= F, K; < ***P. cruciata*** – RAB, C, G, GW, W; > ***P. ramosior*** (Nash) Small – S]

Polygala curtissii A. Gray, Appalachian Milkwort. Mt, Pd, Cp (GA, NC, SC, VA): old fields, thickets, openings; common. 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]

Polygala cymosa Walter, Tall Pinebarren Milkwort. Cp (GA, NC, SC): pond-cypress savannas, Coastal Plain depression ponds, clay-based Carolina bays, other sites with seasonally flooded hydrology; common. May-July. E. NC south to s. peninsular FL, west to s. MS; disjunct in s. DE. [= RAB, C, F, G, GW, K, 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 FL, west to s. MS. [= K; < ***P. grandiflora*** – RAB; *Asemeia grandiflora* (Walter) Small – S]

Polygala hookeri Torrey & A. Gray, Hooker's Milkwort. Cp (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]

Polygala incarnata Linnaeus, Pink Milkwort, Procession Flower. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, VA): pine savannas, woodlands, fields; common (rare in Mountains). June-July. NY (Long Island) and se. PA (Rhoads & Klein 1993) west to MI, WI, and IA, south to FL and TX. [= RAB, C, F, G, GW, K, W; = *Galypola incarnata* (Linnaeus) Nieuwland – S]

Polygala lutea Linnaeus, Orange Milkwort, Red-hot-poker. Cp (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. peninsular FL, west to e. LA. [= RAB, C, F, G, GW, K, Z; = *Pilostaxis lutea* (Linnaeus) Small – S; = *Pylostachya lutea* (Linnaeus) Small]

Polygala mariana P. Miller, Maryland Milkwort. Cp (GA, NC, SC, VA), Pd (VA): bogs, pine savannas, other open wet habitats; common (rare in Piedmont). June-October. S. NJ south to 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) Augustin de Candolle, Dwarf Milkwort, Candyroot. Cp, Pd (GA, SC), Mt (GA, NC): longleaf pine flatwoods, other open moist areas; rare (NC Watch List, SC Rare). E. GA south to s. peninsular 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, Z; = *Pilostaxis nana* (Michaux) Rafinesque – S; = *Pylostachya nana* (Michaux) Rafinesque]

Polygala nuttallii Torrey & A. Gray, Nuttall's Milkwort. Cp (GA, NC, SC, VA), Pd (GA, NC), Mt (VA): pocosins, pine savannas, also in depression ponds (in Augusta and Rockingham counties, VA); uncommon (rare in Mountains). June-August. MA south to e. FL Panhandle; disjunct inland in w. VA, c. TN (Chester, Wofford, & Kral 1997), sc. KY, and allegedly c. AR. [= RAB, C, F, G, K, S, W]

Polygala paucifolia Willdenow, Gaywings, Fringed Polygala, Flowering Wintergreen, Bird-on-the-wing. Mt (GA, NC, SC, VA), Pd (GA): moist forests at moderate to high elevations; common (SC Rare). April-June; June-September. New Brunswick and Québec west to Saskatchewan, 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; = *Triclisperma paucifolia* (Willdenow) Nieuwland – S]

Polygala polygama Walter *var. **obtusata*** Chodat, Northern Bitter Milkwort. Mt, 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; < ***P. polygama*** – RAB, K, S, W]

Polygala polygama Walter *var. **polygama***, Southern Bitter Milkwort, Racemed Milkwort. Cp (GA, NC, SC, VA), Pd, Mt (GA, NC, SC): sandhills, woodlands, woodland borders; common. May-July; June-July. Se. VA, sw. NC, and AR, south to FL and TX. [= C, F, G; < ***P. polygama*** – RAB, K, S, W]

Polygala ramosa Elliott, Short Pinebarren Milkwort, Low Pinebarren Milkwort. Cp (GA, NC, SC, VA), Mt (NC): wet savannas, pocosin margins, bogs; common (VA Rare). 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, Z; = *Pilostaxis ramosa* (Elliott) Small – S; = *Pylostachya ramosa* (Elliott) Small]

Polygala sanguinea Linnaeus, Blood Milkwort, Field Milkwort. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (GA?, NC, VA): woodlands, openings, woodland borders; uncommon. June-August. Nova Scotia and MN, south to nw. SC, n. GA, and LA. [= RAB, C, F, G, GW, K, W; *? P. viridescens* Linnaeus – S]

Polygala senega Linnaeus *var.* ***latifolia*** Torrey & A. Gray, Seneca Snakeroot. {Mt (GA, NC, SC, VA), Pd (NC, SC, VA): woodlands and openings, especially over calcareous or mafic rocks; uncommon (NC Watch List)}. 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; < *P. senega* – RAB, C, K, S, W]

Polygala senega Linnaeus *var.* ***senega***, Seneca Snakeroot. {Mt (GA, NC, SC, VA), Pd (NC, SC, VA): woodlands and openings, especially over calcareous or mafic rocks; uncommon (NC Watch List)}. April-May. Québec west to Alberta, 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; < *P. senega* – RAB, C, K, S, W]

Polygala verticillata Linnaeus *var.* ***isocycla*** Fernald, Whorled Milkwort. {Mt, Pd, Cp (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 Manitoba, south to FL and TX. [= C, F, G, K; < *P. verticillata* var. *verticillata* – RAB; = *P. verticillata* – S, apparently misapplied; < *P. verticillata* – W]

Polygala verticillata Linnaeus *var.* ***verticillata***, Whorled Milkwort. {Mt, Pd, Cp (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; < *P. verticillata* var. *verticillata* – RAB; = *P. pretzii* Pennell – S; < *P. verticillata* – W]

Polygala boykinii Nuttall *var.* ***boykinii***, Boykin's Milkwort. Cp (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] {not keyed at this time; 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] {not keyed at this time; synonymy incomplete}

Polygala crenata C.W. James. FL Panhandle and AL west to TX; reported for GA (Sorrie, pers. comm.). [= K] {not keyed at this time; synonymy incomplete}

Polygala leptostachys Shuttleworth ex A. Gray, Georgia Milkwort. Cp (GA): sandhills; rare (GA Special Concern). In sw. GA (Jones & Coile 1988). In s. MS (Sorrie & Leonard 1999). [= K, S] {not keyed at this time; synonymy incomplete}

Polygala setacea Michaux, Coastal Plain Milkwort. Cp (GA): widespread in the outer Coastal Plain of GA (Jones & Coile 1988), and also reported by Small (1933) as occurring north to NC. [= GW, K, S] {not keyed at this time; synonymy incomplete}

POLYGONACEAE A.L. de Jussieu 1789 (Smartweed Family)

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 (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).

1 Woody vine, climbing by tendrils; [subfamily *Polygonoideae*, tribe *Coccolobeae*] ..... ***Brunnichia***
1 Herb (sometimes very robust and rather woody), herbaceous vine, or (*Fallopia baldschuanica*) a somewhat woody vine lacking tendrils.
  2 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***
  2 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*].
    3 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*].
      4 Fruit 3-winged; basal leaves very large, 20-40 cm wide; inner and outer tepals similar; [plant cultivated, rarely persistent or escaped] ..... ***Rheum***
      4 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***
    3 Tepals mostly 5 in a single whorl; plants with leaves along the stem, lacking well-developed basal leaves.
      5 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***
      5 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*).

6 Leaves cuneate at the base, either linear, spatular, or oblanceolate, mostly < 4 cm long and < 5 mm wide; pedicels jointed at the base; [tribe *Polygoneae*] ..... ***Polygonella***

6 Leaves cuneate, cordate, or hastate at the base, either lanceolate or ovate, mostly > 5 cm long and > 8 mm wide; pedicels not jointed at the base.

7 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***

7 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.

8 Outer tepals neither keeled nor winged at maturity; inflorescence of spikelike racemes, heads, or sparse, interrupted racemes; [tribe *Persicarieae*] ..... ***Persicaria***

8 Outer tepals keeled or winged at maturity; inflorescence a compound panicle of racemes; [tribe *Polygoneae*].

9 Plants climbing or sprawling, herbaceous to somewhat woody, the stems slender; perianth usually not enlarging in fruit; stigma capitate or peltate ..... ***Fallopia***

9 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)

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. Cp (GA, SC): cultivated and persisting; commonly cultivated, rarely persisting or escaping, native of tropical America. [= FNA, K] {not keyed at this time}

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. Cp (GA, SC, VA*): floodplain forests, swamp forests; rare. 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; = *B. cirrhosa* Gaertner – RAB, C, F, G, S]

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)=Z; 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; [of shale barrens of VA and WV]; [subgenus *Oligogonum*] ..... ***E. allenii***

2 Tepals white to pink; plants 4-12 dm tall; [of sandhills of s. NC (at least formerly), SC, and southward]; [subgenus *Eriogonum*] ..... ***E. tomentosum***

Eriogonum allenii S. Watson, Shale-barren Wild-buckwheat. Mt (VA): open and sunny situations in shale barrens (and rarely sandstone); rare (VA Watch List). July-August. Endemic to shale barrens of w. VA and e. WV. [= C, FNA, K, W, Z; = *E. alleni* – F, G, orthographic variant]

Eriogonum tomentosum Michaux, Sandhill Wild-buckwheat, Southern Wild-buckwheat, Dog-tongue. Cp (GA, NC, SC): sandhills, usually in white sand, primarily in the fall-line Sandhills and on riverine dunes in the middle and upper Coastal Plain; uncommon (NC Rare). Late July-September; September-November. S. NC (at least formerly) south to 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, Z]

Eriogonum harperi Goodman, Harper's Wild-buckwheat. Limestone glades and barrens of sc. KY, nc. TN, and n. AL; rare. [*E. longifolium* Nuttall var. *harperi* (Goodman) Reveal – C, FNA, K, Z]

Fagopyrum P. Miller 1754 (Buckwheat)

A genus of about 8-16 species, perennial and annual herbs, of e. Asia and Africa. References: Hinds & Freeman in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

* ***Fagopyrum esculentum*** Moench, Buckwheat. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): fields, disturbed areas, railroad rights-of-way, escaped from cultivation; rare, introduced from Eurasia. June-November. The latin and common name refer to the similarity of the seeds to beechnuts. [= RAB, C, FNA, G, K, W; = *F. sagittatum* Gilibert – F]

* *Fagopyrum tataricum* (Linnaeus) Gaertner, Tartary Buckwheat. Introduced at scattered locations in n. North America, south to WV (FNA). [= FNA, K] {not keyed at this time; add to synonymy}

Fallopia Adanson 1763 (Climbing Buckwheat)
(also see *Reynoutria*)

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).

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].
      4 Perianth 7-10 mm long at maturity (measured from the pedicel joint to the tip); achenes 2-3.5 mm long ..... ***F. scandens*** *var.* ***1***
      4 Perianth 10-15 mm long at maturity (measured from the pedicel joint to the tip); achenes 3.5-6 mm long ..... ***F. scandens*** *var.* ***scandens***

* ***Fallopia baldschuanica*** (Regel) Holub, Silver-lace-vine, China Fleece-vine. Cp, Pd (SC, VA), Mt (NC): disturbed areas, roadsides; rare, introduced from Asia. [= FNA; > *Fallopia aubertii* (Henry) Holub – X; > *Polygonum aubertii* Henry – C, F, K]

Fallopia cilinodis (Michaux) Holub, Fringed Climbing Buckwheat, Fringed Black Bindweed. Mt (GA, NC, VA): around rock outcrops, in openings, glades, and open woodlands at high elevations; uncommon (VA Watch List). June-September. [= FNA; = *Polygonum cilinode* Michaux – RAB, C, K, W, Y, Z; > *Polygonum cilinode* var. *cilinode* – F; > *Polygonum cilinode* var. *laevigatum* Fernald – F; = *Bilderdykia cilinodis* (Michaux) Greene – S; = *Tiniaria cilinodis* (Michaux) Small]

* ***Fallopia convolvulus*** (Linnaeus) Á. Löve, Bindweed, Climbing Buckwheat, Black Bindweed, Nimble-will. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas; common, introduced from Eurasia. May-September. [= FNA, X; = *Polygonum convolvulus* – RAB, GW, W, 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 scandens (Linnaeus) Holub *var.* ***1***, Crested Climbing Buckwheat. Mt, Pd, Cp (NC, SC, VA) {GA}: moist to wet open habitats; common (rare in NC) (NC Watch List). July-October. [= *Polygonum scandens* Linnaeus var. *cristatum* (Engelmann & A. Gray) Gleason – RAB, C, GW, K, Y; = *Polygonum cristatum* Engelmann & A. Gray – F; = *Bilderdykia cristata* (Engelmann & A. Gray) Greene – S; < *Fallopia scandens* – X, infraspecific taxa not distinguished; < *Polygonum scandens* – Z, infraspecific taxa not distinguished; ? *Tiniaria cristata* (Engelmann & A. Gray) Small; = *Fallopia cristata* (Engelmann & A. Gray) Holub]

Fallopia scandens (Linnaeus) Holub *var.* ***scandens***, Common Climbing Buckwheat. Mt, Pd, Cp (NC, SC, VA), {GA}: moist to wet open habitats; uncommon. July-October. [= *Polygonum scandens* Linnaeus var. *scandens* – RAB, C, GW, K, Y; = *Polygonum scandens* – F, W, in the narrow sense; = *Bilderdykia scandens* (Linnaeus) Greene – S; < *Fallopia scandens* – X, infraspecific taxa not distinguished; < *Polygonum scandens* – Z, infraspecific taxa not distinguished; = *Tiniaria scandens* (Linnaeus) Small]

* *Fallopia dumetorum* (Linnaeus) Holub, is introduced at least as far south as scattered locations in c. and se. PA (Rhoads & Klein 1993), WV, KY, TN, and AL. [= FNA; = *Polygonum scandens* Linnaeus var. *dumetorum* (Linnaeus) Gleason – K] {not keyed at this time; add to synonymy}

Persicaria P. Miller 1754 (Smartweed, Tearthumb, Jumpseed)

A genus of about 150 species, herbs, nearly cosmopolitan (primarily temperate Northern Hemisphere). Several components of this genus may belong elsewhere. References: Hinds & Freeman in FNA (2005); Park (1988)=X; Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

1 Stem, petioles, and lower surface of major leaf veins with abundant recurved prickles; [section *Echinocaulon*] .....**Key A**
1 Stem, petioles, and lower surface of major leaf veins unarmed ..... {not yet completed}

Key A – tearthumbs (section *Echinocaulon*)

1 Ocreae foliaceous, green, orbicular, perfoliate; tepals becoming fleshy and blue in fruit..... ***P. perfoliata***
1 Ocreae scarious, not as above; tepals not becoming fleshy or blue in fruit.
  2 Leaf blades triangular in outline, the larger 6-11 cm wide; perianth 4-parted.....***P. arifolia***
  2 Leaf blades lanceolate to narrowly elliptic, the larger 0.8-3 cm wide; perianth 5-parted.
    3 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***
    3 Inflorescence branches glabrous; stamens 8, an outer whorl of 5 and an inner whorl of ; leaves petiolate, sagittate at the base.....***P. sagittata***

Persicaria amphibia (Linnaeus) S.F. Gray, Water Smartweed. Mt, Pd (NC, SC, VA), {GA}: marshes, wet disturbed areas; uncommon (GA Special Concern, NC Watch List). June-August. [= 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 (L.) Haraldson, Halberd-leaf Tearthumb. Cp (GA, NC, SC, VA), Pd (NC, VA), Mt (VA): marshes, wet thickets; common (GA Special Concern). July-November; August-December. Nova Scotia west to MN. south to se. GA w. NC, and w. TN. [= FNA; = *Polygonum arifolium* Linnaeus – RAB, C, GW, K, W, 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) Sojak]

Persicaria careyi (Olney) Greene. {VA} , a native, occurs in scattered locations south to sc. PA (Rhoads & Klein 1993), DE, NJ, and MD (Kartesz 1999). [= FNA; = *Polygonum careyi* Olney – C, F, G, K] {synonymy incomplete}

Persicaria glabra (Willdenow) M. Gómez, Dense-flower Smartweed. Cp (GA, NC, SC, VA): swamp forests; uncommon, rare in VA. June-October. Nearly pantropical. [= FNA; > *Polygonum densiflorum* Meisner – RAB, C, F, G, GW, K, Z; > *Persicaria portoricensis* (Bertero ex Small) Small – S; > *Persicaria densiflora* (Meisner) Moldenke]

Persicaria hirsuta (Walter) Small, Hairy Smartweed. Cp (GA, NC, SC): pondcypress savannas, depression ponds in pinelands; uncommon, rare in NC (NC Rare). June-December. [= FNA, S; = *Polygonum hirsutum* Walter – RAB, GW, K, Z]

Persicaria hydropiper (Linnaeus) Opiz, Common Smartweed, Waterpepper, Marshpepper Smartweed. Pd (GA, NC, SC, VA), Cp (GA, NC, VA), Mt (NC, VA): wet pastures, barnyards, ditches; common. July-November. [= FNA, S; = *Polygonum hydropiper* Linnaeus – RAB, C, F, GW, K, W, Z]

Persicaria hydropiperoides (Michaux) Small, Waterpepper. Cp, Pd (GA, NC, SC, VA), Mt (GA, VA): swamp forests, streams, ditches; common (uncommon in VA Mountains). May-November. [= FNA; > *Polygonum hydropiperoides* var. *hydropiperoides* – RAB, C, F; > *Polygonum hydropiperoides* Michaux – GW, Y; = *Polygonum hydropiperoides* – K, W, 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, Pd, Mt (GA, NC, SC, VA): bottomlands, bottomland fields, disturbed areas; uncommon. July-November. [= FNA, S; *Polygonum lapathifolium* Linnaeus – RAB, C, GW, K, W, Y, Z; > *Polygonum lapathifolium* var. *lapathifolium* – G; > *Polygonum lapathifolium* var. *nodosum* (Rafinesque) Weinm. – G]

* ***Persicaria longiseta*** (de Bruijn) Kitagawa, Longbristle Smartweed. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas, ditches; common (uncommon in NC and SC), introduced from Asia. May-October. [= FNA; = *Polygonum cespitosum* Blume var. *longisetum* (de Bruijn) A.N. Steward – RAB, C, F, G, GW, K, W, Y, Z; = *Polygonum longisetum* de Bruijn]

* ***Persicaria maculosa*** S.F. Gray, Lady's-thumb, Heart's-ease. Cp, Pd, Mt (GA, VA), {NC, SC}: disturbed areas; common, introduced from Eurasia. June-December. [= FNA; = *Polygonum persicaria* Linnaeus – RAB, C, G, GW, K, W, 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 (GA, SC): wet savannas, 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; < *Polygonum meisnerianum* – Z, infraspecific taxa not distinguished; < *Truellum meisnerianum* (Chamisso & Schlectendahl) Sojak]

* ***Persicaria orientalis*** (Linnaeus) Spach, Kiss-me-over-the-garden-gate, Prince's-feather, Prince's-plume. Cp (NC, SC, VA), Pd, Mt (GA, NC, VA): barnyards, disturbed areas, garden edges; rare, introduced from Eurasia. July-November. [= FNA, S; *Polygonum orientale* Linnaeus – RAB, C, F, K, W, Y, Z]

Persicaria pensylvanica (Linnaeus) M. Gómez, Pinkweed, Common Smartweed, Pennsylvania Smartweed. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas, bottomlands; common. July-December. [= FNA, S; *Polygonum pensylvanicum* Linnaeus – RAB, C, F, GW, K, W, Z; *Polygonum pensylvanicum* var. *durum* Stanford – F; *Polygonum pensylvanicum* var. *laevigatum* Fernald – F; *Polygonum pensylvanicum* var. *rosiflorum* J.B.S. Norton – F]

* ***Persicaria perfoliata*** (Linnaeus) H. Gross, Mile-a-minute-vine, Asiatic Tearthumb, Devil's-tail Tearthumb. Pd (VA): roadsides, banks, powerline rights-of-way; 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. [= FNA; = *Polygonum perfoliatum* Linnaeus – C, F, K, X; = *Ampelygonum perfoliatum* (Linnaeus) Roberty & Vautier]

Persicaria punctata (Elliott) Small, Dotted Smartweed. Cp, Pd, Mt (GA, NC, SC, VA): swamp forests, bottomlands, marshes; common. July-November. [= FNA; > *Persicaria punctata* (Elliott) Small var. *punctata* – S; = *Polygonum punctatum* – RAB, GW, W; > *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). [= FNA; *Polygonum robustius* (Small) Fernald – C, F, G, K, Y; < *Polygonum punctatum* – Z]

Persicaria sagittata (L.) Gross ex Nakai, Arrowleaf Tearthumb, Arrowvine, Scratch-grass. Cp, Pd, Mt (GA, NC, SC, VA): marshes, bogs, beaver impondments, wet thickets; common. May-December. Newfoundland west to Manitoba, south to Panhandle FL and e. TX; China, Manchuria, India, Siberia, Korea, and Japan. [= FNA; = *Polygonum sagittatum* Linnaeus – RAB, C, G, GW, K, W, 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, Pd, Mt (GA, NC, SC, VA): swamp forests, bottomland forests; common (rare in Piedmont). July-November. [= FNA, S; = *Polygonum setaceum* Baldwin – RAB, GW, W, 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, Pd, Cp (GA, NC, SC, VA): floodplains, moist forests; common. Section *Tovara* consists of 3 species of e. North America and e. Asia; if recognized as genus, the correct name for this species is *Antenoron virginianum*. [= FNA; = *Tovara virginiana* (Linnaeus) Rafinesque – RAB, S; > *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 chinensis* (Linnaeus) H. Gross, Chinese Knotweed. Introduced in MD and NJ; native of Asia. [= FNA; *Polygonum chinense* Linnaeus – K] {not keyed at this time; add to synonymy}

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)=Z; Wunderlin (1981)=Y; Horton (1961)=X; Ronse De Craene, Hong, & Smets (2004); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

1 Ocreae ciliate; inner perianth segments fimbriate; [subgenus *Thysanella*] .....***P. fimbriata***
1 Ocreae not ciliate; inner perianth segments not fimbriate; [subgenus *Polygonella*].
  2 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***
  2 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.

3 Annual, simple to much-branched from above the base; leaves lacking hyaline margins, mostly deciduous before fruiting; ocreae obtuse; achenes 1.0-1.4 mm wide.
4 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***
4 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***
3 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.
5 Tips of the ocreae and ocreolae long-acuminate, (0.7-) 1.0-1.5 mm long; leaves mostly oblanceolate, 4-13 mm long, 0.5-1.2 (-2.1) mm wide ..... ***P. polygama*** *var.* ***croomii***
5 Tips of the ocreae and ocreolae obtuse to acute, 0-0.5 mm long; leaves mostly spatulate, 7-30 mm long, 1.9-6.0 mm wide..... ***P. polygama*** *var.* ***polygama***

Polygonella americana (Fischer & Meyer) Small. Cp (GA, NC, SC), Pd (GA): sandhills, other dry habitats; uncommon (NC Watch List). 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]

Polygonella articulata (Linnaeus) Meisner, Northern Wireweed. Cp (GA?, NC, VA): sandhills, dunes, and other dry, sandy habitats; rare (NC Rare, VA Watch List). September-October; October-November. ME and s. Québec west to MN, south on the Coastal Plain to VA and ne. NC, otherwise south to se. PA, NY, s. Ontario, MI, n. IN, n. IL, and e. IA. *P. articulata* is the only northern member of an otherwise southern and predominantly Coastal Plain genus. Cited for GA in Jones & Coile (1988); the record seems curious. [= RAB, C, F, FNA, G, K, X; = *Delopyrum articulatum* (Linnaeus) Small – S; **= *Polygonum articulatum*** Linnaeus]

Polygonella fimbriata (Elliott) Horton, Sandhill Jointweed. Cp (GA): sandhills; uncommon. E. GA (not far from SC) south to panhandle FL. It differs from all our other species in having the inner sepals fimbriate. The related *P. robusta* (Small) Nesom & Bates of FL has sometimes been treated as a variety of *P. fimbriata*. [= FNA, K; = *Thysanella fimbriata* (Elliott) A. Gray – S; = *Polygonella fimbriata* var. *fimbriata* – X; **= *Polygonum fimbriatum*** Elliott]

Polygonella gracilis (Nuttall) Meisner, Wireweed. Cp (GA, NC, SC): sandhills; uncommon (NC Watch List). 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, X; = *Delopyrum gracile* (Nuttall) Small – S; **= *Polygonum gracile*** Nuttall]

Polygonella polygama (Ventenat) Engelmann & A. Gray *var.* ***croomii*** (Chapman) Fernald, Carolina October-flower. Cp (GA, NC, SC, VA): sandhills, primarily in the fall-line Sandhills and middle Coastal Plain; uncommon. 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 and Darlington 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 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 even prove that the taxa are valid biological species, and that confusion is only caused by herbarium identifications. [= FNA, Y, Z; < *P. polygama* – RAB, K, X, infraspecific taxa not distinguished; = *P. croomii* Chapman – S]

Polygonella polygama (Ventenat) Engelmann & A. Gray *var.* ***polygama***, Common October-flower. Cp (NC, SC, VA?): sandhills, primarily in the outer Coastal Plain north of SC; common (VA Rare). 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, Y, Z; < *P. polygama* – RAB, C, F, G, K, X, infraspecific taxa not distinguished; = *P. polygama* – S; **= *Polygonum polygamum*** Ventenat]

Polygonella macrophylla Small. Sand pine scrub, coastal dunes. S. AL and Panhandle FL. [= FNA, K, S] {not keyed at this time; add to synonymy}

Polygonum Linnaeus 1753 (Knotweed)

(also see *Fallopia, Persicaria, Reynoutria*)

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.

* ***Polygonum argyrocoleon*** Steudel ex Kunze. Cp (NC): disturbed areas; rare, introduced from western North America. May-August? Reported for NC by Burk (1961). [= RAB, K, Z]

* ***Polygonum aviculare*** Linnaeus *ssp.* ***aviculare***, Knotweed. Mt, Pd, Cp (NC, SC, VA), {GA}: disturbed areas; common. March-November. [= FNA, X; *P. aviculare* – RAB, C, K, S, W, Y; *Polygonum aviculare* var. *aviculare* – F, in part; *P. aviculare* var. *vegetum* Ledebour – F; *P. monspeliense* Persoon; < *P. aviculare* – G, Z, in the broad sense]

Polygonum aviculare Linnaeus *ssp.* ***buxiforme*** (Small) Costea & Tardif, Small's Knotweed. (SC, VA). [= FNA, X; = *Polygonum buxiforme* Small – C, K, S, Y; *P. aviculare* Linnaeus var. *littorale* (Link) Mertens – F; < *P. aviculare* – G, in part; *P. littorale* Link]

* ***Polygonum aviculare*** Linnaeus *ssp.* ***depressum*** (Meisner) Arcangeli, Dooryard Knotweed. {GA, NC, SC, VA}. [= FNA, X; *Polygonum arenastrum* Boreau – C, K; < *P. aviculare* – G, in part]

* ***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, in part; < *P. aviculare* – G, in part; *Polygonum aviculare* Linnaeus var. *rurivagum* (Jord. ex Boreau) Berher; *Polygonum aviculare* Linnaeus var. *angustissimum* Meisner]

Polygonum erectum Linnaeus, Erect Knotweed. Mt, Pd (NC, SC, VA), Cp (VA), {GA}: disturbed areas, open places; rare (NC Watch List). June-October; July-October. [= RAB, C, F, FNA, K, S, W, Y, Z]

Polygonum glaucum Nuttall, Seabeach Knotweed. Cp (GA, NC, SC, VA): ocean beaches, sound-side sandy shores, dune bases; rare (GA Special Concern, NC Rare, VA Rare). May-October; June-November. [= RAB, C, F, FNA, K, S, Y, Z]

Polygonum ramosissimum Michaux *var.* ***prolificum*** Small, Longfruit Knotweed, Bushy Knotweed, Prolific Knotweed. Cp (NC?, VA): {habitat}; rare (VA Watch List). Also reported for NC (Kartesz 1999). [= 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 *var.* ***ramosissimum*** is reported for SC (Kartesz 1999). {investigate} [= K, Y; = *P. ramosissimum* Michaux ssp. *ramosissimum* – FNA, X; = *P. ramosissimum* – C, F, G] {not keyed at this time; synonymy incomplete}

Polygonum tenue Michaux, Glade Knotweed, Slender Knotweed. Pd (GA, NC, SC, VA), Mt (GA, NC, VA), Cp (VA): glades, barrens, and thin, rocky soils, over various rock types (including granite, diabase, amphibolite, greenstone, and metagabbro); uncommon, rare in NC (NC Watch List). July-September; August-October. [= RAB, C, FNA, S, W, Y, Z; > *Polygonum tenue* var. *protrusum* Fernald – F, K; > *Polygonum tenue* var. *tenue* – F, K]

Polygonum achoreum Blake, south to WV (Kartesz 1999). [= C, F, FNA, G, K] {not keyed at this time}

Reynoutria Houttuyn 1777

A genus of about 15 species, perennial herbs, of temperate e. Asia. Ronse Decraene & Akeroyd (1988) 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 phylogeny (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, introduced from 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, Pd (GA, NC, SC, VA), Cp (NC, SC, VA); roadsides, disturbed areas, river banks and sandbars, often forming dense thickets; uncommon, introduced from e. Asia. May-September; August-October. [= *Polygonum cuspidatum* Siebold & Zuccarini – RAB, C, F, K, W, 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, Cp (VA), Mt (NC): disturbed areas, roadsides; rare, introduced from e. Asia. July-August; August-October. [= *Polygonum sachalinense* F. Schmidt ex Maximowicz – RAB, C, F, K, W, 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): uncommonly cultivated (primarily in gardens in the cooler portions of our area), rarely persistent or escaped; rare, introduced from Europe (though originally native of Asia). July-September. [= K; = *Rh. rhabarbicum* – C, misspelled; = *Rh. 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).

subgenus *Acetosella*: acetosella
subgenus *Acetosa*: acetosa, hastatulus
subgenus *Rumex*: the rest

* ***Rumex acetosella*** Linnaeus, Red Dock, Sheep Sorrel, Sourgrass. Mt, Pd, Cp (GA, NC, SC, VA). [= RAB, C, FNA, G, GW, K, W; > *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, Pd (GA, NC, SC, VA), Cp (NC): roadsides, disturbed areas; uncommon. ME and MN south to FL, TX, AZ, and n. Mexico. [= RAB, C, F, FNA, G, GW, K, S, W]

Rumex brittanica Linnaeus, Great Water Dock, native species south to VA, PA, NJ, KY (FNA). [= FNA; > *R. orbiculatus* A. Gray – C, F, G, W; > *R. orbiculatus* var. *orbiculatus* – K]

* ***Rumex brownii*** Campderá, Brown's Dock. Cp (SC), Pd (NC): disturbed areas, floodplains, wool-combing waif; rare, introduced from Australia. [= FNA; = *R. brownei* – K, orthographic variant]

* ***Rumex conglomeratus*** Murray, Clustered Dock. Cp, Pd (GA, NC, SC), Mt (GA), {VA}: [= RAB, C, F, FNA, G, GW, K, S]

* ***Rumex crispus*** Linnaeus *ssp. **crispus***, Curly Dock. Mt, Pd, Cp (GA, NC, SC, VA): common. [= FNA, K; < *R. crispus* – RAB, C, F, G, GW, S, W]

Rumex fascicularis Small. Cp (NC?): swamps and marshes; rare (if present). Peninsular FL, and perhaps north to se. NC. [= FNA, S; < *R. verticillatus* Linnaeus – F, G; = *R. verticillatus* ssp. *fascicularis* (Small) Á. Löve]

Rumex floridanus Meisner, Florida Dock. Cp (GA, NC, SC): swamps and marshes; uncommon. NJ south to FL, west to LA. Orangeburg Co. SC (fide Steve Leonard). [= FNA, G, S; < *R. verticillatus* – RAB, C, F, GW; = *R. verticillatus* Linnaus ssp. *floridanus* (Meisner) Á. Löve; > *R. chrysocarpus* Moris – GW, K, misapplied]

Rumex hastatulus Baldwin, Wild Dock. Cp, Pd (GA, NC, SC, VA), Mt (GA, SC). [= RAB, C, F, FNA, G, GW, K, S, W; *Acetosa hastatula* (Baldwin) Á. Löve]

* ***Rumex obtusifolius*** Linnaeus, Bitter Dock. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): common, introduced. [= RAB, C, F, FNA, G, GW, K, S, W]

* ***Rumex patientia*** Linnaeus, Patience Dock, Monk's-rhubarb. Mt, Pd (NC, VA): rare, introduced. [= RAB, C, F, FNA, G, K]

* ***Rumex pulcher*** Linnaeus, Fiddle Dock. Cp, Pd (GA, NC, SC), Mt (SC), {VA}: introduced from Eurasia. [= RAB, C, F, FNA, G, GW, K, S, W]

* ***Rumex stenophyllus*** Ledebour, Narrowleaf Dock. Cp (SC), introduced from Eurasia. [= FNA, K]

Rumex verticillatus Linnaeus, Swamp Dock. Cp (GA, NC, SC, VA), Pd (NC): tidal freshwater marshes and swamps; common (rare in Piedmont). [= FNA, S; < *R. verticillatus* – RAB, C, F, G, GW, K, W, in part]

* *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 cuneifolius* Campderá. A rare introduction from South America in AL, FL. [= FNA, S; *R. frutescens* Thouars – K, misapplied]

*? *Rumex fueginus* Philippi, American Golden Dock. (NC?). MD, DE, PA. [= FNA; < *R. maritimus* Linnaeus – G, K; = *R. maritimus* var. *fueginus* (Philippi) Dusen – F; *R. maritimus* var. *persicarioides* (Linnaeus) R.S. Mitchell – C, misapplied; *R. persicarioides* Linnaeus – S, misapplied]

* *Rumex paraguayensis* Parodi, Paraguayan Dock. {distribution}. See Brown & Marcus (1998). [= FNA, GW, K]

* *Rumex sanguineus* Linnaeus, Bloody Dock, Red-veined Dock, is introduced at least as far south as se. PA (Rhoads & Klein 1993), MD, NJ, and AL (Kartesz 1999). [= C, FNA, G, K, S]

Rumex triangulivalvis (Danser) Rechinger f. 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]

PORTULACACEAE A.L. de Jussieu 1789 (Purslane Family)

A family of about 29 genera and 450-500 species, trees, vines, shrubs, and 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).

1 Flowers sessile or subsessile; capsule circumscissile..... ***Portulaca***
1 Flowers pedicelled; capsule opening longitudinally.
  2 Flowers borne on a scape, with cymose branching
    3 Leaves linear, terete, 1-2 mm wide; plants to 5 dm tall; [native] ..... ***Phemeranthus***
    3 Leaves obovate or elliptic, 20 mm or more wide; plants to 8 dm tall; [alien, persistent or escaped] ..... ***Talinum***
  2 Flowers solitary or in racemes.
    4 Stems with 2 opposite cauline leaves; petals 6-14 mm long .....***Claytonia***
    4 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 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***
1 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.
  2 Broadest leaves on a plant 1-2 (-4) mm wide.....***C. virginica*** *var.* ***acutiflora***
  2 Broadest leaves on a plant 5-10 (-20) mm wide.
    3 Flowers yellow; [known from NJ, MD, and PA] ..... ***[C. virginica*** *var.* ***hammondiae]***
    3 Flowers white to pink; [widespread in our area] .....***C. virginica*** *var.* ***virginica***

Claytonia caroliniana Michaux, Carolina Spring-beauty. Mt (GA, NC, VA): moist forests, especially northern hardwood forests and cove forests at moderate to high elevations; common. March-May. Nova Scotia west to MN, south to w. NC, e. TN, and n. GA. [= RAB, C, F, FNA, G, S, W, Y, Z; > *C. caroliniana* var. *caroliniana* – K; > *C. caroliniana* Michaux var. *lewisii* McNeill – K]

Claytonia virginica Linnaeus ***var. acutiflora*** Augustin de Candolle, Southern Spring-beauty. Mt, Pd, 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 (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): moist forests. (January-) February-April. Nova Scotia 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. [= C, K, Z; < *C. virginica* – RAB, F, FNA, G, W, Y; = *C. media* (Augustin de Candolle) Link – S]

Claytonia virginica Linnaeus var. *hammondiae* (Kalmbacher) J.J. Doyle, W.H. Lewis, and D.B. Snyder, Yellow Spring-beauty, is known from NJ, MD, and PA. This yellow-flowered spring-beauty is apparently not a mere flower color form, and should be recognized as a taxon. Further study is warranted. [= K; < *C. virginica* var. *virginica* – C; < *C. virginica* – F, G, FNA, Y]

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, introduced from 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, introduced from 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 Leaves obovate or elliptic, 20 mm or more wide; [an introduction, persistent or escaped] ..... ***[***see ***Talinum]***
1 Leaves linear, terete, 1-2 mm wide; [native].
2 Stamens 4-8; flowers open in late afternoon ..... ***[Ph. parviflorus]***
2 Stamens 12-80; flowers variously open from early or late afternoon.
3 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. ..... ***Ph. teretifolius***
3 Style 3.8-7 mm long; stamens 25-80; flowers open from about 1 to 7 p.m. E.D.S.T.
4 Stigma distinctly 3-lobed; mature seeds covered with a dull gray coating; [of calcareous rock outcrops]..... ..... ***[Ph. calcaricus]***
4 Stigma subcapitate; mature seeds brown-black and lustrous; [of noncalcareous rocks].
5 Stamens (40-) 50-80 (-90); [of granite and sandstone from SC southward] ..... ***Ph. mengesii***
5 Stamens 25-42; [of mafic and ultramafic rocks, known from nc. NC and sc. VA] ..... ***Ph. species 1***

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. *Ph. mengesii* and *Ph. parviflorus* Nuttall of the midwestern United States (and disjunct as far east as AL) are apparently the parents of the allotetraploid *Ph. 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 *Ph. species 1*); = *Talinum mengesii* W. Wolf – Q, S, X, Y; < *Talinum mengesii* – K (also see *Ph. species 1*)]

Phemeranthus species 1. Pd (NC, VA): in periodic seepage on mafic or ultramafic rocks; rare (NC Proposed Endangered). (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. Further investigations are needed to confirm its chromosome complement and relationship to *Ph. teretifolius* of nearby granite flatrocks, and to the more southerly *Ph. mengesii*. It is possible that it is only an unusual form of *Ph. mengesii*. [< *Talinum mengesii* – K; < *Phemeranthus mengesii* – FNA, Z]

Phemeranthus teretifolius (Pursh) Rafinesque, Appalachian Rock-pink. Mt, Pd (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. June-September. DE, 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. *Ph. teretifolius* is an allotetraploid, probably derived from hybridization followed by polyploidization of the diploids *Ph. mengesii* and *Ph. parviflorus*. [= FNA, Z; = *Talinum teretifolium* Pursh – RAB, C, F, G, K, Q, S, W, X, Y]

Phemeranthus calcaricus (S. Ware) Kiger, Cedar-glade Rock-pink, occurs on calcareous glades, from c. TN south to n. AL. A tetraploid species, probably derived from *Ph. calycinus* Engelmann. [= FNA, Z; = *Talinum calcaricum* S. Ware – K, Q, Y]

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]

Portulaca Linnaeus 1753 (Purslane, Portulaca)

A genus of about 40 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.
10 [Native in our area, in thin soil on granitic and sandstone outcrops in SC and GA] ..... ***P. coronata***
10 [Introduced cultivar, persistent to weakly spreading from plantings] ..... ***P. umbraticola***
9 Capsule not encircled by an expanded membranaceous wing.
11 Leaves flattened in cross-section, > 2.5 mm wide, obovate to spatulate.
12 Trichomes at nodes conspicuous; seeds round, < 0.6 mm wide ..... ***P. amilis***
12 Trichomes at nodes inconspicuous; seeds elongate, > 0.6 mm long ..... ***P. oleracea***
11 Leaves terete to hemispherical in cross-section, usually < 2 mm wide, linear to lanceolate.
13 Nodes and inflorescences with inconspicuous trichomes ..... ***P. biloba***
13 Nodes and inflorescences with conspicuous trichomes
14 Seeds > 0.65 mm wide.
15 Longest leaves mostly > 20 mm long; capsules mostly > 4 mm in diameter; [introduced, usually in obviously disturbed sites] ..... ***P. grandiflora***
15 Longest leaves mostly < 17 mm long; capsules mostly < 3.5 mm in diameter; [native, on granitic or diabase flatrocks] ..... ***P. smallii***
14 Seeds < 0.65 mm wide
16 Capsules 1.1-2.0 mm in diameter; seeds 0.3-0.5 mm in diameter ..... ***P. halimoides***
16 Capsules 1.5-5 mm in diameter; seeds (0.4-) 0.5-0.6 mm in diameter ..... ***P. pilosa***

* ***Portulaca amilis*** Spegaz., Broadleaf Pink Purslane. Cp (GA, NC, SC, VA), Pd (NC, SC): sandy fields, and other dry, sandy, disturbed habitats; rare, introduced from 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). [= FNA, K, Z]

Portulaca biloba Urban, Grit Purslane. Cp (GA): outcrops of Altamaha Grit; rare (GA Special Concern). 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 coronata Small, Flatrock Portulaca. Pd (GA, SC), Cp (GA): on or around granitic flatrocks, usually under *Juniperus virginiana*, and on Altamaha Grit outcrops; rare (GA Special Concern, SC Rare). 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. Cp (NC, SC, VA), Pd (NC, SC), {GA): in sandy soil or around granitic flatrocks; rare, native of Argentina. [= RAB, C, FNA, G, K, S, Z]

* ***Portulaca halimoides*** Linnaeus. Cp (VA): waste area along railroad; rare, 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, Pd, Cp (GA, NC, SC, VA): gardens, disturbed areas, cracks in sidewalks; common, 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, Z]

Portulaca pilosa Linnaeus, Kiss-me-quick. Cp (GA, NC, SC), Pd (NC, SC): disturbed sandy soils; uncommon. June-October. NC south to 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, Z]

Portulaca smallii P. Wilson, Small's Portulaca. Pd (GA, NC, SC, VA): in thin soils on granitic and diabase flatrocks, sometimes locally spreading to adjacent fields, mowed areas, or other disturbed areas; rare (NC Threatened, SC Rare, VA Rare). 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. Pd, Cp (GA?, NC, SC): disturbed areas, spreading weakly or persistent following cultivation; rare, native of South America and the West Indies. See ***P. coronata*** for further discussion. [< ***P. umbraticola*** Kunth – Z; = ***P. umbraticola*** Kunth ssp. ***umbraticola*** – K]

Talinum Adanson 1763 (Jewels-of-Opar)
(also see *Phemeranthus*)

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).

* ***Talinum paniculatum*** (Jacquin) Gaertner, Jewels-of-Opar. Pd (GA, NC, SC), Cp (GA): fairly commonly cultivated, locally escaped to disturbed areas and garden edges; rare, introduced from the West Indies. June-September. [= FNA, S, X; ***T. paniculatum*** var. ***paniculatum*** – K]

PRIMULACEAE Ventenat 1799 (Primrose Family)
(also see *MYRSINACEAE* and *SAMOLACEAE*)

As reconstituted, a family of 12-13 genera and about 600 species, herbs, primarily north temperate. Källersjö, Bergqvist, & Anderberg (2000) and Martins, Oberprieler, & Hellwig (2003) suggest that the traditional Primulaceae is polyphyletic, and recommend the transfer of several genera to other families, including *Lysimachia*, *Anagallis*, *Centunculus, Trientalis*, and *Glaux* to Myrsinaceae and *Samolus* to Theophrastaceae. *Dodecatheon* and *Hottonia* remain in Primulaceae s.s. References: Channell & Wood (1959); Källersjö, Bergqvist, & Anderberg (2000); Martins, Oberprieler & Hellwig (2003); Anderberg in Kubitzki (2004).

1 Aquatic; leaves pectinate (deeply pinnatifid into linear segments) ..... ***Hottonia***
1 Terrestrial (though sometimes in wetlands or submersed for short periods of time); leaves entire or shallowly toothed.
  2 Leaves strictly in a basal rosette or basally disposed (with a basal rosette and smaller stem leaves).
    3 Inflorescence an umbel; leaves strictly basal ..... ***Dodecatheon***
    3 Inflorescence a raceme or a panicle of racemes; larger leaves basal and smaller leaves on the stem..... ***[see Samolus** in SAMOLACEAE]*
  2 Leaves all or chiefly cauline ..... ***[see Anagallis, Centunculus, Lysimachia, Trientalis** in MYRSINACEAE]*

Dodecatheon Linnaeus 1753 (Shooting star)

A genus of 13-15 species, herbs, of North America and ne. Asia. 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: Fassett (1944)=Z; Mast et al. (2004).

1 Wall of the capsule thin and flexible; corolla lobes rose-purple ..... ***[D. amethystinum]***
1 Wall of the capsule thick and stiff; corolla lobes white to medium pink.
  2 Leaves cordate, subcordate, or abruptly narrowed to the petiole ..... ***[D. meadia** var. **frenchii]***
  2 Leaves long-cuneate at the base, gradually narrowed to the petiole.
    3 Flowers 1-14 per plant; calyx lobes (2.5-) 3.5-4.0 (-5.0) mm long on expanding flowers, becoming 4-5 mm long on fruits; anthers 4-7 mm long; fruit 7-10 mm long..... ***D. meadia** var. **brachycarpum***
    3 Flowers 4-125 per plant; calyx lobes (3-) 4-5 (-8) mm long on expanding flowers, becoming (4-) 5.5-7 (-9) mm long on fruits; anthers 6.5-10 mm long; fruit 10-17 mm long..... ***D. meadia** var. **meadia***

Dodecatheon meadia Linnaeus ***var. brachycarpum*** (Small) Fassett, Ozark Eastern Shooting Star. Mt (VA): dolomite woodlands and glades; rare (VA Watch List). Late April-May; late May-June. Chiefly Ozarkian: MO and OK, and AR south to n. AL and TX; rarely disjunct as far east as w. and sw. VA. [= C, F, G; < ***D. meadia*** – RAB, W; = ***D. meadia*** ssp. *brachycarpum* (Small) R. Knuth – K; = ***D. brachycarpa*** Small – S; < ***Primula meadia*** (Linnaeus) A. R. Mast & Reveal]

Dodecatheon meadia Linnaeus ***var. meadia***, Common Eastern Shooting Star. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (SC): rich forests, woodlands, and rock outcrops (primarily calcareous or mafic), especially with nutrient-rich seepage; uncommon, rare in NC (NC Rare, VA Watch List). Late March-early June; late May-June. MD and PA west to s. WI, se. MN, IA, and OK, south to n. GA, n. FL (Gadsden County), AL, and TX. [= C, F, G; < ***D. meadia*** – RAB, W; = ***D. meadia*** ssp. ***meadia*** – K; > ***D. meadia*** – S; > ***D. hugeri*** Small – S; > ***D. meadia*** var. ***genuinum*** – Z; > ***D. meadia*** var. ***obesum*** Fassett – Z; < ***Primula meadia*** (Linnaeus) A. R. Mast & Reveal]

Dodecatheon amethystinum (Fassett) Fassett, Jeweled Shooting Star. MN and WI south to IL and MO, apparently disjunct eastward in PA. The eastern distribution of *D. amethystinum* is alternatively considered by some to represent eastern populations of *D. radicatum* Greene, or merely depauperate plants of *D. meadia*. [= F, K, Z; < *D. radicatum* Greene var. *radicatum* – C; < *D. radicatum* – G; = ***Primula fassettii*** A. R. Mast & Reveal]

Dodecatheon meadia Linnaeus var. *frenchii* Vasey , French's Shooting-star. IN, IL, and MO south to AL and AR. [= C, F, G, Z; = *D. frenchii* (Vasey) Rydberg – K; = ***Primula frenchii*** (Vasey) A. R. Mast & Reveal]

Hottonia Linnaeus 1753 (Water-violet)

A genus of 2 species, aquatic herbs, of North America and Eurasia. References: Anderberg in Kubitzki (2004).

Hottonia inflata Elliott, Featherfoil, Water-violet. Cp (NC, SC, VA), Pd (GA, NC): 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; rare (GA Special Concern, NC Watch List). April-May; May-June. ME south to FL, west to TX, inland up the Missisippi Embayment to IL, and at other scattered locations inland (as 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, G, GW, K, S]

PUNICACEAE
(see LYTHRACEAE)

RANUNCULACEAE A.L. de Jussieu 1789 (Buttercup Family)
(also see *HYDRASTIDACEAE*)

A family of about 62 genera and 2450 species, herbs, shrubs, and vines, primarily of temperate and boreal regions. References: Whittemore & Parfitt in FNA (1997); Keener (1977); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

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*] ..... ***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 *Isopyroideae*, tribe *Coptideae*] ..... ***Xanthorhiza***
1 Herb; leaves compound or simple.
  3 Leaves simple, sometimes deeply cleft or lobed into rounded or elongate segments.
    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; [subfamily *Helleboroideae*, 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 ..... ***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 ..... ***Consolida***
    3 Perennial; pistil 3 (-5); petals 4, separate; leaf lobes > 2 mm wide ..... ***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]; [subfamily *Ranunculoideae*, 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) ..... ***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] ..... ***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] ..... ***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; [subfamily *Ranunculoideae*, tribe *Ranunculeae*] ..... ***Trautvetteria***

6 Sepals 6-40 mm long, not caducous; stamens not notably white and showy.

7 Leaves opposite, distributed along the stem; style plumose; [subfamily *Ranunculoideae*, tribe *Anemoneae*] ..... ***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; [subfamily *Ranunculoideae*, tribe *Anemoneae*] ..... ***Anemone***

8 Sepals yellow, green, or whitish (sometimes marked with purple); basal leaves unlobed, or palmately cleft into 5-11 (-many) segments; [subfamily *Helleboroideae*, tribe *Helleboreae*].

9 Leaves cordate-reniform, unlobed; sepals bright yellow; petals absent; [native, of bogs and marshes] ..... ***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 ..... ***Eranthis***

10 Sepals 5, nearly as wide as long, green or maroon; cauline leaves present..... ***Helleborus***

Key B

1 Fruit a follicle, each carpel with 2 or more ovules; [subfamily *Helleboroideae*].

2 Leaves cordate-reniform, toothed, not lobed or divided; [tribe *Helleboreae*] ..... ***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 ..... ***Aconitum***

4 Stems strong, erect

5 Annual; leaf lobes < 1.5 mm wide; [exotic] ..... ***Consolida***

5 Perennial; leaf lobes > 2 mm wide; [native] ..... ***Delphinium***

3 Carpels 3-6; plants 1-5 dm tall; [introduced, rarely persistent or escaping]; [tribe *Helleboreae*].

6 Cauline leaves absent, except for the involucre which immediately subtends the fruit..... ***Eranthis***

6 Cauline leaves present..... ***Helleborus***

1 Fruit an achene (or dehiscent utricle in *Trautvetteria*), each carpel with 1 ovule; [subfamily *Ranunculoideae*].

7 Leaves opposite, distributed along the stem; style plumose; [tribe *Anemoneae*] ..... ***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*]..... ***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*]..... ***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*]..... ***Anemone***

10 Cauline leaves alternate; sepals present; [tribe *Ranunculeae*]

11 Achenes pubescent, beakless; leaves simple, cordate, unlobed; [introduced garden plants] ..... ***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].. ..... ***Ranunculus***

Key C

1 Leaflets linear, < 1.5 mm wide.

2 Flowers bilaterally symmetrical..... ***Consolida***

2 Flowers radially symmetrical.

3 Aquatic; [native] ..... ***Ranunculus***

3 Terrestrial; [alien].

4 Flower lacking involucre; pistils simple..... ***[Adonis]***

4 Flower closely subtended by a finely dissected involucre; pistils compound..... ***Nigella***
1 Leaflets broader, rounded, lobed, or toothed.
5 Leaves all cauline, opposite; stems somewhat woody at base..... ***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 ..... ***Aquilegia***
7 Flowers not dangling; petals yellow, not spurred..... ***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 ..... ***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. ..... ***Anemone***
10 Basal leaves with > 5 leaflets; these with 0-3 rounded lobes at the tip; petaloid sepals white to pale pink..... ***Anemonella***
8 Sepals absent, or inconspicuous in comparison to the stamens or pistils.
11 Leaflets 3; flower solitary..... ***Coptis***
11 Leaflets many; flowers many, in a panicle or raceme.
12 Infloredcence a raceme..... ***Actaea***
12 Inflorescence a panicle ..... ***Thalictrum***

Key D

1 Fruit a follicle or capsular (or fleshy and berrylike in some *Actaea*).
2 Mature leaves > 4 dm wide..... ***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..... ***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 ..... ***Nigella***
3 Leaflets broad, rounded; [mostly natives].
5 Follicles borne on stipes, forming an umbel-like cluster; rhizomes yellow or orange..... ***Coptis***
5 Follicles sessile; rhizomes brown or tan.
6 Follicles 15-31 mm long, with beaks 7-18 mm long ..... ***Aquilegia***
6 Follicles 3.5-6.5 mm long, with beaks 1.5-3 mm long ..... ***Enemion***
1 Fruit an achene.
7 Leaves divided into numerous linear segments, all of which are < 1 mm wide.
8 Plant terrestrial ..... ***[Adonis]***
8 Plant aquatic (if leaves divided into numerous linear segments)..... ***Ranunculus***
7 Leaf segments rounded or cleft, > 1 mm wide.
9 Leaves cauline, opposite ..... ***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.... ..... ***Anemone***
11 Achenes conspicuously ribbed or veined on lateral surfaces; leaf texture thin, delicate ..... ***Anemonella***
10 Leaflike involucral bracts not present.
12 Leaflets 3-many, if many the leaflets typically with teeth, or sharp lobes..... ***Ranunculus***
12 Leaflets many, unlobed or typically with 3-9 rounded lobes..... ***Thalictrum***

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. Mt (NC, VA): 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; rare (NC Rare, VA Watch List). 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. Mt (GA, NC, SC, VA), Pd, Cp (GA, NC, VA): seepages, cove forests, other moist forests; uncommon (rare in Coastal Plain) (SC Rare). 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 correlated 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* (Augustin de Candolle) Hardin = K, Z; > *A. uncinatum* ssp. *uncinatum* – K, Z]

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 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 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) ..... ***A. pachypoda***
    - 6 Fruiting pedicels slender, 0.4-0.7 mm in diameter; fruit red (rarely white) ..... ***[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. Mt, Pd (GA, NC, SC, VA), Cp (VA): rich cove forests and slopes; common (rare in Piedmont and Coastal Plain). April-May; August-October. Québec and MN south to c. GA, 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 Augustin de Candolle, Mountain Black-cohosh, Late Black-cohosh. Mt (GA, NC, SC, VA): rich cove forests and slopes, at moderate to high elevations; uncommon (SC Rare). 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. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): rich cove forests, other mesic and moderately to very fertile forests; common (uncommon in SC, rare in Coastal Plain of NC). 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. Mt (VA): rich cove forests over calcareous rocks (limestone or dolostone); rare (US Species of Concern, VA Rare). 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* Augustin de Candolle – Z, misapplied]

Actaea rubra (Aiton) Willdenow, Red Baneberry. South to c. PA (Rhoads & Klein 1993) and n. NJ. [= C, F, FNA, G, Z; ? *A. rubra* ssp. *rubra* – K]

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, is naturalized in n. AL and sc. TN (Parfitt in FNA 1997). [= C, FNA, G, K]

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; 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. quinquefolia* *var*. *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* *var*. *quinquefolia***

Anemone acutiloba (Augustin de Candolle) G. Lawson, Sharp-lobed Hepatica, Sharp-lobed Liverleaf. Mt (GA, NC, SC, VA), Pd (GA?, NC): moist forests, especially over calcareous or mafic rocks; uncommon (SC Rare). March-April. Widespread in e. North America. See comments under *A. americana* about the taxonomy of the two taxa of "Hepatica." [= FNA; = *Hepatica acutiloba* Augustin de Candolle – RAB, C, F, G, W; = *Hepatica nobilis* P. Miller var. *acuta* (Pursh) Steyermark – K, Z; = *Hepatica acuta* (Pursh) Britton – S]

Anemone americana (Augustin de Candolle) H. Hara, Round-lobed Hepatica, Round-lobed Liverleaf. Pd, Mt, Cp (GA, NC, SC, VA): moist forests; common (uncommon in Coastal Plain of NC and GA, rare in Coastal Plain of SC). February-April. Widespread in e. North America. 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; = *Hepatica americana* (Augustin de Candolle) Ker-Gawler – RAB, C, F, G, W; = *Hepatica nobilis* P. Miller var. *obtusa* (Pursh) Steyermark – K, Z; < *Hepatica hepatica* (Linnaeus) Karsten – S]

Anemone berlandieri Pritzel, Eastern Prairie Anemone, Tenpetal Anemone. Pd (GA, NC, SC, VA): thin, circumneutral soils around rock outcrops; rare (GA Special Concern, NC Rare, SC Rare, VA Rare). 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 in from KS, OK, and TX east to AR, MS, and AL; disjunct in c. GA, c. NC, 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; < *A. caroliniana* Walter – RAB, C, F, G, S, W; *?* *A. heterophylla* Nuttall ex Torrey & Gray; < *A. decapetala* Arduino, misapplied (a South American species)]

Anemone canadensis Linnaeus, Canada Anemone. Mt, Pd (VA): moist forests; rare (VA Rare). May-August. Québec west to Alberta, 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. Pd (GA, NC, SC): clayey soils of post oak and blackjack oak woodlands (Iredell soils), wet meadows; rare (GA Special Concern, NC Rare, SC Rare). 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. Pd, Mt, Cp (NC, SC, VA): rich, moist soils on slopes or in bottomlands; common (uncommon in NC and SC Mountains, rare in VA Piedmont, rare in Coastal Plain). 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 quinquefolia Linnaeus *var*. ***minima*** (Augustin de Candolle) Frodin ex Dutton & Keener, Tiny Anemone. Mt (NC, VA), Pd (VA): acidic forests, especially under *Alnus serrulata* along small streams; rare (NC Watch List, VA Watch List). March-May. A Southern Appalachian endemic: VA and WV south to NC and TN. See Dutton & Keener (1994). [= FNA, K; = *A. minima* Augustin de Candolle – C, F, G, W]

Anemone quinquefolia Linnaeus *var*. ***quinquefolia***, Wood Anemone. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp (NC, VA): rich, moist forests, grassy balds, often abundant at high elevations; common (rare in upper Piedmont and outer Coastal Plain of NC and VA). March-May. The species is widespread in ne. North America, south to MD, IN, IL, and IA, and south in the mountains to nc. GA. [= 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. Mt, Pd, Cp (GA, NC, SC, VA): rich forests and woodlands, especially prevalent on circumneutral soils; common (uncommon in Coastal Plain, especially south of VA). May-July. The species is widespread in e. North America. 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 blanda* Schott & Kotschy is 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 keyed at this time}

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]

Anemonella Spach (Rue-anemone, Windflower)

A monotypic genus, a perennial herb, of temperate e. North America. *Anemonella* is often united with *Thalictrum* (as section *Anemonella*); this may prove to be the more appropriate treatment. References: Park & Festerling in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

Identification notes: *Anemonella 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).

Anemonella thalictroides (Linnaeus) Spach, Rue-anemone, Windflower. Mt, Pd, Cp (GA, NC, SC, VA): moist forests; common (rare in Coastal Plain). March-May. The species is widespread in e. North America. [= C, F, G; = *Thalictrum thalictroides* (Linnaeus) Eames & Boivin – RAB, FNA, K, W; = *Syndesmon thalictroides* (Linnaeus) Hoffmannsegg ex Britton – S]

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, easily mistaken for *Thalictrum*, *Anemonella*, or *Enemion*; look for old fruits.

1 Flowers red and yellow ..... ***A. canadensis***
1 Flowers blue or purple ..... ***A. vulgaris***

Aquilegia canadensis Linnaeus, Canada Columbine, Eastern Columbine. Mt, Pd, Cp (GA, NC, SC, VA): forests, woodlands, rock outcrops, especially (though by no means entirely) on calcareous or mafic substrates; common (rare in Coastal Plain of GA, NC, and SC, where restricted to coquina limestone outcrops, Indian shell middens, and other calcareous sites). March-May. Widespread in e. North America, 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. Pd, Mt (NC), {GA}: disturbed areas; rare, introduced from 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]

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. Mt (NC, VA), Pd, Cp (VA): bogs, wet meadows, seepage swamps, brookbanks; uncommon, rare south of VA (NC Rare). April-June. *Caltha palustris* is circumboreal, widespread in n. Eurasia and n. North America, south in e. North America to w. NC, ne. TN, WV, IN, IL, and IA. *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]

Cimicifuga Wernischeck 1763 (Black-cohosh)
(see *Actaea*)

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).

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, 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* and *C. viticaulis*).
8 Sepal tips acuminate; achene bodies cobwebby-tomentose toward 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].
9 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***
9 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*).
10 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***
10 Sepals thick in texture, 1-5 cm long, short-sericeous, apically recurved; leaves 1-11-foliolate; [subgenus *Viorna*].
11 Lower surface of leaves glaucous and glabrous (rarely with a few scattered hairs).
12 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***
12 Plant a climbing vine; all leaves generally compound, often 6-10-foliolate; [of various habitats, ranging from NC south].
13 Leaf blade thin in texture; secondary and tertiary veins not prominently reticulate ..... ***C. glaucophylla***
13 Leaf blade leathery in texture; secondary and tertiary veins prominently reticulate; [in the Ridge and Valley of eastern TN and westward] ..... ***[C. versicolor]***
11 Lower surface of leaves not glaucous, pubescent (rarely nearly glabrous).
14 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***
14 Plants viny, sprawling or climbing, the stems usually over 1 m long, not rhizomatous-clonal; leaflets generally broader.
15 Leaves coriaceous, the secondary and tertiary veins forming prominent reticulations on the upper surface.
16 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]***
16 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***
15 Leaves membranous, the secondary and tertiary veins forming faint, indistinct reticulations on the upper surface.

17 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***

17 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.

18 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]***

18 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. Mt (VA): dry to mesic calcareous barrens, woodlands, and forests, over dolostone (Elbrook Formation); rare (VA Rare). 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. Mt (VA): shale barrens; uncommon. May-June. Endemic to w. VA (Alleghany, Augusta, Bath, Botetourt, Highland, and Rockbridge counties), and e. WV. [= C, FNA, G, K, W; = *C. albicoma* var. *albicoma* – F; = *Coriflora albicoma* (Wherry) W.A. Weber]

Clematis catesbyana Pursh, Coastal Virgin's-bower, Satin-curls. Cp (GA, NC, SC), Mt (NC, VA): dunes and interdune swales with abundant shell hash, calcareous woodlands and thickets; rare (NC Watch List, VA Rare). July-September. Se. VA south to 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; < *C. ligusticifolia* Nuttall – RAB, misapplied; > *C. catesbyana* – S; > *C. micrantha* Small – S]

Clematis coactilis (Fernald) Keener, Virginia White-haired Leatherflower. Mt (VA): shale barrens, shaly woodlands, dry calcareous barrens and woodlands; rare (VA Rare). May-June. Endemic to w. VA (Botetourt, Craig, Giles, Montgomery, Pulaski, Roanoke, and Wythe counties). [= C, FNA, K, W; = *C. albicoma* Wherry var. *coactilis* Fernald – F; = *Coriflora species 1*]

Clematis crispa Linnaeus, Marsh Clematis, Southern Leatherflower, Blue Jasmine. Cp, Pd (GA, NC, SC, VA), Mt (GA): marshes, swamps, disturbed wet or moist areas; common (rare in VA, rare in Piedmont) (VA Watch List). 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; = *Viorna crispa* (Linnaeus) Small – S; = *Coriflora crispa* (Linnaeus) W.A. Weber]

Clematis fremontii S. Watson. Mt (GA): prairies; rare. MO, KS, and NE; disjunct in nw. GA. See Anonymous (2003) for additional information. [= FNA, K; = *Coriflora fremontii* (S. Watson) W.A. Weber]

Clematis glaucophylla Small, White-leaved Leatherflower. Mt (GA, VA?), Pd, Cp (GA): habitat in our area poorly known, the species not recently seen here, probably in dry woodlands or openings over calcareous rocks, according to RAB in "rich woods"; rare (VA Rare). May-September. Widespread in Southeastern United States, from se. TN and OK, south to FL 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; = *Viorna glaucophylla* (Small) Small – S; = *Coriflora glaucophylla* (Small) W.A. Weber]

Clematis occidentalis (Hornemann) Augustin de Candolle *var. **occidentalis***, Purple Clematis, Mountain Clematis. Mt (NC, VA): rocky slopes over mafic rocks (greenstone, amphibolite), known positively in NC only from Bluff Mountain, Ashe County; rare (NC Rare, VA Watch List). May-June. Var. *occidentalis* is widespread in ne. North America, from New Brunswick west to w. Ontario, 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; < *C. verticillaris* Augustin de Candolle – RAB, G; < *C. occidentalis* – C, W; > *C. verticillaris* var. *verticillaris* – F; > *C. verticillaris* Augustin de Candolle var. *cacuminis* Fernald – F; < *Atragene americana* Sims – S]

Clematis ochroleuca Aiton, Curlyheads. Pd (GA, NC, SC, VA), Mt (GA, NC, VA), Cp (NC, SC, VA): dry woodlands and woodland borders, generally over mafic or calcareous rocks, such as diabase, gabbro, or calcareous siltstone; uncommon (rare in Mountains and Coastal Plain). April-June. Primarily Piedmont: NY south to ec. GA. [= RAB, C, F, FNA, G, K, W; = *Viorna ochroleuca* (Aiton) Small – S; = *Coriflora ochroleuca* (Aiton) W.A. Weber]

Clematis reticulata Walter. Cp (GA, SC), Pd (GA), Mt? (GA?): dry, sandy woodlands, such as longleaf pine sandhills and dry hammocks; uncommon. May-August. Se. SC south to FL, west to TX, and north in the interior to TN and AR. [= RAB, FNA, K; = *Viorna reticulata* (Walter) Small – S; = *Coriflora reticulata* (Walter) W.A. Weber]

Clematis socialis Kral, Alabama Leatherflower. Mt (GA): bottomlands; rare (US Endangered, GA Endangered). Nw. GA (Floyd Co.) and ne. AL (St. Clair and Cherokee counties). Timmerman-Erskine & Boyd (1999) report on reproductive ecology of this endangered species. [= FNA, K]

* ***Clematis terniflora*** Augustin de Candolle, Sweet Autumn Clematis, Yam-leaved Clematis. Mt (NC, VA), Pd, Cp (GA, NC, SC, VA): disturbed areas; uncommon, introduced from e. Asia (Japan, China, Korea). July-September. [= C, FNA, GW, K, W; *? C. dioscoreifolia* Léveillé & Vaniot – RAB; > *C. dioscoreifolia* Léveillé & Vaniot var. *robusta* Carrière & Rehder – F; *? C. paniculata* Thunberg – S; *? C. maximowicziana* Franchet & Savatier]

Clematis viorna Linnaeus, Northern Leatherflower, Vase-vine. Mt, Pd, Cp (GA, NC, SC, VA): mesic forests, woodlands, thickets, especially over mafic rocks; common (rare in Coastal Plain south of VA). May-September. Widespread in

Southeastern United States, north to PA, IL, and MO. [= RAB, C, F, FNA, G, K, W; > *Viorna viorna* (Linnaeus) Small – S; > *Viorna beadlei* Small – S; > *Viorna flaccida* (Small) Small – S; > *Coriflora viorna* (Linnaeus) W.A. Weber; > *Coriflora beadlei* (Small) W.A. Weber]

Clematis virginiana Linnaeus, Virgin's-bower. Mt, Pd, Cp (GA, NC, SC, VA): moist forests, thickets, and openings; common (rare in Coastal Plain south of VA). July-September. Widespread in e. North America. 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 viticaulis Steele, Millboro Leatherflower. Mt (VA): shale barrens and shaly woodlands; rare (US Species of Concern, VA Rare). May-June. Endemic to w. VA (Augusta, Bath, and Rockbridge counties). [= C, F, FNA, G, K, W; = *Coriflora viticaulis* (Steele) 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 pitcheri Torrey & A. Gray var. *pitcheri,* Bellflower Leatherflower, ranges east to nc. TN (Chester, Wofford, & Kral 1997) and KY (Kartesz 1999). [= FNA, K; < *Viorna pitcheri* (Torrey & A. Gray) Britton – S]

Clematis versicolor Small ex Rydberg, Pale Leatherflower. Sc. KY, c. TN, nc. AL; Ozarks and Ouachitas of s. MO, n. and c. AR, and e. OK. [= FNA, K; *Viorna versicolor* (Small ex Rydberg) Small – S; = *Coriflora versicolor* (Small ex Rydberg) W.A. Weber]

* *Clematis viticella* Linnaeus, native to Europe, has been reported for TN (Pringle in FNA 1997). [= FNA, K; *Viticella viticella* (Linnaeus) Small] {not keyed at this time}

Other species of *Clematis*, of Asian or European origin, are cultivated as ornamentals.

Consolida (Augustin 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 with 5 or more lobes; inflorescence an elongate or compound raceme; pistil densely pubescent; follicle 12-25 mm long..... ***C. ajacis***
1 Lower bracts of the inflorescence unlobed or the lowermost with 3 lobes; inflorescence a corymbiform raceme; pistil glabrous; follicle 8-17 mm long..... ***C. regalis***

* ***Consolida ajacis*** (Linnaeus) Schur, Rocket Larkspur. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): roadsides, fields, waste places, disturbed ground; common, introduced from Europe. [= FNA, K; = *Delphinium ajacis* Linnaeus – RAB, F, G, S; = *Delphinium ambiguum* Linnaeus – C; = *Consolida ambigua* (Linnaeus) P.W. Ball & Heywood in Heywood & P.W. Ball – W]

* ***Consolida regalis*** S.F. Gray, Rocket Larkspur, Forking Larkspur. Cp (NC): disturbed areas; rare, introduced from Europe. Also known from DC and to be expected in VA. [= FNA, K; = *Delphinium consolida* Linnaeus – C, G, S]

* *Consolida pubescens* (de Candolle) Soó is naturalized in s. TN (Warnock in FNA 1997). [= FNA, K] {not keyed at this time}

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. Mt (NC): bogs; rare (NC Rare). May-June. The species ranges from Greenland west to AK, south to NJ, nw. NC, n. IN, IA, and British Columbia; 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. The species is distinctive, with neatly trifoliolate leaves, small white flowers on scapes, and yellow roots. [= C; = *C. groenlandica* (Oeder) Fernald – F; = *C. trifolia* ssp. *groenlandica* (Oeder) Hultén – G; < *C. trifolia* – FNA, K, S]

Delphinium Linnaeus 1753 (Larkspur)
(also see *Consolida*)

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).

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. Mt (GA): limestone prairies and glades; rare. Endemic to c. and n. AL and nw. GA. [= FNA, K]

Delphinium carolinianum Walter ***ssp. calciphilum*** M.J. Warnock, Glade Larkspur. Mt (GA): limestone glades; rare (GA Special Concern). 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. Pd, Cp (GA, SC): rocky woodlands, granite outcrops, Altamaha Grit outcrops, blackland prairies, moist sandy woodlands associated with longleaf pine; rare (GA Watch List, SC Rare). May-July. IL west to MO, south to LA and TX, with disjunct occurrences eastward in SC, GA, 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, Z; < ***D. carolinianum*** var. ***carolinianum*** – F; < ***D. carolinianum*** – S]

Delphinium exaltatum Aiton, Tall Larkspur. Mt (NC, VA), Pd (NC): 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; rare (US Species of Concern, NC Endangered, VA Watch List). 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, Z]

Delphinium tricorne Michaux, Dwarf Larkspur. Mt (GA, NC, {SC}, VA), Pd, Cp (NC, VA): rich, moist forests, especially over mafic or calcareous rocks, less commonly (as along the Roanoke River in ne. NC) on very fertile alluvial deposits; uncommon (rare in Piedmont and Coastal Plain) (GA Special Concern). 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, Z]

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 controversial; I here follow Keener (1977). References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993); Keener (1977).

Identification notes: *Enemion* is superficially similar to the much more common *Anemonella 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. Pd (NC, SC, VA), Cp (NC): rich forests, either on natural levees with very nutrient rich sediments or on slopes with underlying mafic rocks; rare (NC Rare, VA Rare, SC Rare). March-April; May. Fairly widespread in e. North America, primarily west of the Appalachians, from w. NY, s. Ontario and MN south to TN and AR; disjunct in the Piedmont and Coastal Plain of VA, NC, and SC and the Coastal Plain of FL. [= FNA, K; = *Isopyrum biternatum* (Rafinesque) Torrey & Gray – RAB, C, F, G, S]

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 (NC): cultivated in gardens, rarely persisting or escaped; rare, native of Eurasia. January-March. [= F, FNA, G, K]

Ficaria Schaeffer 1760 (Lesser Celandine)

Best treated as a genus separate from *Ranunculus*, based on morphology and molecular phylogenetics; *Myosurus* is more closely related to *Ranunculus* than is *Ficaria* (Paun et al. 2005). References: Paun et al. (2005).

* ***Ficaria verna*** Hudson, Lesser Celandine, Pilewort. Pd (NC, VA), Cp (VA): disturbed rich forests and bottomlands, mesic suburban forests, lawns, naturalized locally from horticultural plantings; rare, introduced from Europe. First reported for NC by Krings et al. (2005). [= *Ranunculus ficaria* Linnaeus – C, F, FNA, G, Y; > *R. ficaria* var. *bulbifera* Marsden-Jones – K]

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).

* ***Helleborus viridis*** Aiton, Green Hellebore, Christmas-rose. Mt (VA), Pd (NC): cultivated in gardens, seeding down, rarely escaped or persistent; rare, introduced from Europe. December-May. This plant has fallen somewhat out of horticultural favor. [= C, F, FNA, G, K, S]

Hepatica
(see *Anemone*)

Isopyrum
(see *Enemion*)

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. Pd (NC, SC, VA), Cp (NC, VA), {GA}: usually in disturbed areas, such as fields in floodplains; uncommon. 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. [= RAB, C, F, FNA, G, GW, K, S; > *M. minimus* ssp. *minimus* – Z]

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. Mt (VA): cultivated in gardens, rarely persistent or escaping; rare, native of s. Europe. [= C, F, FNA, G, K]

Ranunculus Linnaeus 1753 (Buttercup, Crowfoot, Spearwort)
(also see *Ficaria*)

A genus of about 600 species, perennial and annual herbs, nearly cosmopolitan (most diverse in temperate and boreal regions of the Northern Hemisphere). The seven subgenera are distinctive and have often been recognized at the generic level; three are represented in our area. 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.

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 1.5-3 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 cm long; sepals 1.5-3 mm long; achene beak 0.1-0.3 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 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***
  2 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; achene beak strongly hooked, 0.5-1.2 mm long ..... ***R. recurvatus*** *var*. ***recurvatus***
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.
2 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].
3 Stems repent, rooting at the nodes. ..... ***R. repens***
3 Stems erect, not rooting at the nodes.
4 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*]**
4 Petals 8-16 mm long; plant a cormose or hard-based perennial; achene face truly smooth.
5 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***
5 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***
2 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].
6 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***
6 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].
7 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***
7 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).
8 Plants repent; aerial shoots 50-80 (-91) cm long at time of fruiting; [generally of swamps and marshes] ..... ***R. caricetorum***

8 Plants erect; aerial shoots 14-45 (-60) cm long at time of fruiting; [generally of upland habitats]..... ..... ***R. hispidus***

Ranunculus abortivus Linnaeus, Kidneyleaf Buttercup. Mt, Pd, Cp (GA, NC, SC, VA): low fields, disturbed areas, bottomlands, lawns, roadsides; common (uncommon in Coastal Plain south of VA). (February-) March-June. Labrador to AK, south to FL, TX, and CO. A common weed in shady and sunny places. [= RAB, FNA, GW, K, S, W, Y; > ***R. abortivus*** var. *abortivus* – C, F, G; > ***R. abortivus*** var. *indivisus* Fernald – F]

* ***Ranunculus acris*** Linnaeus, Tall Buttercup, Bitter Buttercup. Mt, Pd (GA, NC, VA), Cp (NC, SC, VA): pastures, fields, roadsides, disturbed areas; common (uncommon in Piedmont, rare in Coastal Plain), introduced from Europe. May-August. [= RAB, C, F, FNA, G, GW, S, W, Y; > ***R. acris*** var. *acris* – K]

Ranunculus allegheniensis Britton, Allegheny Buttercup, Mountain Crowfoot. Mt (NC, VA, SC?), Pd (VA): cove forests, rich forested slopes; uncommon (rare in Piedmont). 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, Y]

Ranunculus ambigens S. Watson, Water-plantain Crowfoot, Water-plantain Spearwort. Cp, Pd (NC, VA), Mt (VA): marshes; rare (NC Rare, VA Watch List). April-June. ME west to MN, south to VA, NC, ne. TN, w. TN, and LA. [= RAB, C, F, FNA, G, GW, K, W, Y; = ***R. obtusiusculus*** Rafinesque – S]

* ***Ranunculus arvensis*** Linnaeus, Corn Crowfoot, Hungerweed. Pd (GA, NC, SC), Mt (NC): fields, disturbed areas; rare, introduced from Europe. April-June. [= C, FNA, G, GW, K, X, Y; > ***R. arvensis*** var. *arvensis* – RAB; > ***R. arvensis*** var. *tuberculatus* (Augustin de Candolle) Koch – RAB]

* ***Ranunculus bulbosus*** Linnaeus, Bulbous Buttercup. Cp (NC, SC, VA), Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common (rare in SC), introduced from Europe. April-June. [= RAB, C, FNA, GW, K, S, W, 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. Pd, Cp, Mt (VA): swampy forests and marshes; rare. April-August. New Brunswick west to s. Manitoba, 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 Augustin de Candolle. Cp, Pd, Mt (GA, NC, SC, VA): swamp forests, wet woodlands, open marshy wetlands; uncommon. April-August. NY west to s. Ontario, WI, and MN, south to n. peninsular FL, LA, and e. TX. This species is tetraploid (n = 16). [= RAB, F, G, GW, W, 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. Pd (GA, NC, SC, VA), Mt (GA, NC, VA), Cp (GA): 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; rare (NC Watch List, SC Rare). March-June. MA and NY west to s. Ontario, MN, and se. Manitoba, 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. Cp (NC, VA): pools in floodplains of small stream swamps, other stagnant or slowly moving waters; rare (NC Rare, VA Watch List). March-May. ME west to British Columbia, 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 hederaceus Linnaeus, Ivy-leaved Water Crowfoot. Longstalked Crowfoot. Cp (NC, SC, VA), Mt (VA): coastal brackish marshes, other circumneutral marshes; rare (NC Rare, VA Rare). April-June. Se. PA south to SC on the Coastal Plain; disjunct in Newfoundland; also in Europe. [= RAB, C, F, FNA, G, GW, K, Y]

Ranunculus hispidus Michaux, Hispid Buttercup, Hairy Buttercup. Mt, Pd (GA, NC, SC, VA), Cp (GA, VA): rich moist forests, creekbanks, mesic to dry woodlands and forests, bottomlands; common. March-June. MA and VT west to s. Ontario, n. IL, and se. KS, south to 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; > ***R. hispidus*** var. *falsus* Fernald – F; > ***R. hispidus*** var. *marilandicus* (Poiret) L. Benson – G; > ***R. hispidus*** var. *eurylobus* L. Benson – F, G]

Ranunculus laxicaulis (Torrey & A. Gray) Darby, Coastal Plain Spearwort. Cp (GA, NC, SC, VA), Pd (GA): marshes; rare (NC Watch List, VA Rare). 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. Mt, Pd (VA): submerged in streams; rare (VA Rare). Sw. Québec west to Saskatchewan, ID, and OR, south to DE, VA, KY, nc. TN, AL, AR, TX, NM, and AZ. [= C, F, GW, K, Y; < ***R. aquatilis*** Linnaeus var. *diffusus* – FNA; *? R. circinatus* Sibthorp – G; *? Batrachium trichophyllum* – S, misapplied]

Ranunculus micranthus Nuttall, Small-flowered Buttercup, Rock Buttercup. Pd (NC, VA), Mt, Cp (VA), {GA?}: rich forests; uncommon (rare south of VA) (NC Rare). 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, Y; > ***R. micranthus*** var. *micranthus* – F; > ***R. micranthus*** var. *delitescens* (Greene) Fernald – F]

* ***Ranunculus muricatus*** Linnaeus. Pd (GA, SC), Cp (SC): ditches and marshes; rare, introduced from Europe. April-June. [= RAB, FNA, GW, K, S, X, Y]

* ***Ranunculus parviflorus*** Linnaeus, Small-flowered Buttercup, Stickseed Crowfoot. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas; common (rare in Mountains), introduced from Europe. February-July. [= RAB, C, F, FNA, G, GW, K, S, W, X, Y]

* ***Ranunculus platensis*** Sprengel. Pd (NC), Cp (GA): lawns, ditches; rare, introduced from South America. [= FNA, GW, K, X, Y]

Ranunculus pusillus Poiret, Low Spearwort. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, VA): marshes, ditches, other wet habitats; common (uncommon in Mountains). April-June. S. NY south to FL, west to TX, north in the interior to OH, IN, and MO. [= RAB, C, F, FNA, G, GW, S, W, Y; > *R. pusillus* var. *pusillus* – K]

Ranunculus recurvatus Poiret *var.* ***recurvatus***, Hooked Buttercup, Hooked Crowfoot. Mt, Pd, Cp (GA, NC, SC, VA): bottomland forests, cove forests, swamps, mesic slope forests; common. April-June. ME and Québec 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; > *R. recurvatus* var. *adpressipilis* Weatherby – F]

* ***Ranunculus repens*** Linnaeus, Creeping Buttercup, Meg-many-feet. Mt, Pd (NC, VA), Cp (NC, SC, VA): low meadows, disturbed areas; uncommon, introduced from Europe. [= RAB, FNA, G, GW, K, S, W, Y; > *R. repens* var. *repens* – C, F; > *R. repens* var. *degeneratus* Schur – C; > *R. repens* var. *glabratus* Augustin de Candolle – C, F; > *R. repens* var. *pleniflorus* Fernald – F]

* ***Ranunculus sardous*** Crantz, Sardinian Buttercup, Hairy Buttercup. Cp, Pd (GA, NC, SC, VA), Mt (GA, VA): low fields, disturbed areas; uncommon, introduced from Europe. April-July. [= RAB, C, F, FNA, G, GW, K, X, Y]

Ranunculus sceleratus Linnaeus *var.* ***sceleratus***, Cursed Buttercup, Celery-leaf Crowfoot. Cp (GA, NC, SC, VA), Pd (NC, VA), Mt (VA): marshes, ditches, and stream margins; common (uncommon south of VA). 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. Cp, Mt, Pd (VA), {NC?}: submerged in water of acidic streams; rare (NC Rare, VA Rare). *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* – Y; *R. aquatilis* Linnaeus var. *capillaceus* (Thuill.) Augustin de Candolle – G; *Batrachium flaccidum* (Persoon) Ruprecht – S]

* ***Ranunculus trilobus*** Desfontaines. Cp (SC): fields, roadsides, ditches; rare, introduced from sw. Europe. [= FNA, K, X, Y]

Ranunculus harveyi (A. Gray) Britton var. *harveyi*, east to e. TN and AL. [= FNA, K] {synonymy incomplete}

Ranunculus macounii d'Urv., occurs in WV (Kartesz 1999). {investigate} [= K] {not keyed at this time; synonymy incomplete}

Ranunculus pensylvanicus Linnaeus f., Bristly Buttercup, ranges south to s. PA (Rhoads & Klein 1993), DE, DC, and MD (Whittemore in FNA 1997). [= FNA, K] {synonymy incomplete}

Thalictrum Linnaeus 1753 (Meadow-rue)
(also see *Anemonella*)

A genus of about 330 species, perennial herbs, of Eurasia, North America, South America, and Africa. References: Park & Festerling in FNA (1997); Park (1992)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993).

1 Flowers perfect; fruit scimitar-shaped; [section *Physocarpum*].
- 2 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] ..... ***Th. clavatum***
- 2 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]..... ***[Th. mirabile]***

1 Flowers unisexual (rarely a few bisexual); fruits not scimitar-shaped.
- 3 Leaflets of the stem leaves linear to narrowly lanceolate, oblanceolate or elliptic, (3-) 5-10 (-25)× as long as wide; [section *Leucocoma*] ..... ***Th. cooleyi***
- 3 Leaflets of the stem leaves ovate, obovate, or suborbicular, 0.7-3 (-5)× as long as wide.
  - 4 Most of the leaflets with (3-) 4-6 (-9) lobes or teeth; [section *Heterogamia*].
    - 5 Cauline leaf subtending the lowest flowering branch sessile; plant flowering May-July; achenes borne on a 0.7-2.5 mm long stipe..... ***Th. coriaceum***
    - 5 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.
      - 6 Largest leaflets < 15 mm wide; stems 10-40 cm tall, reclining ..... ***Th. debile***
      - 6 Largest leaflets > 15 mm long; stems 30-80 cm tall, erect ..... ***Th. dioicum***
  - 4 Most of the leaflets with 1-3 (-5) lobes or teeth; [section *Leucocoma*].

7 Leaflet undersurfaces, peduncles, and achenes with stipitate glands or papillae.
8 Anthers 0.5-1.2 mm long; stigmas 0.6-2.2 mm long ..... ***Th. pubescens* var. *hepaticum***
8 Anthers 1.5-2.8 mm long; stigmas (1.5-) 2.0-3.5 mm long ..... ***Th. revolutum***
7 Leaflet undersurfaces, peduncles, and achenes glabrous or pubescent, lacking both stipitate glands and papillae.
9 Leaflet undersurfaces, peduncles, and achenes finely pubescent..... ***Th. pubescens* var. *pubescens***
9 Leaflet undersurfaces, peduncles, and achenes glabrous.
10 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)..... ***Th. macrostylum***
10 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).
12 Anthers 0.5-1.2 mm long; stigmas 0.6-2.2 mm long ..... ***Th. pubescens* var. *hepaticum***
12 Anthers 1.5-2.8 mm long; stigmas (1.5-) 2.0-3.3 mm long..... ***Th. revolutum***

Thalictrum clavatum Augustin de Candolle, Lady-rue, Mountain Meadowrue. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp? (VA?): seepages, moist forests, spray cliffs at waterfalls, brookbanks; common, rare in Piedmont (rare in Coastal Plain, if record is valid). 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]

Thalictrum cooleyi Ahles, Cooley's Meadowrue, Savanna Meadowrue. Cp (GA, NC): 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*; rare (US Endangered, GA Endangered, NC Endangered). 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 in the genus, 2n = 210, a ploidy level of 30x compared to the base chromosome level of 7 in *Thalictrum*. [= RAB, FNA, GW, K, Z]

Thalictrum coriaceum (Britton) Small, Appalachian Meadowrue, Maid of the Mist. Mt (GA, NC, SC, VA), Pd (VA): rich forests; uncommon, rare in Piedmont (GA Rare). 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; > *Th. coriaceum* – C, F, G, W, in a narrower sense; > *Th. steeleanum* B. Boivin – C, F, G, W; > *Th. coriaceum* – S; > *Th. caulophylloides* Small – S]

Thalictrum debile Buckley, Trailing Meadowrue. Mt (GA): moist to wet forests over limestone; rare (GA Threatened). Nw. GA west to e. MS. [= FNA, GW, K, S]

Thalictrum dioicum Linnaeus, Early Meadowrue. Mt, Pd (GA, NC, SC, VA), Cp (VA): seepages, moist forests; common, rare in Coastal Plain. ME, Québec, and MN south to SC, c. GA, AL, and MO. [= RAB, C, F, FNA, G, GW, K, S, W]

Thalictrum macrostylum Small & Heller, Small-leaved Meadowrue. Cp, Pd, Mt (GA, NC, SC, VA): moist places, perhaps associated with circumneutral soils, moist to dry ultramafic outcrop barrens (over olivine), tidal freshwater marshes; rare (GA Rare [*Th. subrotundum*], NC Watch List, VA Rare). May-August. Se. VA south and west through NC, SC, sc. GA, FL, and AL to MS. [= C, F, FNA, G, GW, K, S, Z; > *Th. macrostylum* – RAB; > *Th. subrotundum* B. Boivin – RAB]

Thalictrum pubescens Pursh *var.* ***hepaticum*** (Greene) Keener, Appalachian Tall Meadowrue. Mt (GA, NC): seepage areas; rare (NC Watch List). 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. [= W; < *Th. polygamum* Muhlenberg ex Sprengel – RAB, F, G, S, nomen nudum; < *Th. pubescens* – C, GW, K; < *Th. revolutum* – FNA]

Thalictrum pubescens Pursh *var.* ***pubescens***, Common Tall Meadowrue, Late Meadowrue, King-of-the-meadow. Mt, Pd (NC, VA), Cp (NC, SC, VA), {GA}: bogs, marshes, wet forests; common, rare in Piedmont and Coastal Plain south of VA. May-July. Labrador, Newfoundland, and Ontario south to GA, SC and MS. [= W; < *Th. polygamum* Muhlenberg ex Sprengel – RAB, F, G, S, nomen nudum; < *Th. pubescens* – C, GW, K, Z; < *Th. pubescens* – FNA]

Thalictrum revolutum DC, Skunk Meadowrue. Mt, Pd (GA, NC, SC, VA), Cp (GA, NC, VA): mesic to dry forests, woodlands, and barrens, over hornblende, greenstone, dolostone, and serpentinized olivine; common, rare in Coastal Plain south of VA. May-July. Québec and Ontario 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; < *Th. revolutum* – FNA]

Thalictrum dasycarpum Fischer & Avé-Lallemant, Purple Meadowrue. Québec and Yukon 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 our area; substantiation is needed. [= FNA, K] {not keyed at this time; synonymy incomplete}

Thalictrum mirabile Small is a delicate relative of *Th. clavatum*, occurring on wet sandstone cliffs primarily in the Cumberland Plateau (and especially associated with sandstone rockhouses), from KY south through TN to n. AL and nw. GA (and additionally cited in FNA as occurring in w. NC). The inflorescence appears sparser because of the shorter and narrower achenes borne on longer stipes. [= FNA, GW, K, S]

Trautvetteria Fischer & C.A. Meyer 1835 (Tassel-rue)

A monotypic genus, a perennial herb, disjunctly distributed in temperate to boreal e. North America, w. North America, and Japan (or sometimes treated as 2-3 species). *Trautvetteria* is very closely related to some parts of *Ranunculus* (Johansson 1998). References: Parfitt in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993); Johansson (1998).

Trautvetteria caroliniensis (Walter) Vail *var. **caroliniensis***, Tassel-rue, False Bugbane. Mt, Pd (GA, NC, SC, VA), Cp (GA, NC, SC): streambanks, seepages, grassy balds, moist forests, swamp forests, very rarely in calcareous longleaf pine savanna ecotones; common, uncommon in Piedmont, rare in Coastal Plain (SC Rare). Late May-July. The genus is monotypic, the single species distributed disjunctly as follows: 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), IN, IL, and MO [var. *caroliniensis*], in w. North America from s. British Columbia south to CA, AZ, and NM [var. *borealis* (H. Hara) T. Shimizu], and in Japan [var. *japonica* (Siebold & Zuccarini) T. Shimizu]. The varieties are poorly differentiated morphologically and may not warrant recognition. 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 been destroyed by intensive silvicultural practices. [= K; < *T. caroliniensis* – RAB, C, F, FNA, G, GW, S, W]

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 stems usually about knee-high and unbranched, the rhizomes with a bright yellow, bitter-tasting alkaloid.

Xanthorhiza simplicissima Marshall, Yellowroot, Brook-feather. Mt, Pd, Cp (GA, NC, SC, VA): streambanks and riverbanks; common (uncommon in Coastal Plain, and essentially absent from VA north of the James River). 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; = *Xanthorrhiza simplicissima* – S, orthographic variant]

RESEDACEAE DC. ex Gray 1821 (Mignonette Family)

A family of about 6 genera and 75-80 species, herbs and shrubs, of the northern hemisphere. References: Kubitzki in Kubitzki & Bayer (2003).

Reseda Linnaeus 1754 (Mignonette)

A genus of about 55-60 species, herbs, of Europe, Mediterranean region, and c. Asia.

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 odorata*** Linnaeus, Garden Mignonette. Cp (SC), Pd (NC): gardens, garden borders, and disturbed areas; rare, doubtfully established, introduced from Mediterranean Europe. Reported for scattered locations in eastern North America (Kartesz 1999). [= C, G, K]

* *Reseda alba* Linnaeus, White Mignonette, is introduced from the Mediterranean region to ne. United States, south to DE and se. PA (Rhoads & Klein 1993). [= C, F, G, K]
* *Reseda lutea* Linnaeus, Yellow Mignonette, Wild Mignonette, is introduced from Europe to the ne. United States, south to DE, se. PA, and sc PA (Rhoads & Klein 1993). [= C, F, G, K]
* *Reseda luteola* Linnaeus, Weld, Dyer's Rocket, Yellow-weed, formerly cultivated as a die plant, is reported from se. and sc. PA (Rhoads & Klein 1993). [= C, F, G, K]
* *Reseda phyteuma* Linnaeus, Corn Mignonette, introduced from Europe, is reported from se. PA (Rhoads & Klein 1993). [= K]

RHAMNACEAE A.L. de Jussieu 1789 (Buckthorn Family)

A family of about 50-52 genera and 900-925 species, mostly trees, shrubs, and lianas, cosmopolitan in distribution. References: Bricicky (1964a)=Z; Richardson et al. (2000a, 2000b); Medan & Schirarend in Kubitzki (2004).

1 Plant a vine; [tribe *Rhamneae*] ..... ***Berchemia***
1 Plant a shrub or small tree.
  2 Leaves with 3 prominent veins from near the base.
    3 Plants not spiny; fruit dry, capsular; [native]; [tribal placement uncertain] ..... ***Ceanothus***
    3 Plants armed with stipular spines; fruit pulpy; [alien, cultivated and escaped]; [tribe *Paliureae*] ..... ***Ziziphus***
  2 Leaves with prominently pinnate venation, the lowermost lateral veins no more prominent than others.
    4 Leaves opposite, 2-4 cm long; [of shell middens and shell hammocks in the outer Coastal Plain of NC and SC]; [tribe *Rhamneae*] ..... ***Sageretia***
    4 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].
      5 Inflorescence repeatedly branched dichotomously; peduncles fleshy and reddish in fruit; nectariferous disc pubescent; [tribe *Paliureae*] ..... ***Hovenia***
      5 Inflorescence not repeatedly branched dichotomously; peduncles not fleshy; nectariferous disc glabrous; [tribe *Rhamneae*].
        6 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***
        6 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: Bricicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

Identification notes: The young stems are shining and reddish, the bark on older stems is medium gray and smooth (though often marred by sap wells drilled by Yellow-bellied Sapsuckers). Larger stems can reach 10 cm in diameter. The smooth bark and neatly pinnately-veined leaves are distinctive.

Berchemia scandens (Hill) K. Koch, Supplejack, American Rattan. Cp (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. [= RAB, C, F, G, GW, K, S, Z]

Ceanothus Linnaeus 1753 (Redroot, New Jersey Tea)

A genus of ca. 55 species, shrubs, mostly in California. References: Fross & Wilken (2006)=X; Coile (1988)=Y; Bricicky (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. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): woodland borders, dry woodlands, glady openings, dry ridge forests and woodlands (pine or oak) in the Mountains; common. May-June; June-July. ME west to s. Manitoba, south to FL and TX. [= C, F, G, X, Y, Z; < *C. americanus* – RAB, K, S, W; = *C. americanus* – S]

Ceanothus americanus Linnaeus *var.* ***intermedius*** (Pursh) Torrey & A. Gray, Southern New Jersey Tea. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): sandhills, dry sandy woodlands and forests, rocky openings around granitic or quartzitic rocks in the Piedmont; common. May-June; June-July. NJ (or possibly MA) south to 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* – RAB, K, S, W; = *C. intermedius* Pursh – S]

Ceanothus herbaceus Rafinesque, Prairie Redroot. Pd (VA?): flood-scoured rocky riverbanks; rare. April-May. Primarily midwestern: MI west to MT, south to nw. IN, AR, TX, and Mexico; disjunct eastward in Québec, NH, VT, NY, MD, WV, 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 and MD. [= 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. Cp (GA): sandhills; common. E. GA, FL, and 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. [= K, S, X, Y, Z]

Frangula P. Miller 1754 (Buckthorn)

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: 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. Mt (NC), Pd (VA): forested area along Blue Ridge Parkway; rare, introduced from 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. [= K; = *Rhamnus frangula* Linnaeus – C, F, G]

Frangula caroliniana (Walter) A. Gray, Carolina Buckthorn. Mt (GA, NC, SC, VA), Pd (GA, NC, SC), Cp (GA, SC): dry to moist barrens, woodlands, and forests, Coastal Plain limestone bluffs and shell middens, especially over mafic or calcareous rocks; rare (NC Watch List). May-June. Sw. VA west to s. OH and s. MO, south to FL and TX. [= K; = *Rhamnus caroliniana* Walter – RAB, S, W; > *Rhamnus caroliniana* Walter var. *caroliniana* – C, F, G, Z]

Hovenia Thunberg 1781 (Raisin-tree)

A genus of 7 species, trees, of e. Asia. References: Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

* ***Hovenia dulcis*** Thunberg, Japanese Raisin-tree. Pd (NC): escaped from cultivation to suburban woodlands; rare, introduced from China. Goldman (1998) presents a discussion of this species' introduction into North America, with a color photograph. [= RAB, K, Z]

Rhamnus Linnaeus 1753 (Buckthorn)
(also see *Frangula*)

The recognition of *Frangula* as separate from *Rhamnus* is supported by molecular phylogeny (Bolmgren & Oxelman 2004). References: Brizicky (1964a)=Z; Bolmgren & Oxelman (2004); Medan & Schirarend in Kubitzki (2004).

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 ..... ***[Rh. 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 ..... ***Rh. 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].
  3 Sepals and stamens 5; petals 0; fruit with 3 stones; [of mafic or calcareous peaty wetlands and seeps] ..... ***Rh. 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 leves glabrous below .... ***Rh. lanceolata*** *var.* ***glabrata***
    4 Young leaves and young branches pubescent; mature leaves soft pubescent below .... ***Rh. lanceolata*** *var.* ***lanceolata***

Rhamnus alnifolia L'Héritier, Alder-leaved Buckthorn, American Alder-Buckthorn. Mt (VA): mafic or calcareous (dolomitic) seeps, usually with *Parnassia grandifolia*; rare (VA Rare). May-July. Newfoundland west to British Columbia, south to NJ, PA, w. VA, ne. TN (Chester, Wofford, & Kral 1997), OH, n. IN, n. IL, IA, and CA. [= C, F, G, K, W, Z]

* ***Rhamnus davurica*** Pallas, Dahurian Buckthorn. Pd (NC, VA): suburban woodlands, rarely naturalized; rare, introduced from e. Asia. Also reported from suburban areas near Louisville, KY, and Knoxville, TN (D. Estes, pers. comm..). [> *Rhamnus davurica* ssp. *??* – K; = ***Rh. citrifolia*** (Weston) W. Hess & Stearn – C]

Rhamnus lanceolata Pursh *var.* ***glabrata*** Gleason, Western Lance-leaved Buckthorn. Mt (VA): dry habitats over calcareous rocks; rare (VA Rare). 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; = ***Rh. lanceolata*** ssp. *glabrata* (Gleason) Kartesz & Gandhi – K; < ***Rh. lanceolata*** – S, W]

Rhamnus lanceolata Pursh *var.* ***lanceolata***, Eastern Lance-leaved Buckthorn. Mt (VA): dry to moist thickets over calcareous rocks; rare (VA Watch List). April-May. Var. *lanceolata* ranges from PA south to AL, mostly in the Appalachians. [= C, F, G, Z; = ***Rh. lanceolata*** ssp. *lanceolata* – K; < ***Rh. lanceolata*** – S, W]

* *Rhamnus cathartica* Linnaeus, Common Buckthorn. Reported for VA by Harvill et al. (1991), but the report is actually based on specimens of ***Rh. davurica*** (Virginia Botanical Associates 2005). {check sspp.} [= C, F, G, K, Z]

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 (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. Cp (GA, NC, SC): shell middens and shell hammocks; rare (GA Threatened, NC Rare, SC Rare). September; 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. [= RAB, K, S, Y, Z]

Ziziphus P. Miller 1754 (Jujube)

A genus of 85-100 species, shrubs and trees, of tropical and warm temperate areas. References: Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

* ***Ziziphus zizyphus*** (Linnaeus) Karsten, Chinese Jujube, Common Jujube. Pd (GA): {habitat}; rare, introduced, native of from Eurasia. Reported from ec. GA (Jones & Coile 1988). Cultivated at least as far north as NC. [= K; = *Zizyphus zizyphus* (Linnaeus) Karsten – S, orthographic variant; = ***Z. jujuba*** P. Miller – Z]

RHIZOPHORACEAE R. Brown 1814 (Red Mangrove Family)

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 (GA, NC, SC): beaches; rare. 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. Not truly a part of our flora, but repeatedly introduced naturally. [= GW, K, S]

ROSACEAE A.L. de Jussieu 1789 (Rose Family)
(also see *CHRYSOBALANACEAE*)

A family of about 85-95 genera and 2000-3000 species, trees, shrubs, and herbs, nearly cosmopolitan, but mainly boreal and temperate. References: Eriksson et al. (2003); Kalkman in Kubitzki (2004).

1 Herbs.
2 Leaves simple.
Aphanes
Dalibarda
Geum (Waldsteinia)
2 Leaves compound.
3 Leaves pinnately compound, with (5-) 7-many leaflets.
Agrimonia
Aruncus
Drymocallis
Filipendula
Geum
Sanguisorba
3 Leaves palmately compound, with 3-7 (-9) leaflets.
Fragaria
Gillenia
Potentilla
Sibbaldiopsis
Geum (Waldsteinia)
1 Trees or shrubs
2 Leaves compound.
3 Leaves palmately compound, with 3-5 leaflets.
4Rubus
4Sibbaldiopsis
3 Leaves pinnately compound, with 5-many leaflets.
5
5
Dasiphora
Rosa
Sorbaria
Sorbus
2 Leaves simple.
Amelanchier
Aronia
Chaenomeles
Crataegus
Cydonia
Exochorda
Kerria
Malus
Neviusia
Photinia
Physocarpus
Prunus
Pyracantha

Pyrus
Rhodotypos
Rubus
Spiraea
Stephanandra

Agrimonia Linnaeus (Agrimony)

A genus of about 10-15 species, herbs, mainly north temperate. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004).

1 Inflorescence axis glandular-pubescent (sometimes also with non-glandular hairs).
  2 Larger leaves with 11-15 (-23) primary leaflets (not counting the secondary leaflets); stamens 5-7 ..... ***A. parviflora***
  2 Larger leaves with 3-9 primary leaflets (not counting the secondary leaflets); stamens 10-15.
    3 Hypanthium 3-5 mm wide in fruit; nutlet 3-3.3 mm in diameter; inflorescence usually with copious long, spreading, non-glandular hairs ..... ***A. gryposepala***
    3 Hypanthium 2-2.5 mm wide in fruit; nutlet 2-2.4 mm in diameter; inflorescence usually with minute glandular hairs only (or sparsely pubescent with long non-glandular hairs] ..... ***A. rostellata***
1 Inflorescence axis pubescent with non-glandular hairs.
  4 Larger leaves with 3-5 (-7) primary leaflets (not counting the secondary leaflets) ..... ***A. microcarpa***
  4 Larger leaves with 5-13 primary leaflets (not counting the secondary leaflets).
    5 Terminal leaflets 1-2.5 (-3) cm long; [of pinelands of the Coastal Plain] ..... ***A. incisa***
    5 Terminal leaflets 2.5-9 cm long; [of various habitats].
      6 Larger leaves with 7-13 lanceolate-elliptic leaflets; outer bristles of the fruit spreading ..... ***A. bicknellii***
      6 Larger leaves with 5-7 (-9) obovate-elliptic leaflets; outer bristles of the fruit ascending ..... ***A. pubescens***

Agrimonia bicknellii (Kearney) Rydberg. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): moist forests and woodlands; uncommon? July-September; August-October. MA west to MI, south to NC, GA, and TN. Closely related to, and perhaps not separable from, *A. pubescens*. [= K, S, Z; < *A. pubescens* Wallroth var. *pubescens* – RAB; < *A. pubescens* – C, F, G]

Agrimonia gryposepala Wallroth, Common Agrimony. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): mesic forests, thickets, marshes, bogs, wet meadows, wet forests; common (GA Special Concern). July-August; July-October. ME and Ontario west to MT, south to NJ, w. NC, e. TN, IN, and KS; also in CA and NM. [= RAB, C, F, G, K, S, W, Z]

Agrimonia incisa Torrey & A. Gray, Pineland Agrimony. Cp (GA, NC?, SC): pinelands, disturbed areas associated with pinelands; rare (US Species of Concern, NC Watch List). July-early September. E. SC south to FL and west to MS (also reported from NC, but no specimen has been seen). [= RAB, C, K, S, Z]

Agrimonia microcarpa Wallroth, Low Agrimony. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): dry to moist forests and woodlands; uncommon. July-September; August-October. NJ south to FL, west to e. TX. [= C, F, G, K, S, W, Z; = *A. pubescens* Wallroth var. *microcarpa* (Wallroth) Ahles – RAB; > *A. microcarpa* – S; > *A. platycarpa* Wallroth – S]

Agrimonia parviflora Aiton, Southern Agrimony. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): marshes, bottomland forests, wet pastures; common. July-September; July-October. CT west to s. MI and SD, south to FL, TX, the West Indies and Mexico. [= RAB, C, F, G, K, S, W, Z]

Agrimonia pubescens Wallroth, Downy Agrimony. Mt (GA, NC, SC, VA), Pd, Cp (GA, NC, VA): dry to moist forests and woodlands; common. July-September; August-October. ME west to MI and SD, south to NC, GA, and OK. [= K, S, W, Z; < *A. pubescens* var. *pubescens* – RAB; < *A. pubescens* – C, F, G (also see *A. bicknellii*)]

Agrimonia rostellata Wallroth, Woodland Agrimony. Mt, Pd, Cp (GA, NC, SC, VA): moist to wet forests and woodlands; common. July-August; July-October. CT west to IN and KS, south to SC, GA, LA, and OK. [= RAB, C, F, G, K, S, W, Z]

* ***Agrimonia eupatoria*** Linnaeus, Medicinal Agrimony. Mt (NC): fields and disturbed areas; rare, apparently naturalized, introduced from Eurasia. July-September. Introduced at scattered localities in ne. North America. [= C, F, G, K, Z] {not keyed at this time}

Agrimonia striata Michaux, Roadside Agrimony. Pd (GA): {habitat unknown}; rare. South to se. PA (Rhoads & Klein 1993), MD, DE, WV, KY, Piedmont GA (Jones & Coile 1988), and AL. It will key to *A. bicknellii* in the above key, but differs in having the leaves conspicuously glandular and sparsely pubescent beneath (vs. densely velvety pubescent and not conspicuously glandular), the fruiting hypanthium 4-5 mm long (vs. 2.5-3 mm long). [= C, F, G, K] {not keyed at this time}

Alchemilla Linnaeus
(see *Aphanes*)

Amelanchier Medikus 1789 (Serviceberry, Sarvis, Shadbush, Juneberry, "May Cherry", "Currant")

A genus of about 20-40 species, shrubs and trees, north temperate. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004).

Amelanchier arborea (Michaux f.) Fernald. [= C, F, 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]

Amelanchier canadensis (Linnaeus) Medikus, Eastern Serviceberry. (GA, NC, SC, VA). [= RAB, C, G, GW, K, W; > *A. canadensis* var. *canadensis* – F, Z; > *A. canadensis* var. *subintegra* Fernald – F, Z; = *A. oblongifolia* (Torrey & A. Gray) Roemer – S]

Amelanchier laevis Wiegand, Smooth Serviceberry. (GA, NC, SC, VA). [= C, 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. In Potomac River Gorge, VA and MD (Chris Frye, pers. comm.), but may actually be a new species. See Dibble & Campbell (1995). [= F, K; *? A. canadensis* × *spicata* – C]

Amelanchier obovalis (Michaux) Ashe, Coastal Plain Serviceberry. (GA, NC, SC, VA). [= RAB, C, F, G, GW, K, Z]

Amelanchier sanguinea (Pursh) Augustin de Candolle *var.* ***sanguinea***, Roundleaf Serviceberry, New England Serviceberry. (GA, NC, VA). [= K; < *A. sanguinea* – RAB, F, S, W, Z; *A. sanguinea* var. *sanguinea* – C, G (also see *A. humilis*)]

Amelanchier stolonifera Wiegand, Dwarf Serviceberry. (GA, NC, SC, VA). [= F, K, S, W, Z; < *A. spicata* (Lamarck) K. Koch – C, G, misapplied as to North American material]

Amelanchier bartramiana (Tausch) M.J. Roemer. South to WV and PA. [= C, F, G, K] {synonymy incomplete}

Amelanchier humilis Wiegand. South to montane MD, NJ, and PA. [= K; < *A. sanguinea* var. *sanguinea* – C, G; > *A. humilis* var. *humilis* – F] {synonymy incomplete}

Aphanes Linnaeus (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) include it in *Alchemilla* based on molecular evidence. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004); Eriksson et al. (2003).

* ***Aphanes microcarpa*** (Boissier & Reuter) Rothmaler, Parsley-piert. Pd (GA, NC, SC, VA), Cp, Mt (NC, SC, VA): lawns, fields, pastures, roadsides; common (uncommon in Piedmont of VA and Mountains of NC and VA), introduced from Europe. Late April-May. This plant is inconspicuous and often overlooked. [= C, K; = *Alchemilla microcarpa* Boissier & Reuter – RAB, F, G, W, Z; > *Aphanes australis* Rydberg – S]

* *Aphanes arvensis* Linnaeus is 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 our region's flora without additional documentation. [= C, K; = *Alchemilla arvensis* (Linnaeus) Scopoli – F, G] {not keyed}

Argentina Hill
(see *Potentilla*)

Aronia Medicus 1789 (Chokeberry)

A genus of about 65 species, of e. Asia and 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. References: 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, Mt, Pd (GA, NC, SC, VA): bogs, pocosins, wet savannas, other wet habitats; common. March-May; September-November. Widespread in the Coastal Plain from Newfoundland south to

FL and west to TX, extending inland in the south to WV and KY. [= C, G, GW, S, W; = *Sorbus arbutifolia* (Linnaeus) Heynhold var. *arbutifolia* – RAB; = *Pyrus arbutifolia* (Linnaeus) Linnaeus f. – F, Z; = *Photinia pyrifolia* (Lamarck) K. Robertson & J.B. Phipps – K, X]

Aronia melanocarpa (Michaux) Elliott, Black Chokeberry. Mt (GA, NC, SC, VA), Pd (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, G, GW, S; = *Sorbus melanocarpa* (Michaux) Heynhold – RAB; = *Pyrus melanocarpa* (Michaux) Willdenow – F, Z; < *A. melanocarpa* – W (also see *A. prunifolia*); = *Photinia melanocarpa* (Michaux) J.B. Phipps – K, X]

Aronia prunifolia (Marshall) Rehder, Purple Chokeberry. Pd, Mt (NC, VA), Cp (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; = *Sorbus arbutifolia* var. *atropurpurea* (Britton) Schneider – RAB; = *Pyrus floribunda* Lindley – F, 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 1-2 species, perennial herbs, of temperate North America and Europe. References: 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..... ..... ***A. dioicus** var. **pubescens***

Aruncus dioicus (Walter) Fernald *var. **dioicus***, Eastern Goat's-beard. Mt (GA, NC, SC, VA), 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, K, Z; < *A. dioicus* – RAB, W; = *A. allegheniensis* Rydberg – S]

Aruncus dioicus (Walter) Fernald *var. **pubescens*** (Rydberg) Fernald, Midwestern Goat's-beard. Mt (VA): 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, 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 – K; = *A. aruncus* (Linnaeus) Karsten – S]

Chaenomeles Lindley 1821 (Flowering Quince)

A genus of 3-4 species, shrubs, of montane, temperate e. Asia. References: Kalkman in Kubitzki (2004).

* ***Chaenomeles speciosa*** (Sweet) Nakai, Flowering Quince. Pd (NC), Cp (VA): 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, 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; Lance (1995); Kalkman in Kubitzki (2004).

Identification notes: 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. margaretta***
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): upland hardwood and pine-hardwood forests, over sandstone, circumneutral clay soils, and calcareous substrates; uncommon (but may be locally abundant). April; September. Nw. GA and ne. AL. Related to *C. iracunda*, 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. [= 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 (though locally abundant). March-April; June-July. Se. NC south to n. FL and se. AL. The 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, which is actually *C. crus-galli*. Related species *C. rufula* Sargent and *C. opaca* Hooker & Arnott occur in the deeper south in similar habitats, *C. rufula* restricted to w. FL, sw. GA, and se. AL, and *C. opaca* ranging from s. MS west to e. TX and s. AR. See Phipps (1988) for extensive additional discussion of *C. aestivalis* and relatives. The fruits of all three species are traditionally gathered for preserves, pies, and jelly. [= RAB, K, X, Z; < *C. aestivalis* – S]

Crataegus alabamensis Beadle, Alabama Hawthorn. Pd, Cp (GA, NC, SC): sandhills, upland pine and pine-oak forests, rocky woodlands, especially xeric or subxeric habitats with sandy or well-drained clay soils; uncommon. April; August-September. C. and e. NC south to n. FL, west to n. AL and s. MS. Often reaching treelike proportions (4-8 m tall, trunk 10-30 cm diameter). Some local forms may produce palatable fruit to 22 mm in diameter. [= X; < *C. flava* Aiton – RAB, K, S; > *C. teres* Beadle – Q; > *C. attrita* Beadle – Q; > *C. clara* Beadle – Q; > *C. ravenelii* Sargent – Q; > *C. cuthbertii* Ashe]

Crataegus alleghaniensis Beadle. Mt, Pd (GA, NC, SC, GA), 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 and ne. MS. A variable species, displaying characteristics which suggest intermediacy between the complex of taxa involved in *C. intricata* Lange and *C. aprica* Beadle. [= X; < *C. flava* Aiton – RAB, W; > *C. alleghaniensis* – Q; > *C. ignava* Beadle – K, Q; > *C. extraria* Beadle – K, Q; > *C. impar* Beadle – K, Q; > *C. cullasagensis* Ashe – 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. Mt, 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 c. & n. MS and e. TN. Related to *C. flava* Aiton, and perhaps one of the parents of it (see discussion of *C. flava*). [= W, X; < *C. flava* Aiton – RAB; > *C. aprica* – Q; > *C. sororia* Beadle – Q; > *C. annosa* Beadle – K, Q]

Crataegus berberifolia Torrey & Gray, Barberry Hawthorn. Pd, Cp (GA, NC, SC): mixed hardwood and pine forests of uplands, usually in subxeric to xeric habitats in NC, SC, GA, especially over basic to calcareous soils; common. Distributed primarily from Piedmont of NC south to Piedmont and upper Coastal Plain of SC, Piedmont and upper Coastal Plain of GA, and west across AL, MS, LA, to e. TX; north to s. AR, TN. April-May; August-October. 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. [= C, K, X; > *C. berberifolia* – Q, S; > *C. mohri* – Q; > *C. engelmannii* Sargent; > *C. torva* Beadle; > *C. mohrii* Beadle – S]

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). Related to *C. boyntonii*, and perhaps only a variety of it; *C. buckleyi* differs chiefly in having purple anthers, more glandular-serrate calyx lobes, russet fruit, and smaller leaves (3-6 cm long x 2-4 cm wide) than *C. boyntonii*. [= 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. 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 TN w. to AR. May-early June; September-October. Usually found as a solitary specimen, or in 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]

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, Chapman's Hill-thorn. Mt (VA, NC), 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. Occupies sub-xeric uplands in Appalachian Region, tolerant of lowland floodplains in GA, AL, TN. One of the earliest hawthorns to flower in spring. Foliage may be conspicuously pubescent in some local populations. [= S, W, X; > *C. collina* var. *collina* – F, G; > *C. collina* var. *collicola* (W.W. Ashe) – F, G; > *C. rigens* Beadle – K, Q; > *C. collina* – Q; > *C. ingens* Beadle – Q; > *C. amnicola* Beadle – Q; < *C. punctata* Jacquin – RAB, C]

Crataegus crus-galli Linnaeus, Cockspur Hawthorn. Mt, Pd, Cp (GA, NC, SC, VA): pastures, thickets, disturbed woodlands and forests, fencerows; common. April-May; September-October. *C. crus-galli* sometimes forms extensive local colonies. Numerous variants occur, differing mostly in size and shape of leaves. [= C, W, X; < *C. crus-galli* Linnaeus – RAB; > *C. crus-galli* – K; > *C. macra* Beadle; > *C. regalis* Beadle var. *regalis* – F; > *C. algens* Beadle; > *C. arborea* Beadle – K; > *C. limnophylla* Sargent – K; > *C. crus-galli* var. *crus-galli* – F, G; > *C. crus-galli* var. *pyracanthifolia* (Aiton) Sargent – F, G; > *C. crus-galli* var. *exigua* (Sargent) Eggleston – G; > *C. crus-galli* var. *macra* (Beadle) Palmer – F, G; > *C. pyracanthoides* Beadle var. *arborea* (Beadle) Palmer – G; *? C. crus-galli* – S]

Crataegus dispar Beadle, Aiken Hawthorn. Cp (GA, SC), Pd (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. Endemic to GA and SC; lower Piedmont and adjacent upper Coastal Plain of sc. SC, historically also in e. GA. A distinctive species with its deeply cut and serrated, tomentose leaves, often pale bluish-green in color. At the time of this publication, *C. dispar* does not appear to be common in the vicinity of Aiken, SC. [= K, Q, X]

Crataegus flava Aiton, Yellow Hawthorn. Cp (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 related *C. aprica* Beadle is most similar, and may be involved in contributing to a possible hybrid origin of *C. flava*. Unfortunately, the name *C. flava* Aiton and the ambiguous taxon which it historically represents has been widely misapplied for more than a century. [= Q, X; < *C. flava* Aiton – RAB, K, S; > *C. elliptica* Aiton]

Crataegus intricata Lange, 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, here considered in synonomy. Some of these variants include yellowish-fruited types such as *C. fortunata* Sargent (of NC and WV), *C. straminea* Beadle (of AL and TN), pubescent types such as *C. biltmoreana* Beadle (of VA, NC, GA, AL, and TN), *C. communis* Beadle (of NC, GA, AL, and TN), *C. craytonii* Beadle (of NC), and types which bear very shallowly lobed leaves such as *C. padifolia* Beadle (of AL and TN) and *C. rubella* Beadle (of NC, SC, GA, AL, TN, and VA). *C. intricata* frequently exhibits a shrubby habit, and may form colonies by root sprouts. [= C, K, S, W, X; < *C. flabellata* – RAB; > *C. intricata* var. *intricata* – F, G; > *C. intricata* var. *straminea* (Beadle) Palmer – F, G; > *C. biltmoreana* Beadle – F, G, Q; > *C. communis* Beadle – Q; > *C. craytonii* Beadle – Q; > *C. fortunata* Sargent – F; > *C. padifolia* Beadle var. *padifolia* – F, G; > *C. padifolia* var. *incarnata* Sargent – F, G; > *C. rubella* Beadle – F, G, Q; > *C. straminea* Beadle – Q]

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 margaretta 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. margarettiae* 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. [= 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, 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): 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 (5-10mm diameter), with dense flesh; bark of main trunk brown, furrowed. [= X; > *C. pulcherrima* – K, Q; > *C. macilenta* Beadle – Q; > *C. lenis* Beadle – Q; > *C. ancisa* Beadle – K, Q; > *C. opima* Beadle – Q; > *C. inanis* Beadle – K, Q; > *C. illustris* Beadle – Q; > *C. incilis* Beadle – 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* – Q; > *C. eximia* Beadle – Q; > *C. gilva* Beadle – 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, 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; > *C. austromontana* Beadle – Q]

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, X; < *C. harbisonii* Beadle – K]

Crataegus austrina Beadle. C. AL. [= Q, X]

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, 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 keyed at this time}

Crataegus opaca Hooker & Arnott. AL. [= K, X]

Crataegus pinetorum Beadle. In AL and TN. [= K, Q, X]

Crataegus rufula Sargent. Cp (GA): flatwoods ponds, river swamps; uncommon. [= K, Z; > *C. maloides* Sargent – S] {not keyed at this time; synonymy incomplete}

Crataegus venusta Beadle. C. AL. [= Q, X; < *C. sargentii* Beadle – K]

Cydonia P. Miller 1754 (Quince)

A monotypic genus, a shrub, probably native of the Caucasus. References: Kalkman in Kubitzki (2004)=Z.

* *Cydonia oblonga* P. Miller, Edible Quince, is reported for MD (Kartesz 1999). [= K, Z; = *Pyrus cydonia* Linnaeus]

Dalibarda Linnaeus (Dewdrop, Robin-runaway, Star-violet)

The genus is monotypic, but should perhaps be included in *Rubus* (Alice & Campbell 1999). References: Robertson (1974)=Z; Alice & Campbell (1999).

Dalibarda repens Linnaeus, Dewdrop, Robin-runaway, Star-violet. Mt (NC, VA): bog margins and mountain swamp forests, often along spring seeps, mostly in dense shade beneath *Rhododendron maximum*; rare (NC Endangered, VA Rare). June-September. Newfoundland west to MI and MN, south to NJ and OH, and disjunct to WV, sw. VA, and w. NC. [= RAB, C, G, GW, K, S, W; **= *Rubus dalibarda*** Linnaeus; = *Rubus repens* (Linnaeus) Kuntze]

Dasiphora Rafinesque (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).

Dasiphora fruticosa (Linnaeus) Rydberg ssp. *floribunda* (Pursh) Kartesz, Shrubby-cinquefoil, Golden-hardhack. This species is widepread in the western and northern parts of North America, south to NJ, PA, OH, IN, and IL. It was reported for western NC (near Ducktown, in Turtletown, Cherokee County, N.C.") by Gattinger (1901), but additional 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

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: Eriksson, Donoghue, & Hibbs (1998); Eriksson et al. (2003); Kalkman in Kubitzki (2004).

Drymocallis arguta (Pursh) Rydberg, Tall Potentilla. Mt (VA): greenstone barrens; rare (VA Rare). Québec west to Mackenzie, south to w. VA, IN, MO, and AZ. Reported for e. TN by Gattinger (1901); the documentation unknown. [= *Potentilla arguta* Pursh – F, G; > ***P. arguta*** var. *arguta* – C; > ***P. arguta*** ssp. *arguta* – K]

Duchesnea J.E. Smith 1811 (Indian Strawberry)

(see *Potentilla*)

Exochorda Lindley 1858 (Pearlbush)

A genus of about 4 species, shrubs, of e. Asia. References: Kalkman in Kubitzki (2004).

* ***Exochorda racemosa*** (Lindley) Rehder, Pearlbush. Pd (GA, NC, SC, VA): disturbed areas, woodland borders; rare, introduced from China. First reported for South Carolina by Hill & Horn (1997). [= C, 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 (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, at least north of our area]; [section *Filipendula*] ..... ***[F. ulmaria]***

Filipendula rubra (Hill) B.L. Robinson, Queen-of-the-Prairie. Mt (GA, NC, VA), Pd (VA): bogs, wet meadows, over mafic or calcareous rocks; rare (NC Endangered, VA Rare). June-July; July-September. PA west to n. IL and MN, south to WV, w. VA, w. NC, n. GA, KY, and IA. The closest relatives are the other two members of section *Albicoma*: ***F. palmata*** (Pall.) Maximowicz and ***F. angustifolia*** (Turczaninow) Maximowicz, both of ne. Asia. [= RAB, C, F, G, GW, K, S, W, Y, Z]

* *Filipendula ulmaria* (Linnaeus) Maximowicz, Meadowsweet, Queen-of-the-Meadow, is cultivated and sometimes escaped or persistent. It is reported for KY, WV, PA, and NJ (Kartesz 1999). [= Y; > ***F. ulmaria*** var. *ulmaria* – C, F, G; > ***F. ulmaria*** ssp. *ulmaria* – K]

Fragaria Linnaeus (Strawberry)

A genus of about 10 species, herbs, of temperate Eurasia, North America, and South America. References: 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, Pd, Mt (GA, NC, SC, VA): gardens, persistent on garden edges; commonly cultivated, rarely persistent or weakly escaped. An octoploid hybrid of the two octoploid species, *F. chiloensis* and *F. virginiana*. [= RAB, F; = *F.* ×*ananassa* var. *ananassa* – K; < *F.* ×*ananassa* – RAB, F; = *F. ananassa* – C; = *F. chiloensis* Duchesne var. *ananassa* – G]

Fragaria vesca Linnaeus *var.* ***americana*** Porter. (NC, VA). [= C, F, G; < *F. vesca* – RAB; = *F. vesca* ssp. *americana* (Porter) Staudt – K, W; = *F. americana* (Porter) Britton – S]

Fragaria virginiana P. Miller, Wild Strawberry. Mt, Pd, Cp (GA, NC, SC, VA): grasslands, roadsides, pastures; common. [= RAB, C, W; > *F. virginiana* var. *virginiana* – F, G; > *F. virginiana* var. *illinoensis* (Prince) Gray – F, G; > *F. virginiana* var. *australis* Rydberg – G; > *F. virginiana* ssp. *virginiana* -- K; > *F. virginiana* ssp. *grayana* (Vilmorein ex J. Gay) Staudt – K; > *F. virginiana* – S; > *F. australis* (Rydberg) Rydberg – S; > *F. grayana* Vilmorin ex J. Gay – S]

Fragaria vesca Linnaeus var. *vesca*. East and south to PA, WV, and KY. [= C, F, G; = *F. vesca* ssp. *vesca* – K]

Geum Linnaeus 1753 (Avens)

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 inter-related. References: Robertson (1974)=Z, Bolle (1933)=Y; Král (1966)=X; Smedmark (2006); Smedmark & Eriksson (2002); Kalkman in Kubitzki (2004).

1 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***

1 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, or lavender; [of mesic to boggy forests, or less commonly, grassy balds (*G. geniculatum*)].

2 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***

2 Calyx lobes 4-10 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*].

3 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 sepals 5-10 mm long, green or purple-darkened; petals yellow or often with a substantial suffusion of rose, lavender, or purple; lower portion of style with long, gland-tipped hairs

4 Portion of the style above the kink 4-7 mm long; sepals 5-10 mm long, green or purple-darkened; [of nw. NC and adjacent TN] ..... ***G. geniculatum***

4 Portion of the style above the kink 3-4 mm long; sepals 9-15 mm long, purple; [of ne. WV northward] ..... ***[G. rivale]***

3 Portion of the style above the kink 1-2 mm long; calyx reflexed soon after anthesis, the sepals 3-9 mm long, green; petals white, cream, or yellow; lower portion of style glabrous or with long, eglandular hairs.

5 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***

5 Larger stipules 2-10 (-12) mm wide, entire to toothed; mid-cauline leaves less coarsely toothed, with 3-7 teeth per cm of margin.

6 Plant in flower.

7 Petals bright yellow, 5-9 mm long ..... ***G. aleppicum***

7 Petals white or cream (often drying pale yellow), 2-7 (-7.5) mm long.

8 Petals (3-) 4-7 (-7.5) mm long; pedicels puberulent (sometimes also slightly hirsute); [of moist to dry forests]..... ***G. canadense***
8 Petals (2-) 2.5-4 (-5.5) mm long; pedicels densely hirsute with spreading or slightly reflexed hairs, and also puberulent; [of wetlands].
9 Young achenes glabrous..... ***G. laciniatum*** *var.* ***laciniatum***
9 Young achenes sparsely to densely pubescent with long stiff trichomes..... ..... ***G. laciniatum*** *var.* ***trichocarpum***

6 Plant in fruit.
9 Pedicel predominantly puberulent, also sometimes with scattered long 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***
9 Pedicel moderately to densely hirsute with long, 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].
11 Hairs on the achene extending upward onto the lower portion of the style; pedicel sparsely hirsute with spreading hairs; receptacle densely hispid ..... ***G. aleppicum***
11 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.
12 Achenes glabrous..... ***G. laciniatum*** *var.* ***laciniatum***
12 Achenes sparsely to densely pubescent with long stiff trichomes .... ***G. laciniatum*** *var.* ***trichocarpum***

Geum aleppicum Jacquin, Yellow Avens. Mt (NC, VA), Pd (VA): bogs and boggy meadows; rare (NC Rare, VA 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, GW, K, W, Y, Z; > *G. aleppicum* var. *strictum* (Aiton) Fernald – C, F, G]

Geum canadense Jacquin. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): moist slope forests, bottomland forests, swamp forests; common. May-July; July-November. Nova Scotia 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, G, GW, S, W, Z; > *G. canadense* var. *canadense* – F, K, 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 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). July-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 situations that are apparently repeated 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, K, S, W, Y, Z]

Geum laciniatum Murray *var.* ***laciniatum.*** (VA): {info from VAHP}. This variety ranges south to VA, MD, KY, and TN. It resembles *G. laciniatum* var. *trichocarpum* but has the achenes glabrous (vs. sparsely to densely pubescent with long stiff trichomes). [= F, G, K, Z; < *G. laciniatum* – C, W, Y]

Geum laciniatum Murray *var.* ***trichocarpum*** Fernald, Rough Avens. Mt (NC, SC, VA), Pd, Cp (VA): bogs and boggy meadows, usually calcareous or basic; rare (NC Rare, VA Rare). June-July; July-August. *G. laciniatum* ranges from Nova Scotia west to MN, south to w. NC, ne. TN, MO, and KS. Var. *trichocarpum* ranges from Nova Scotia west to MN, south to w. NC, IL, MO, and KS. Var. *laciniatum*, differing in its glabrous achenes, appraches our area and should be sought; it is generally more northern and more restricted in distribution, ranging from Nova Scotia west to s. Ontario, south to MD, WV, TN, OH, and IN. [= F, G, K, Z; < *G. laciniatum* – RAB, C, GW, W, Y]

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 (US Endangered, NC Endangered). 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 Nova Scotia and the higher peaks of NH and ME), *G. calthifolium* Menzies ex Smith var. *calthifolium* (of wet snow-melt meadows of w. British Columbia, w. Yukon, 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, K, W, Z; = *Sieversia radiata* (Michaux) Greene – S; **= *Parageum radiatum*** (Michaux) H. Hara – X; = *Acomastylis radiata* (Michaux) Bolle – Y]

Geum vernum (Rafinesque) Torrey & A. Gray, Spring Avens. Mt, Pd (NC, VA): seepages, swamps, roadsides, disturbed areas; uncommon, 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, Y, Z; = *Stylypus vernus* Rafinesque – S]

Geum virginianum Linnaeus, Cream Avens. Mt, Pd (NC, SC, VA), Cp (NC, VA): bottomland forests, moist slope forests, swamp forests, and extending upslope to mesic or even dry sites, especially over mafic rocks; common. June-August; July-November. MA and NY west to IN, south to SC and TN. [= RAB, C, F, G, GW, K, W, Y, Z; > *G. virginianum* – S; > *G. hirsutum* Muhlenberg ex Link – S]

Geum rivale Linnaeus, Water Avens, Purple Avens, is a circumboreal plant of calcareous bogs, swamps, seepages, and wet meadows that ranges south to WV (Pocahontas, Preston, Randolph, and Tucker counties). It is most closely related (in our area) to *G. geniculatum*. [= C, F, G, K, Y]

Gillenia Moench 1802 (Indian-physic, Bowman's-root)

A genus of 2 species, herbs, of e. North America. There has been nomenclatural debate about whether the name *Gillenia* must be rejected because it is a later homonym of *Gillena*; the resolution appears to be that *Gillenia* can be used, and as it is older than the name *Porteranthus*, should be used (see Robertson 1974; Brummitt 1988; Parkinson 1988). References: Robertson (1974)=Z; Kalkman in Kubitzki (2004).

1 Stipules ovate, 10-20 mm long; leaves trifoliate, the leaflets of the lower leaves laciniate-toothed to divided ..... ***G. stipulata***
1 Stipules linear, 6-8 mm long; leaflets of the lower leaves; 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): dry to mesic woodlands and forests, especially over circumneutral soils derived from diabase (in NC) or greenstone (in VA); rare (NC Rare, VA Rare). 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, G; = *Porteranthus stipulatus* (Muhlenberg ex Willdenow) Britton – C, K, S, W, Z]

Gillenia trifoliata (Linnaeus) Moench, Mountain Indian-physic. Mt, Pd (GA, NC, SC, VA), Cp (VA): moist forests, roadbanks, forest edges; common. April-June; August-October. Ontario west to MI, south to SC, AL, nc. GA, and MO. [= RAB, F, G; = *Porteranthus trifoliatus* (Linnaeus) Britton – C, K, S, W, Z]

Kerria Augustin de Candolle 1818 (Kerria)

A monotypic genus, a shrub, of China and Japan. References: Kalkman in Kubitzki (2004).

* ***Kerria japonica*** (Linnaeus) Augustin de Candolle, Kerria, Japanese-rose. Pd (NC, SC, VA), Cp (VA): woodland borders, suburban woodlands; rare, introduced from China. April-May. Single and "doubled" forms are cultivated. [= C, F, G, K]

Malus P. Miller (Apple, Crabapple)

A genus of 30-50 species, trees and shrubs, north temperate. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004).

1 Twigs not thorny; leaves involute or convolute in bud; leaves unlobed; [cultivated and persistent or escaping]; [subgenus *Malus*].
  2 Leaves glabrous or nearly so; fruits small, < 3 cm in diameter ("crabapples") ..... ***M. prunifolia***

2 Leaves densely pubescent in bud, permanently pubescent beneath; fruits large, > 5 cm in diameter ("apples") .... ***M. pumila***

1 Twigs thorny; leaves folded in bud; leaves often lobed; [native, sometimes weedy]; [subgenus *Chloromeles*].

3 Leaves permenantly pubescent beneath; pedicels and hypanthium pubescent; [western, disjunct east to KY and MS] .... ***[M. ioensis]***

3 Leaves glabrous or nearly so; pedicels and hypanthium glabrous or wiith scattered long hairs; [widespread in our area].

4 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***

4 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***

Malus angustifolia (Aiton) Michaux, Wild Crab Apple. Cp, Pd, Mt (GA, NC, SC, VA): forests, woodlands, fence-rows; common, uncommon in Piedmont and Mountains. April-May; August-September. NJ, PA, OH, and MO, south to FL and TX. [= RAB, S, W; = *Pyrus angustifolia* Aiton – C, G, 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 coronaria (Linnaeus) P. Miller, Wild Crab Apple. Mt, Pd (GA, NC, SC, VA), Cp (GA, NC, SC): forests, woodlands, fencerows; common. May; September-October. NY, Ontario and WI south to GA and LA. [= RAB, K, W; = *Pyrus coronaria* Linnaeus – C, Z; > *Pyrus coronaria* Linnaeus var. *coronaria* – F; > *Pyrus coronaria* Linnaeus var. *elongata* Rehder – F; > *Pyrus coronaria* Linnaeus var. *dasycalyx* (Rehder) Fernald – F; > *Pyrus coronaria* Linnaeus var. *lancifolia* (Rehder) Fernald – F; = *Pyrus lancifolia* Bailey – G; > *Malus bracteata* Bailey – S; > *Malus coronaria* (Linnaeus) P. Miller – S; > *Malus lancifolia* Rehder – S; > *Malus coronaria* (Linnaeus) P. Miller var. *dasycalyx* Rehder]

* ***Malus prunifolia*** (Willdenow) Burkhardt, Chinese Apple, Crab-apple. Pd (VA), {SC}. [= K; = *Pyrus prunifolia* Willdenow]

* ***Malus pumila*** P. Miller, Common Apple. Mt, Pd, Cp (NC, SC, VA): commonly cultivated throughout, especially in the Mountains and Piedmont, and long persistent. April-May; July-October. [= RAB, K, W; = *Pyrus malus* Linnaeus – C, F, G, Z; = *Malus malus* (Linnaeus) Britton – S; = *Malus domestica* Burkhart]

Malus ioensis (Wood) Britton var. *ioensis*, Prairie Crabapple. Forests, woodlands, fence-rows. East to KY and MS. [= K; < *Pyrus ioensis* (Wood) Bailey – C, F, G] {not keyed at this time; synonymy incomplete}

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 (GA Threatened). Sc. TN (Chester, Wofford, & Kral 1997), nw. GA (Jones & Coile 1988), and n. AL. [= K, S]

Photinia Lindley (Photinia, Redtip)
(also see *Aronia*)

A genus of about 35 species, trees and shrubs, of Asia and Central America. Perhaps should be combined into *Aronia* (see discussion under that genus). References: Kalkman in Kubitzki (2004).

* *Photinia villosa* (Thunberg) Augustin de Candolle, Redtip, Photinia, is cultivated as an ornamental landscaping plant and persists after cultivation. [= K; ***Aronia***]

Physocarpus (Cambess.) Rafinesque 1838 (Ninebark)

A genus of 3-5 species, shrubs, of North America and ne. Asia. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004).

1 Follicles stellate-pubescent ..... ***Ph. opulifolius*** *var.* ***intermedius***

1 Follicles glabrous ..... ***Ph. opulifolius*** *var.* ***opulifolius***

Physocarpus opulifolius (Linnaeus) Maximowicz *var.* ***intermedius*** (Rydberg) B.L. Robinson, Midwestern Ninebark. Pd (SC, NC?): {habitat and distribution needing additional investigation}. 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 his taxon. Additional study is needed. [= C, F, G, K, Z; < *Ph. opulifolius* – RAB, W; > *Opulaster alabamensis* Rydberg – S; > *Opulaster stellatus* Rydberg – S; = *Opulaster intermedius* Rydberg]

Physocarpus opulifolius (Linnaeus) Maximowicz *var.* ***opulifolius***, Eastern Ninebark. Mt, Pd (NC, SC), {GA, VA}: stream banks, riverside thickets, rock outcrops, cliffs, especially over mafic or calcareous rocks; common. May-July. Québec west to

WI, south to SC, TN, and n. IL. [= C, F, G, K, Z; < *Ph. opulifolius* – RAB, W; > *Opulaster opulifolius* (Linnaeus) Kuntze – S; > *Opulaster australis* Rydberg – S]

Porteranthus
(see *Gillenia*)

Potentilla Linnaeus 1753 (Cinquefoil, Five-fingers, Potentilla)
(also see *Drymocallis* and *Sibbaldiopsis*)

A genus of 400-500 species, depending on the controversial circumscription. References: Robertson (1974)=Z; Eriksson, Donoghue, & Hibbs (1998); Eriksson et al. (2003); Kalkman in Kubitzki (2004).

1 Flowers solitary, on naked, axillary pedicels; leaves palmately 3-5-foliolate.
- 2 Leaves 3-foliolate; fruit strawberry-like, fleshy and red, consisting of an expanded fleshy receptacle bearing superficial achenes ..... ***P. indica***
- 2 Leaves primarily 5-foliolate on a plant (some poorly developed leaves may be 3-foliolate); fruit a head of achenes, dry.
  - 3 Lowest flower from the axil of the second well-developed leaf..... ***P. simplex***
  - 3 Lowest flower from the axil of the first well-developed cauline leaf, or from the axil of a lower and poorly-developed leaf.
    - 4 Middle leaflet of larger leaves 1.5-4 cm long; plants silky-pilose, the pubescence appressed or loosely ascending..... ***P. canadensis*** *var.* ***canadensis***
    - 4 Middle leaflet of larger leaves 3-6 cm long; plants long-villous, the pubescence loosely spreading to reflexed ..... ***P. canadensis*** *var.* ***villosissima***

1 Flowers in terminal cymes; leaves palmately 3-9-foliolate.
- 5 Leaves 3-foliolate.
  - 6 Petals and sepals subequal; stamens (15-) 20; achenes usually ridged..... ***P. norvegica***
  - 6 Petals much shorter than the sepals; stamens 5-10 (-15); achenes smooth..... ***P. rivalis*** *var.* ***millegrana***
- 5 Leaves 5-9-foliolate.
  - 7 Leaves (5-) 7-9-foliolate; petals 8-18 mm long, pale (sulphur) yellow, creamy-white, or white.
    - 8 Leaves pinnately compound; petals 12-18 mm long, creamy-white or white..... ***[see Drymocallis]***
    - 8 Leaves palmately compound; petals 8-15 mm long, pale (sulphur) yellow..... ***P. recta***
  - 7 Leaves 5 (-7)-foliolate; petals 3-7 mm long, medium yellow.
    - 9 Leaves pubescent beneath, the surface not concealed ..... ***P. intermedia***
    - 9 Leaves densely tomentose beneath, the surface concealed.
      - 10 Pubescence of the stem and veins of the leaf undersurface tomentose only; leaves revolute ..... ***P. argentea***
      - 10 Pubescence of the stem and veins of the leaf undersurface tomentose and also with long, spreading hairs; leaves not revolute..... ***P. inclinata***

* ***Potentilla argentea*** Linnaeus, Silvery Five-fingers, Hoary Five-fingers. Mt, Pd, Cp (NC, VA): disturbed areas; rare, naturalized from Europe. May-July. [= RAB, C, F, G, W; *P. argentea* var. *argentea* – K]

Potentilla canadensis Linnaeus *var.* ***canadensis***, Running Five-fingers. Mt, Pd, Cp (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, 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, W; = *P. caroliniana* Poiret – S]

* ***Potentilla inclinata*** Villars. Cp (NC): disturbed areas; rare, naturalized from Europe. May-June. [= C, K; ? *P. canescens* Bess. – RAB, F, G]

* ***Potentilla indica*** (Andrews) T. Wolf, Indian-strawberry. Cp, Pd, Mt (GA, NC, SC, VA): disturbed areas, lawns, gardens; common, naturalized from 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]

* ***Potentilla intermedia*** Linnaeus. Mt (NC, VA), Pd, Cp (VA): disturbed areas; rare, naturalized from Europe. May-July. [= RAB, C, F, G, K]

Potentilla norvegica Linnaeus, Strawberry-weed. Mt (GA, NC, VA), Cp (NC, VA), Pd (GA, NC, SC, VA): pastures, fields, disturbed areas, especially where moist; common (uncommon in Piedmont and 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, G, W; > *P. norvegica* var. *norvegica* – F; > *P. norvegica* ssp. *monspeliensis* (Linnaeus) Ascherson & Graebner – K; > *P. monspeliensis* Linnaeus – S]

* ***Potentilla recta*** Linnaeus, Sulphur Five-fingers. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas; common, naturalized from Europe. April-July; May-August. [= RAB, C, F, G, K, W]

* ***Potentilla rivalis*** Nuttall, Brook Five-fingers. Mt, Pd, Cp (VA): habitat not known; rare, adventive from further west. [= C, 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, Mt, Pd (GA, NC, SC, VA): woodlands, fields, disturbed areas; common. April-June; April-July. Newfoundland and MN south to AL and TX. [= RAB, C, G, K, W; > *P. simplex* var. *simplex* – F; > *P. simplex* var. *argyrisma* Fernald – F; > *P. simplex* var. *calvescens* Fernald – F; > *P. simplex* – S; > *P. canadensis* – S, misapplied]

* *Potentilla anserina* Linnaeus, Silverweed, occurs as an introduction south to e. TN (Chester, Wofford, & Kral 1997), se. PA (Rhoads & Klein 1993), and NJ (Kartesz 1999). [= C, F; *Argentina anserina* (Linnaeus) Rydberg – K] {not keyed at this time; synonymy incomplete}

* ***Potentilla reptans*** Linnaeus, Creeping Five-fingers, native of Eurasia, is reported for VA (Cronquist 1991, Kartesz 1999) and occurs as well in se. PA (Rhoads & Klein 1993). [= C, F, K] {not keyed at this time; synonymy incomplete}

Prunus Linnaeus 1753 (Plum, Cherry, Sloe, Peach, Apricot)

A genus of about 200 species, trees and shrubs, nearly cosmopolitan. References: 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 sessile or on a pedicel < 2 mm long
  - 4 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]***
  - 4 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.
    - 5 Leaves 8-15 cm long, > 4× as long as wide, falcate; fruit peach-colored, > 5 cm in diameter; [**peach**; subgenus *Amygdalus*] ..... ***P. persica***
    - 5 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*]
      - 6 Twigs reddish-brown; fruits 3-5 cm in diameter ..... ***P. armeniaca***
      - 6 Twigs bright green; fruits 2-3 cm in diameter, the flesh sour and/or bitter ..... ***P. mume***
- 3 Flowers and fruit pedicellate, the pedicel > 4 mm long; fruit glabrous, ovary glabrous or pubescent initially.
  - 7 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**
  - 7 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**

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***
    3 Fruit 3-4 cm long; thicket-forming shrub to small tree, often thorny ..... ***P. 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** var. **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) ..... ***P. alleghaniensis var. alleghaniensis, P. maritima var. maritima, P. injucunda, P. umbellata***

Prunus alabamensis C. Mohr, Alabama Black Cherry. Cp (GA, SC), Pd (GA), Mt (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; > *Padus alabamensis* (C. Mohr) Small – S; > *Padus cuthbertii* Small – S; > *Padus australis* Beadle – S; = *Prunus serotina* ssp. *hirsuta* (Elliott) McVaugh – Y, Z]

Prunus alleghaniensis Porter ***var. alleghaniensis***, Allegheny Plum, Allegheny Sloe. Mt (NC, VA), Pd (VA): dry rocky woodlands, shale barrens; 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]

Prunus americana Marshall, Wild Plum. Mt, Pd, Cp (GA, NC, SC, VA): upland forests, bottomland forests, fencerows; common. March-April; July-August. ME to Saskatchewan, south to FL, LA, OK, NM, and AZ. [= C, K, S, W, Z; = *Prunus americana* var. *americana* – RAB, F, G]

Prunus angustifolia Marshall *var.* ***angustifolia***, Chickasaw Plum. Cp, Pd (GA, NC, SC, VA), Mt (GA, VA): roadsides, fencerows, abandoned fields, especially sandy; common. March-April; May-early July. NJ, PA, IN, IL, MO, NE, and CO, south to FL, TX, and NM. [= F, K; < *Prunus angustifolia* – RAB, C, G, S, W, Z]

* ***Prunus armeniaca*** Linnaeus, Apricot. Cp (VA): persistent around old home sites; rare, native of n. China. [= C, K]

* ***Prunus avium*** Linnaeus, Sweet Cherry, Mazzard Cherry, Bing Cherry. Pd (NC, VA), Mt, Cp (VA), {NC, SC}: common. [= RAB, C, F, G, K, S, W, Z]

Prunus caroliniana (P. Miller) Aiton, Carolina Laurel Cherry. Cp (GA, NC, SC), Pd, 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; uncommon. March-April; September-October. Se. NC south to FL, west to TX, near the coast. [= RAB, K, Z; = *Laurocerasus caroliniana* (P. Miller) M. Roemer – S]

* ***Prunus cerasus*** Linnaeus, Sour Cherry, Pie Cherry. Mt (NC, VA), Pd, Cp (VA), {GA}: disturbed areas; fencerows, suburban forests; commonly cultivated, rarely persistent or escaped. April-May; June. [= RAB, C, F, G, K, S, W, Z]

* ***Prunus domestica*** Linnaeus, 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. [= *Prunus domestica* ssp. *domestica* – C; = *Prunus domestica* var. *domestica* – K]

* ***Prunus glandulosa*** Thunberg, Dwarf Flowering Almond. Cp (NC): persisting at abandoned homesites; rare, introduced from c. and n. China and Japan. [= K]

***** ***Prunus hortulana*** Bailey, Wild-goose Plum. Mt, Pd, 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, G, K, S, Z]

Prunus injucunda Small, Hog Plum, Flatwood Plum. Cp, Pd (GA, NC, SC): upland rocky or sandy forests and woodlands; uncommon. March-April; August-September. S. NC south to GA and AL. [= S; = *Prunus umbellata* Elliott var. *injuncunda* (Small) Sargent – K; < *Prunus umbellata* – RAB, Z]

* ***Prunus insititia*** Linnaeus, Damson, Bullace. Pd (VA): rare, introduced from Europe. [= F, G, Z; = *Prunus domestica* ssp. *institia* (Linnaeus) C.K. Schneider – C; = *Prunus domestica* Linnaeus var. *insititia* (Linnaeus) Fiori & Paoletti – K]

* ***Prunus mahaleb*** Linnaeus, Mahaleb Cherry, Perfumed Cherry, St. Lucie Cherry. Mt, Pd (NC, VA): roadsides, old homesites; rare, introduced from Europe. April-May; July. [= RAB, C, F, G, K, W, Z]

*? ***Prunus maritima*** Marshall *var.* ***maritima***, Beach Plum. Cp (VA): disturbed dune-like area on shore of Chesapeake Bay, and ocean dunes from e. MD northward; rare. Native from New Brunswick south to e. MD, along the coast; somewhat disjunct in e. VA in an ambiguously native occurrence. [= K; < *Prunus maritima* – C; = *Prunus maritima* – F, G]

Prunus mexicana S. Watson, Big-tree Plum, Mexican Plum. Pd (GA, NC, SC), Cp (GA, SC): streamsides, upland forests, fencerows; rare (GA Special Concern). NC, OH, WI, IA, and SD, south to GA, AL, MS, LA, and TX. [= C, G, K, S, Z; = *Prunus americana* Marshall var. *lanata* – F]

* ***Prunus mume*** 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.

*? ***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, Pd (VA): old fields, hedgerows, forest edges; uncommon. May; June. Newfoundland west to Manitoba, south to NY, OH, IN, IL, and IA; apparently disjunct in VA. [= C, F, G, K]

Prunus pensylvanica Linnaeus f., Fire Cherry, Pin Cherry. Mt (GA, NC, VA): high elevation forests, thickets at high elevations resulting from fire or logging; common (GA Special Concern). April-May; August-September. Newfoundland west to British Columbia, south to w. NC, n. GA, e. TN, IN, IL, IA, SD, and CO. [= RAB, C, F, G, W, Z; > *Prunus pensylvanica* var. *pensylvanica* – K; = *Prunus pennsylvanica* – S (an orthographic variant)]

* ***Prunus persica*** (Linnaeus) Batsch, Peach. Cp, Pd (GA, NC, SC, VA), Mt (VA): roadsides, trash-heaps, disturbed thickets; commonly cultivated, commonly escaped or persistent, native of China. March-April; June-July. [= RAB, C, F, G, K, W, Z; = *Amygdalus persica* Linnaeus – S]

Prunus serotina Ehrhart *var.* ***serotina***, Black Cherry. Mt, Pd, Cp (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. Nova Scotia west to ND, south to 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; < *P. serotina* var. *serotina* – RAB; < *Prunus serotina* – C, F, G, W; < *Padus virginiana* – S, misapplied; = *Prunus serotina* ssp. *serotina* – Y, Z]

* ***Prunus serrulata*** Thunberg, Japanese Flowering Cherry. Pd (NC): suburban forests; rare, introduced from Japan. [= K]

* ***Prunus subhirtella*** Miquel, Higan Cherry, Weeping Higan Cherry, Winter-flowering Cherry. Pd (VA): floodplain forests in suburban areas; rare, introduced from e. Asia, commonly planted, rarely escaped, but locally invasive. [= K; > *P. subhirtella* var. *pendula* (Maximowicz)]

Prunus susquehanae Willdenow, Appalachian Dwarf-cherry, Appalachian Sand Cherry, Susquehanna Cherry. Pd, Mt (NC, VA): open rocky or sandy sites; rare. Sw. ME and sw. Québec west to Manitoba, 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, K; = *Prunus pumila* var. *cuneata* (Rafinesque) L.H. Bailey – C, G; = *Prunus cuneata* Rafinesque – S; < *Prunus pumila* – W, Z]

Prunus umbellata Elliott, Hog Plum, Flatwood Plum. Cp, 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 FL and TX. Fox, Godfrey, & Blomquist (1952) report *Prunus mitis* for s. NC (Cleveland County). [= *Prunus umbellata* Elliott var. *umbellata* – K; < *Prunus umbellata* – RAB, Z; > *Prunus umbellata* – S; > *Prunus mitis* Beadle – S]

Prunus virginiana Linnaeus *var. **virginiana***, Choke Cherry. Mt (GA, NC, VA): forming clonal thickets in oak and northern hardwood forests; common, rare southward (GA Special Concern). Late April-June; July-August. Newfoundland and Labrador west to Manitoba, south to w. NC, n. GA, AR, and OK. Other varieties occur in w. North America. [= K, Z; < *Prunus virginiana* – RAB, C, F, G, W; = *Padus nana* (Du Roi) Roemer – S]

* *Prunus cerasifera* Ehrhart, Cherry-plum. Introduced at scattered locations; reported for TN, PA, NJ (Kartesz 1999). [= F, K]

* *Prunus padus* Linnaeus, European Bird Cherry, is cultivated and rarely escaped at least as far south as se. PA (Rhoads & Klein 1993) and DE (Kartesz 1999). [= C, K]

Prunus pumila Linnaeus var. *depressa* (Pursh) Gleason, Prostrate Dwarf-cherry, Northern Sand Cherry. Sandy or gravelly shores and islands. South to s. PA (Rhoads & Klein 1993). [= C, G, K, X; *Prunus depressa* Pursh – F]

* *Prunus tomentosa* Thunberg, Nanking Cherry, Korean Cherry. Disturbed areas, suburban forests and woodlands. Naturalized at least as far south as MD and PA; native of Asia. April. [= K]

Pyracantha M.J. Roemer 1847 (Firethorn, Pyracantha)

A genus of about 3 species, shrubs, of s. Europe east to e. Asia. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004).

1 Leaf margin entire; leaves oblanceolate, obtuse to mucronate-notched at the tip ..... ***P. koidzumii***
1 Leaf margin crenate-serrate; leaves acute to obtuse at the tip.
  2 Young shoots gray-pubescent ..... ***P. coccinea***
  2 Young shoots rusty-pubescent ..... ***[P. fortuneana]***

* ***Pyracantha coccinea*** M.J. Roemer, Scarlet Firethorn. Cp (GA, NC, SC, VA), Pd, Cp (GA, NC, SC): planted, persistent around old homesites, and rarely escaped to woodlands; rare, introduced from se. Europe and Asia Minor. [= K, Z; = *Cotoneaster pyracantha* (Linnaeus) Spach – F, S; = *Crataegus pyracantha* Linnaeus]

* ***Pyracantha koidzumii*** (Hayata) Rehder, Formosan Firethorn. Pd (SC): planted, rarely escaped to woodlands, rare, native of Taiwan. [= K, Z]

* *Pyracantha fortuneana* (Maximowicz) Li, Chinese Firethorn. Planted, rarely escaped or persistent, native of China. AL and FL. May-July; October-December. [= K; = *P. crenatiserrata* (Hance) Rehder]

Pyrus Linnaeus (Pear)
(also see *Aronia*, *Malus*, and *Sorbus*)

A genus of 10-20 species, trees and shrubs, of Eurasia and n. Africa. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004).

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, Pd, Mt (GA, NC, SC, VA): planted and persistent; commonly cultivated, becoming an aggressive naturalizer, introduced from China. March-April. Its abundant naturalization in MD and n. VA suggests that this species has the potential to become a serious pest (see Nesom 2000c, Vincent 2005). [= K]

* ***Pyrus communis*** Linnaeus, Common Pear. Mt, Pd, Cp (GA, NC, SC, VA): planted, persistent around oldhouses and in orchards; uncommon, introduced from Europe. April; August-October. [= RAB, C, F, G, K, S, Z]

* ***Pyrus pyrifolia*** (Burmann f.) Nakai, Oriental Pear, Japanese Pear, Chinese Pear. Cp, Pd (VA): planted, persistent around old houses and in orchards; uncommon, introduced from Asia. April; August-October. [= F, K, Z]

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 (NC, SC, VA): suburban woodlands, disturbed areas, roadsides, old house sites; rare, well established locally, native of e. Asia. Late March-May. [= C, F, G, K; *? Rh. 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: Robertson (1974)=Z; Kalkman in Kubitzki (2004).

*? ***Rosa arkansana*** Porter *var. **suffulta*** (Greene) Cockerell, Prairie Rose. Mt (NC): {habitat}; rare. Reported from North Carolina portion of the Great Smoky Mountains National Park. [= F, K; < *R. arkansana* – C]

Rosa blanda Aiton *var. **blanda***, Smooth Rose, Meadow Rose. Pd (VA): {habitat}; rare. Also south to s. PA (Rhoads & Klein 1993), MD, and WV (Kartesz 1999). [= K; < *R. blanda* – C, F, G]

* ***Rosa bracteata*** J.C. Wendland, McCartney Rose, Chickasaw Rose. Pd (GA, NC, SC, VA): disturbed areas, suburban borders; rare, persistent after cultivation, introduced. May-November; July-November. [= RAB, C, F, G, K, S, Z]

* ***Rosa canina*** Linnaeus, Dog Rose. Mt (NC, VA), Pd, Cp (VA): pastures; rare, introduced. May-June; September-October. [= RAB, C, F, G, K, S, W, Z]

Rosa carolina Linnaeus, Carolina Rose. Mt, Pd, Cp (GA, NC, SC, VA): upland forests, woodlands, pastures, roadsides; common. May-June; August-October. New Brunswick and Ontario south to FL and TX. [= RAB, C, G, W, Z; > *R. carolina* var. *carolina* – F, K; > *R. carolina* var. *grandiflora* (Baker) Rehder – F; > *R. carolina* var. *villosa* (Best) Rehder – F; > *R. carolina* – S; > *R. lyoni* Pursh – S; > *R. serrulata* Rafinesque – S]

* ***Rosa cinnamomea*** Linnaeus, Cinnamon Rose. {VA} Reported for VA (Kartesz 1999). {investigate} [= F, G, K, Z; *? R. majalis* Herrm. – C]

* ***Rosa damascena*** P. Miller, Damask Rose. Mt (NC): disturbed areas; rare, persistent after cultivation, introduced. May-June; September-October. [= RAB; *R. ×damascena* P. Miller (pro sp.) – K]

* ***Rosa gallica*** Linnaeus, French Rose. Mt (NC, VA), Pd (SC, VA): disturbed areas; rare, introduced. May-June; September-October. [= RAB, C, F, G, K, Z]

* ***Rosa laevigata*** Michaux, Cherokee Rose. Cp (GA, NC, SC): roadsides, moist forests; common (rare in NC), native of China. Late March-April; September-October. [= RAB, K, S, Z]

* ***Rosa micrantha*** Borrer ex J.E. Smith, Eglantine Rose. Mt, Pd (NC, SC, VA), Cp (NC, VA): pastures, streambanks, thickets; uncommon, introduced. May-June; September-October. [= RAB, C, F, G, K, S, W, Z]

* ***Rosa multiflora*** Thunberg ex Murray, Multiflora Rose. Mt, Pd, Cp (GA, NC, SC, VA): pastures, thickets, bottomlands, upland forests, bogs; common, native of Asia, aggressively invasive. May-June; September-October. [= RAB, C, F, G, K, S, W, Z]

Rosa palustris Marshall, Swamp Rose. Cp, Pd, Mt (GA, NC, SC, VA): swamp forests, bogs, streamsides; common. May-July; September-October. New Brunswick and Ontario south to FL, MS, and AR. [= RAB, C, F, G, GW, K, W, Z; > *R. palustris* – S; > *R. floridana* Rydberg – S]

* ***Rosa rubiginosa*** Linnaeus, Eglantine Rose, Sweetbriar Rose. Mt (GA, NC, VA), Cp (SC), Pd (GA, VA): pastures, disturbed areas; rare, introduced. Late May-June; September-October. Brummitt (2005) rejected the name *R. eglanteria* for *R. rubiginosa* [= S; = *R. eglanteria* Linnaeus – RAB, C, F, G, K, W, Z]

* ***Rosa rubrifolia*** Villars, Red-leaf Rose. {SC} Reported for SC (Kartesz 1999). [= K]

* ***Rosa rugosa*** Thunberg, Japanese Rose, Rugosa Rose. Cp, Pd (VA): cultivated and occasionally escaped; rare, introduced from Asia. [= C, F, G, K, Z]

Rosa setigera Michaux, Prairie Rose. Mt (GA, NC, VA), Cp (NC, SC), Pd (GA): stream banks, pastures; rare, nativity uncertain. May-June; September-October. [= RAB, C, S, W; > *R. setigera* var. *setigera* – F, G, K, Z; > *R. setigera* var. *tomentosa* Torrey & A. Gray – F, G, K, Z]

* ***Rosa spinosissima*** Linnaeus, Scotch Rose. Mt (VA): cultivated and rarely escaped; rare, introduced. [= F, G, K; > *R. pimpinellifolia* Linnaeus – C]

* ***Rosa tomentosa*** J.E. Smith. {NC} [= C, F, K, S]

Rosa virginiana P. Miller, Virginia Rose. Mt, Pd, Cp (VA), {GA, NC}: moist to dry forests and woodlands; uncommon (rare south of VA). May-June; August-October. Newfoundland and Ontario south to GA, AL, and MO. C. TN (Chester, Wofford, & Kral 1997), e. and c. KY (Clark et al. 2005). [= C, F, G, S, W, Z; > *R. virginiana* var. *virginiana* – K]

* ***Rosa wichuraiana*** Crépin, Memorial Rose, Dorothy Perkins Rose. Pd (GA, NC, SC, VA), Cp (NC, SC, VA), Mt (VA): roadbanks, railroad embankments, disturbed areas; uncommon, introduced. May-June; September-October. See Duncan (1985) for documentation for GA. [= C, F, G, K, W, Z; *R. wichuriana* – RAB, orthographic variant]

* ***Rosa xanthina*** Lindley, Yellow Rose. Reported for SC (Kartesz 1999). {investigate} [= K]

Rosa acicularis Lindley ssp. *sayi* (Schweinitz) W.H. Lewis, Prickly Rose. South and east to WV (Cronquist 1991, Kartesz 1999). [= K; = *R. acicularis* var. *bourgeauiana* (Crépin) Crépin – C, F; < *R. acicularis* – G]

* *Rosa dumetorum* Thuill. Introduced in KY. [= K]

* *Rosa moschata* J. Herrmann, Musk Rose. Introduced in AL. [= K, S]

Rosa obtusiuscula Rydberg. Endemic to Tennessee? [= K, S]

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. odoratus* 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 palmately lobed; petals deep pink; [subgenus *Anoplobatus* – **flowering raspberries**] ..... ***R. odoratus***
1 Leaves 3-9-foliolate (reduced simple leaves may also be present in the inflorescence); petals white or pale pink (rarely red).
  2 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**].
    3 Floricane leaves pinnately 5-9-foliolate ..... ***R. illecebrosus***
    3 Floricane leaves 1-3-foliolate.
      4 Inflorescence paniculiform, many-flowered; berries sticky, purplish-red, lacking a glaucous bloom..... ..... ***R. phoenicolasius***
      4 Inflorescence corymbiform, few-flowered; berries not sticky, black or red (rarely purplish or yellow), with a glaucous bloom.
        5 Fruit black (rarely yellow); pedicels with stout curved prickles; stems (at least the primocanes) strongly white-glaucous ..... ***R. occidentalis***
        5 Fruit red (rarely purple or yellow); pedicels with narrow straight bristles and sometimes also glandular hairs; stems green.
          6 Inflorescence without glandular hairs or gland-tipped bristles; [alien, cultivated, sometimes escaped or persistent]..... ***R. idaeus*** *var.* ***idaeus***
          6 Inflorescence with glandular hairs and gland-tipped bristles; [native in Mountains of NC and VA] .. ..***R. idaeus*** *var.* ***strigosus***
  2 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**].
    7 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**].
      8 Leaves compound, the leaflets additionally laciniately divided; leaves green beneath .....***R. laciniatus***
      8 Leaves compound, the leaflets toothed; leaves grayish-tomentose beneath.
        9 Prickles nearly straight; stems glabrescent; petals pale pink to red.....***R. bifrons***
        9 Prickles recurved; stems canescent above; petals white to pale pink .....***R. discolor***
    7 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].
      10 Primocanes prostrate, creeping, or low-arching, rooting at the tip or also at the nodes; [**dewberries**].
        11 Stems primarily armed with narrow-based prickles or even narrower bristles, with or without stout-based prickles as well.
          12 Inflorescence racemiform; bristles of the stem nonglandular (very small glandular hairs may be present).....***R. hispidus***
          12 Inflorescence reduced, normally to a single flower per branch of the floricane ..... ***R. trivialis***
        11 Stems armed with stout-based, usually recurved prickles, bristles lacking.
          13 Inflorescence racemiform, all of the several flowers subtended by stipules only (or the lowermost subtended by a leaf)..... ***R. recurvicaulis***
          13 Inflorescence with all of the 1-several flowers subtended by simple or trifoliolate leaves.
            14 Trifoliolate leaves of the floricanes with the terminal leaflet oblanceolate to obovate, the base cuneate, the tip obtuse or very shortly acuminate.....***R. enslenii***
            14 Trifoliolate leaves of the floricanes with the terminal leaflet ovate, the base broadly rounded to subcordate, the tip sharply acute to long acuminate ..... ***R. flagellaris***
      10 Primocanes erect, ascending, or high-arching, not rooting; [**native blackberries**].
        15 Canes armed primarily with bristles or slender-based prickles .....***R. setosus***
        15 Canes armed with heavy, stout-based, often recurved, prickles (or the canes essentially unarmed, the broad-based prickles few or almost absent).
          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.....***R. allegheniensis***

16 Pubescence of the inflorescence rachis and pedicels nonglandular (or with a very few gland-tipped hairs intermixed); glandular hairs absent elsewhere.
17 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***
17 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].
18 Leaves of the primocanes with the terminal leaflet cuneate at the base, mostly 1.8-2.5× as long as wide ..... ***R. argutus***
18 Leaves of the primocanes with the terminal leaflet rounded to cordate at the base, mostly 1.1-2.0× as long as wide.
19 Leaves glabrous (or very nearly so) beneath; canes with few and weak prickles ..... ***R. canadensis***
19 Leaves softly pubescent beneath; canes with many and strong prickles ..... ***R. pensilvanicus***

Rubus allegheniensis Porter, Allegheny Blackberry. Mt (GA, NC, VA), Pd (NC, VA): forests, woodlands, grassy balds; common. May-June; July. Nova Scotia west to MN, south to w. NC, n. GA, and e. TN. [= RAB, C, G, W; > *R. allegheniensis* var. *allegheniensis* – F, K; > *R. allegheniensis* var. *gravesii* Fernald – F, K; > *R. alumnus* Bailey – F, K; > *R. reravus* Bailey – F; *? R. nigrobaccus* Bailey – S]

Rubus argutus Link, Southern Blackberry. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, thickets, clearcuts, disturbed areas, pastures; common. April-May; late May-July. MA west to MO, south to FL and TX. The most common "highbush" blackberry in most of our area. [= C, G, GW; > *R. argutus* – RAB, K, S; > *R. betulifolius* Small – RAB, S; > *R. argutus* – F; > *R. blakei* Bailey – F; > *R. fatuus* Bailey – F; > *R. immanis* Bailey – K; > *R. jugosus* Bailey – F; > *R. louisianus* Berger – F; < *R. argutus* – W (also see *R. pensilvanicus*)]

* ***Rubus bifrons*** Vest ex Trattinick. Cp, Pd, Mt (NC, SC, VA), {GA}: disturbed areas, roadsides, thickets; common, introduced from Europe. May-June; late June-July. [= RAB, C, F, G, K, W]

Rubus canadensis Linnaeus, Smooth Blackberry, Thornless Blackberry. Mt (GA, NC, SC, VA): forests, woodlands, grassy balds, especially common at high elevations; common. June-July; July-August. Newfoundland west to MN, south (primarily in the Appalachians) to w. NC, e. TN, and n. GA. [= RAB, C, G, S, W; > *R. canadensis* – F, K]

Rubus cuneifolius Pursh, Sand Blackberry. Cp, 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 FL and AL, 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* Bailey – K; > *R. sejunctus* Bailey – F]

* ***Rubus discolor*** Weihe & Nees, Himalaya-berry. Cp, Pd (NC?, SC?, VA): disturbed areas, thickets; uncommon, introduced from Europe. [= C, K; = *R. procerus* P.J. Mueller – F; *? R. linkianus* Seringe – S, misapplied?]

Rubus enslenii Trattinick, Southern Dewberry. {Cp, Pd, Mt (NC, SC, VA), {GA}: roadsides, disturbed areas; uncommon? {phenology} S. ME west to s. WI, south to GA and LA.} [= C, G, S; < *R. flagellaris* – RAB, W; > *R. enslenii* – F; > *R. akermani* Fernald – F; > *R. cathartium* Fernald – F; > *R. celer* Bailey – F, K; > *R. clarus* Bailey – F, K; > *R. cordifrons* Bailey – F; > *R. deamii* – K; > *R. decor* Bailey – F; > *R. felix* Fernald – F; > *R. flagellaris* – K; > *R. hypolasius* Fernald – F; > *R. imperiorum* Fernald – F; > *R. iniens* Bailey – F, K; > *R. leviculus* Bailey – F, K; > *R. longipes* Fernald – F; > *R. nefrens* Bailey – F, K; > *R. obvius* Bailey – F, K; > *R. particularis* Bailey – F, K; > *R. pernagaeus* Fernald – F, K; > *R. rosagnetis* Bailey – F; > *R. scambens* Bailey – F, K; > *R. sewardianus* – F, K; > *R. subinnoxius* Fernald – F; > *R. tetricus* Bailey – F; > *R. whartoniae* Bailey – F, K]

Rubus flagellaris Willdenow, Northern Dewberry. Cp, Pd, Mt (NC, SC, VA), {GA}: old fields, woodlands, roadsides, disturbed areas; common. April-May; May-July. Québec west to MN, south to GA and AR. [= C, G; < *R. flagellaris* – RAB, W (also see *R. enslenii*); > *R. flagellaris* – F, K, S; > *R. baileyanus* Britton – F, K, S; > *R. depavitus* Bailey – F, K; > *R. injunctus* Bailey – F; > *R. invisus* (Bailey) Britton – F, K, S; > *R. jaysmithii* – F, K; > *R. kentuckiensis* Bailey – F; > *R. plexus* Fernald – F, K; > *R. redundans* Bailey – F; > *R. roribaccus* (Bailey) Rydberg – F, K; > *R. temerarius* Bailey – F, K]

Rubus hispidus Linnaeus, Swamp Dewberry. Cp (NC, SC, VA), Mt, Pd (NC, VA): bogs, moist woodlands and forests, disturbed moist areas; common. May-June; June-July. Nova Scotia and Québec west to WI, south to n. SC and MO. [= RAB, C, G, GW, S, W; > *R. ambigens* Fernald – F; > *R. davisiorum* Bailey – F; > *R. hispidus* – K; > *R. hispidus* var. *hispidus* – F; > *R. hispidus* var. *obovalis* (Michaux) Fernald – F; > *R. huttonii* Bailey – F; > *R. paganus* Bailey – K; > *R. porteri* Bailey – F, K; > *R. tardatus* Blanchard – F, K; > *R. vagulus* Bailey – F; > *R. vegrandis* Bailey – F; > *R. vigil* Bailey – F; > *R. zaplutus* 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), introduced from 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): high elevation forests and thickets, adelgid-killed spruce-fir forests; rare. June-August; July-September. The species is circumboreal; var. *strigosus* ranges from 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; = *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?}: disturbed areas; rare, introduced from Japan. [= RAB, C, F, G, K]

* ***Rubus laciniatus*** Willdenow, Cut-leaved Blackberry, Evergreen Blackberry. Mt, Pd (NC, SC, VA): disturbed areas, thickets; rare, introduced from Europe. May-June; June-July. [= RAB, C, F, K, W]

Rubus occidentalis Linnaeus, Black Raspberry, Blackcap. Mt, Pd, Cp (NC, SC, VA), {GA}: roadsides, woodlands, thickets, disturbed areas; common (increasingly rare southward in our area; much more common in VA than in NC, and rare in n. SC). Late April-early June; June-July. Québec to e. CO, south to n. GA and AR. [= RAB, C, F, G, K, S, W, Z]

Rubus odoratus Linnaeus, Flowering Raspberry. Mt (GA, NC, VA): moist roadsides, thickets, and forests; common. June-August; July-October. Nova Scotia west to MI, south to w. NC, n. GA, and e. TN. [= RAB, C, G, W, Z; > *Rubus odoratus* var. *odoratus* – F, K; > *Rubus odoratus* var. *columbianus* Millspaugh – F, K; = *Rubacer odoratum* (Linnaeus) Rydberg – S]

Rubus pensilvanicus Poiret, Pennsylvania Blackberry. Cp, Pd, Mt (NC?, VA), {SC?}: roadsides, thickets, woodlands; common. April-May; late May-July. ME west to MN, south to VA (NC?, SC?), IN, and MO. [> *R. pensilvanicus* – C, F, K; > *R. barbarus* Bailey – F; > *R. condensiflorus* Bailey – F; > *R. congruus* Bailey – F; > *R. cupressorum* Fernald – F; > *R. defectionis* Fernald – F, K; > *R. dissitiflorus* Fernald – F; > *R. floricomus* Blanchard – F, K; > *R. floridus* Tratt. – F, S; > *R. frondosus* Bigelow – F, K; > *R. laudatus* Berger – K; > *R. libratus* Bailey – F; > *R. orarius* Blanchard – C; > *R. pauxillus* Bailey – F, K; > *R. pergratus* Blanchard – K; > *R. praepes* Bailey – F; > *R. recurvans* Blanchard – F, K; > *R. rosarius* Bailey – K; > *R. subsolanus* Bailey – F; > *R. pensilvanicus* – G; > *R. ostryifolius* Rydberg – G]

* ***Rubus phoenicolasius*** Maximowicz, Wineberry. Mt, Pd (NC, SC, VA), Cp (VA), {GA}: roadsides, thickets; common, introduced from e. Asia. May-June; June-July. [= RAB, C, F, G, K, S, W]

Rubus recurvicaulis Blanchard. Mt (NC?, VA): {moist areas; uncommon? {phenology} Nova Scotia west to MN, south to MD, NC?, and IN. [= C; > *R. boyntoni* Ashe – F, orthographic variant; > *R. boyntonii* Ashe – K; *R. cordifrons* Bailey – F; *R. grimesii* Bailey – F, K; > *R. recurvicaulis* – F; > *R. arundelanus* Blanchard – G]

Rubus setosus Bigelow, Bristly Blackberry. (VA): {habitat not known}; rare? {phenology} Québec west to WI, south to VA and IL. [= C, G; > *R. angustifoliatus* Bailey – F; > *R. benneri* Bailey – F; > *R. elegantulus* Blanchard – K; > *R. nocivus* Bailey – F; > *R. racemiger* Bailey – F, K; > *R. semisetosus* Blanchard – F, K; > *R. setosus* – F, K]

Rubus trivialis Michaux, Southern Dewberry, Coastal Plain Dewberry. Cp, 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 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 pubescens Rafinesque, Dwarf Blackberry, ranges south to WV and s. PA (Rhoads & Klein 1993). [= C; > *R. pubescens* var. *pubescens* – F, K]

Sanguisorba Linnaeus 1753 (Burnet)

A genus of 15 or more species, herbs, of Eurasia, n. Africa, and North America. References: Robertson (1974)=Z; Nordborg (1966, 1967)=Y; Kalkman in Kubitzki (2004).

1 Leaflets pinnatifid (each leaflet incised nearly to the midvein); [subgenus *Poteridium*] .....***S. annua***
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]; [subgenus *Sanguisorba*, section *Sanguisorba*] ..... ***S. 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]; [subgenus *Poterium*, section *Poterium*] ....***S. minor*** *ssp.* ***muricata***

* ***Sanguisorba annua*** (Nuttall ex Hooker) Torrey & A. Gray, Prairie Burnet. Cp (SC): roadsides; rare, introduced from sc. United States. April-May. [= RAB, G, K, Z; = ***Poteridium annuum*** (Nuttall ex Hooker) Spach]

Sanguisorba canadensis Linnaeus, Canada Burnet, American Burnet, White Burnet. Mt (GA, NC, SC, VA): fens, seepage over mafic or ultramafic rocks (such as amphibolite, greenstone, serpentinite), spray zones around waterfalls; rare (GA Threatened, NC Rare, VA Rare). Late July-September. Newfoundland and Labrador west to Manitoba, 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, G, GW, K, S, W, Z]

* ***Sanguisorba minor*** Scopoli *ssp.* ***muricata*** (Spach) Nordborg, Salad Burnet, Garden Burnet, Fodder Burnet. Mt (NC, VA), Pd (VA): cultivated as an herb and salad green, escaped to moist, disturbed areas; rare, introduced from Europe. June-July. [= K, Y, Z; < *S. minor* – RAB, C, F, G; < *Poterium sanguisorba* Linnaeus – S; = ***Poterium sanguisorba*** Linnaeus ssp. ***muricatum*** (Spach) Rouy; = *Poterium polygamum* Waldstein & Kitaibel]

Sibbaldiopsis Rydberg 1901 (Mountain-cinquefoil)

A genus of several species, subshrubs, of northern North America and ne. Asia; most closely related to *Sibbaldia*. Molecular phylogenetic studies indicate that this genus is more closely related to *Alchemilla*, *Aphanes*, *Dasiphora, Drymocallis, Fragaria*, and other genera outside our area than to *Potentilla* (Eriksson et al. 2003). References: Eriksson, Donoghue, & Hibbs (1998); Eriksson et al. (2003); Kalkman in Kubitzki (2004).

Sibbaldiopsis tridentata (Aiton) Rydberg, Mountain-cinquefoil, Three-toothed Cinquefoil, Mountain White Potentilla, Wine-leaf Cinquefoil. Mt (GA, NC, VA): grassy balds, crevices of rock outcrops at high (rarely moderate) elevations, high elevation glades; rare, though sometimes locally abundant (GA Endangered, NC Watch List, VA Rare). June-August; July-September. Greenland and Newfoundland west to Northwest Territories, south to ND, IA, WI, MI, s. Ontario, and Nova Scotia, 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. [= K, S; = *Potentilla tridentata* Aiton – RAB, C, F, G, W]

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, an Asian shrub, is cultivated and naturalized at least as far south as s. PA (Rhoads & Klein 1993) and WV. [= C, F, G, K]

Sorbus Linnaeus (Mountain-ash, Rowan)
(also see *Aronia*)

A genus of about 250 species, trees and shrubs, of mainly temperate Northern Hemisphere. References: Jones (1939)=Z; Aldasoro et al. (2004).

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]***

Sorbus americana Marshall, Mountain-ash, American Rowan. Mt (GA, NC, VA), Pd (NC, SC): high elevation forests, balds, and high elevation rock outcrops, often with *Picea, Abies*, and/or *Betula alleghaniensis*; common (rare in Piedmont) (GA Rare). June-July; September-October (persisting well into winter). 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, Z; = *Pyrus americana* (Marshall) Augustin de Candolle – F]

* *Sorbus aucuparia* Linnaeus, Rowan, European Mountain-ash, occurs as 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*. [= C, G, K, Z; = *Pyrus aucuparia* (Linnaeus) Gaertner – F]

Spiraea Linnaeus 1753 (Spiraea, Meadowsweet, Hardhack)

A genus of about 80 species, shrubs, of north temperate areas (especially Asia). References: Robertson (1974)=Z; Rehder (1940); Uttal (1974); Kalkman in Kubitzki (2004).

1 Inflorescence a simple umbel; flowers white; [section *Chamaedryon*]; [introduced].
  2 Umbels sessile, 3-6-flowered; leaves 2-5 cm long, ovate, finely serrulate..... ***S. prunifolia***
  2 Umbels peduncled, many-flowered; leaves 1.5-3.5 cm long, obovate, coarsely serrate..... ***S. ×vanhouttei***
1 Inflorescence a compound corymb or panicle; flowers white, pink, or red; [native or introduced].
  3 Inflorescence a corymb, flat-topped or rounded, broader than long; [section *Calospyra*].
    4 Leaves rounded, obtuse, or acute at the apex; petals white (rarely pink); [native].
      5 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***
      5 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***
    4 Leaves long-acuminate at the apex; petals pink (rarely white or red); [introduced].
      6 Leaves pubescent on the veins beneath; flowers usually pink (rarely white); shrub to 15 dm tall .... ***S. japonica*** *var.* ***fortunei***

6 Leaves glabrous; flowers usually white (rarely pink); shrub to 8 dm tall.....***S. ×bumalda***

3 Inflorescence a panicle, longer than broad; [section *Spiraea*].

7 Lower leaf surface densely tomentose with white, tawny, or rusty tomentum which obscures the surface.

8 Follicles pubescent; [native, common in boggy wetlands].....***S. tomentosa***

8 Follicles glabrous; [introduced, rare].....***S. ×billiardii***

7 Lower leaf surface glabrous or with a few scattered hairs that do not obscure the surface.

9 Leaves lanceolate to oblong-lanceolate, widest at or below the middle; flowers pink; [introduced, rarely escaped or persisting].....***S. salicifolia***

9 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].

10 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***

10 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. Mt (NC, VA), Pd (VA): bogs, boggy streambanks, seepages; uncommon (NC Watch List). June-September; August-October. Ranging from Québec west to Alberta, 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, G, S, W, Z; = *S. alba* var. *alba* – RAB, C, GW, K]

* ***Spiraea ×billiardii*** Herincq [*S. douglassii* ×*salicifolia*]. Mt (VA): cultivated, escaped or persisting; rare, introduced from cultivation, one parent from w. North America, one from Eurasia. [= K]

* ***Spiraea ×bumalda*** Burven [*S. albiflora* ×*japonica*]. Pd (VA): cultivated, escaped or persisting; rare, introduced from cultivation, both parents from Asia. [= K]

Spiraea corymbosa Rafinesque, Dwarf Spiraea, Rock Spiraea. Mt, Pd (NC, VA), {GA?}: rocky forests and woodlands, granitic domes, dry slopes of Piedmont monadnocks, rocky slopes in partial sun; common, rare in NC (NC Rare). 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 closely 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, S; < *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. ***var. fortunei*** (Planchon) Rehder, Japanese Spiraea. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): roadsides, woodland borders, old home-sites; uncommon, introduced from Japan and China. June-July; July-August. [= K; < *S. japonica* – RAB, C, F, G, W, Z]

Spiraea latifolia (Aiton) Burkhart, Broadleaf Meadowsweet. Mt (NC, VA), Pd, Cp (VA): bogs, seeps, and rock outcrops (glades) over amphibolite, greenstone, olivine, and granite; uncommon (GA Rare, NC Watch List). June-September; August-October. Newfoundland west to MI, south to w. NC. [= G, S, W, Z; = *S. alba* var. *latifolia* (Aiton) Dippel – RAB, C, GW, K; > *S. latifolia* var. *latifolia* – F; > *S. latifolia* var. *septentrionalis* Fernald – F]

* ***Spiraea prunifolia*** Siebold & Zuccarini, Bridal-wreath Spiraea. Mt, Pd (VA), Cp (NC, VA): cultivated, escaped or persisting; uncommon, introduced from China, Korea, and Taiwan. [= C, G, K]

* ***Spiraea salicifolia*** Linnaeus, Willowleaf Spiraea. Mt (NC, VA): cultivated, escaped or persisting; rare, introduced from Eurasia. [= C, K]

Spiraea tomentosa Linnaeus, Hardhack, Steeplebush. Mt (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): bogs, wet meadows; common (rare in Piedmont) (GA Rare). July-September; September-October. Nova Scotia west to MN, south to SC, ne. GA, c. TN, and AR. [= RAB, GW, K, S, W; > *S. tomentosa* var. *rosea* (Rafinesque) Fernald – C, F, G, Z; > *S. tomentosa* var. *tomentosa* – C, F, G, Z; *? S. subcanescens* Rydberg]

* ***Spiraea ×vanhouttei*** (C. Briot) Carrière [*S. cantoniensis* × *trilobata*], Bridal-wreath Spiraea. Pd (NC): cultivated, escaped or persisting; rare, introduced from cultivation, the two parents both from Asia. [= K, Z; = *C. vanhouttei* – C, G]

Spiraea virginiana Britton, Virginia Spiraea, Appalachian Spiraea. Mt (GA, NC, VA): riverbanks, riverside shrub thickets, where occasionally flood-scoured; rare (US Threatened, GA Threatened, NC Endangered, VA Endangered). 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, G, K, S, W, Z; > *S. virginiana* var. *serrulata* Rehder]

* ***Spiraea cantoniensis*** Loureiro. Cp (NC): roadsides; rare, introduced from 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). [= K] {not keyed at this time; synonymy incomplete}

* ***Spiraea thunbergii*** Siebold ex Blume. Cp (NC): roadsides; rare, introduced from Asia. *S. thunbergii* has been collected from roadside at Fort Bragg, NC, by Phil Crutchfield (specimen at Fort Bragg) (Sorrie, pers. comm.). [= C, K] {not keyed at this time; synonymy incomplete}

Stephanandra Siebold & Zuccarini 1843 (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*; the combination for our species has not yet been made. References: Oh & Potter (2005); Kalkman in Kubitzki (2004).

* ***Stephanandra incisa*** (Thunberg) Zabel, Lace Shrub. Pd (VA): suburban woodlands; rare, establishing from horticultural plantings, native of Japan and Korea. [= K; ***Neillia*** sp.]

Waldsteinia Willdenow 1799 (Barren Strawberry)

A genus of about 5 species, perennial herbs, of North America, southern Europe, and Korea. Evolutionarily embedded in *Geum* and probably best submerged into it. References: Douglass (1980); Robertson (1974)=Z; Bolle (1933)=Y; Smedmark (2006); Smedmark & Eriksson (2002); Kalkman in Kubitzki (2004).

1 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 ..... ***W. lobata***
1 Leaves trifoliolate (fully divided); leaves sparsely pubescent with stiff hairs, these distributed mostly or strictly on the veins, the intervein surfaces glabrous to very sparsely pubescent.
  2 Calyx lobes 2-7.5 mm long; petals 5-10 mm long, 3-6 mm wide ..... ***W. fragarioides*** *var.* ***fragarioides***
  2 Calyx lobes 3-4.5 mm long; petals 2.5-4 mm long, 1-1.5 mm wide ..... ***W. fragarioides*** *var.* ***parviflora***

Waldsteinia fragarioides (Michaux) Trattinick *var.* ***fragarioides***, Northern Barren Strawberry. Pd (GA?, NC, VA?): forests, streambanks; rare (NC Watch List). Late March-May; May-June. New Brunswick west to MN, south to NC, GA, TN, IN, and MO. [= C, F; < *W. fragarioides* – RAB, W, Y; = *W. fragarioides* ssp. *fragarioides* – K, Z; = *W. fragarioides* – G, S; < ***Geum fragarioides*** (Michaux) Smedmark]

Waldsteinia fragarioides (Michaux) Trattinick *var.* ***parviflora*** (Small) Fernald, Southern Barren Strawberry. Pd, 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. [= C, F; = *Waldsteinia fragarioides* ssp. *doniana* (Trattinick) Teppner – K, Z; < *W. fragarioides* – RAB, W, Y; = *W. parviflora* Small – G; = *W. doniana* Trattinick – S; < ***Geum fragarioides*** (Michaux) Smedmark]

Waldsteinia lobata (Baldwin ex Elliott) Torrey & A. Gray, Lobed Barren Strawberry. Mt (GA, NC, SC), Pd (GA, SC): forests, streambanks; rare (GA Threatened, NC Rare, SC Rare). March-May; May-June. Sw. NC south to nw. SC and n. and c. GA. Some populations appear to be morphologically intermediate between *W. lobata* and *W. fragarioides* ssp. *doniana*; further study is needed. [= K, S, Y, Z; = ***Geum lobatum*** (Baldwin ex Elliott) Smedmark]

RUBIACEAE A.L. de Jussieu 1789 (Madder Family)

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] ..... ***Paederia***
  2 Shrub or tree; corolla white, green, or maroon; [native].
    3 Inflorescence spherical; [widespread in our area] ..... ***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”; [of s. SC southward] ..... ***Pinckneya***
      4 Inflorescences thyrsoid; calyx lobes inconspicuous; [of ne. FL southward] ..... ***[Psychotria]***
1 Herbs.
  5 Leaves whorled.
    6 Flowers congested into involucrate heads; corolla pink ..... ***Sherardia***
    6 Flowers in branched inflorescences lacking an involucre; corolla white, greenish, yellow, or brown.
      7 Flowers in 2-flowered reduced cymes; flowers yellow ..... ***Cruciata***
      7 Flowers > 2 per cyme; flowers white, green, brown, or yellow.
        8 Corolla tube much longer than the corolla lobes ..... ***[Asperula]***
        8 Corolla tube shorter than the corolla lobes ..... ***Galium***
  5 Leaves opposite

9 Flowers paired, the ovaries connate and developing into a single fleshy red fruit; leaves roundish.....***Mitchella***
9 Flowers single or in inflorescences with multiple flowers, the fruits **either** dry **or** fleshy and yellowish or black.
10 Carpels with few to many seeds.
11 Corolla 5-lobed.....***Pentodon***
11 Corolla 4-lobed.
12 Capsule longer than the calyx tube flowers blue, pink, or white .....***Houstonia***
12 Capsule not longer than the calyx tube; flowers white .....***Oldenlandia***
10 Carpels 1-seeded.
13 Flowers in dense, terminal, involucrate heads; flowers 4- or-6-lobed; styles 3 .....***Richardia***
13 Flowers in axillary or terminal clusters, or single in axils, not involucrate; flowers 4-lobed; styles 2.
14 Flowers usually solitary in leaf axils; fruit separating into 2 parts .....***Diodia***
14 Flowers in terminal and axillary clusters; fruits not separating into 2 parts.
15 Carpels opening transversely.....***Mitracarpus***
15 Carpels opening longitudinally.....***Spermacoce***

Asperula Linnaeus (Woodruff)

A genus of 90-200 species, mostly European.

* *Asperula arvensis* Linnaeus, Woodruff. South to se. PA as an introduction (Rhoads & Klein 1993). [= C, G, K]

Borreria
(see *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, Pd, Mt (GA, NC, SC, VA): 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*)]

Cruciata P. Miller (Crosswort)

A genus of about 10 species, herbs, of Europe and western Asia. References: Rogers (2005)=Z

* ***Cruciata pedemontana*** (Bellardi) Ehrend, Piedmont Crosswort. Mt (GA, NC, VA), Pd (GA, VA), Cp (VA), {SC}: lawns, grassy roadsides; 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). [= K, Z; = *Galium pedemontanum* (Bellardi) Allioni – RAB, C, F, W]

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, Pd, Mt (GA, NC, SC, VA): 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; > *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, Pd, Mt (GA, NC, SC, VA): 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; > *D. virginiana* var. *attenuata* Fernald – F, K; > *D. virginiana* var. *latifolia* Torrey & A. Gray – K; > *D. virginiana* var. *virginiana* – F, K; > *Diodia virginiana* – S; > *Diodia tetragona* Walter – S; > *Diodia hirsuta* Pursh – S; > *Diodia harperi* Small – S]

Galium Linnaeus 1753 (Bedstraw, Cleavers, Woodruff)
(also see *Cruciata*)

A genus of ca. 300 species, herbs, cosmopolitan. References: Puff (1976, 1977)=Z; 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 4-8) 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 ..... ***[Cruciata pedemontana]***
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. virgatumXXX***
  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 . ..... ***[Sherardia arvensis]***
1 Flowers in axillary or terminal diffuse inflorescences, not subtended by an involucre; stems either smooth, retrorse-scabrid, or pubescent.
2 Fruits and ovaries uncinate-hispid; leaves 15-50 mm long, 7-10 mm wide ..... ***G. triflorum***
2 Fruits and ovaries glabrous or papillose; leaves 5-25 mm long, 1-6 mm wide.
3 Largest leaves < 10 mm long; fruits 0.7-1 mm across; annual ..... ***G. divaricatum***
3 Largest leaves > 10 mm long; fruits 1-2.5 mm across; perennial.
4 Corolla 1.5-2.5 mm across, 3-lobed; [collectively widespread in our area].
5 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***
5 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***
4 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].
6 Leaf margins retrorsely ciliate-scabrid; leaves 3-5× as long as wide; [plants of bogs and moist thickets] .. .. ***G. asprellum***
6 Leaf margins antrorsely ciliate-scabrid; leaves 4-8× as long as wide; [plants of dry forests and woodlands].
7 Leaves sharply acute or cuspidate; corolla 2.5-3 mm across ..... ***G. concinnum***
7 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 aparine Linnaeus, Cleavers. Mt, Pd, Cp (GA, NC, SC, VA): meadows, thickets, disturbed areas, forests; common. April-May. 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; > *G. aparine* var. *aparine* – C; > *G. aparine* var. *echinospermum* (Wallroth) Farwell – C]

Galium asprellum Michaux, Rough Bedstraw. Mt (NC, VA), Pd, Cp (VA): bogs, streambanks, wet meadows; uncommon. July-September. 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]

Galium boreale Linnaeus, Northern Bedstraw. Mt (VA): woodlands and fields; uncommon (VA Watch List). May-August. Circumboreal, south in North America to DE, sw. VA, KY, MO, and CA. [= C, K, W; > *G. boreale* var. *intermedium* Augustin de Candolle – F, G]

Galium circaezans Michaux ***var. circaezans***, Southern Forest Bedstraw. Mt, Pd, Cp (GA, NC, SC, VA): moist forests; common. April-June. NY, KY, and MI, south to FL and TX. The varieties need additional study. [= C, F, G, K; < *G. circaezans* – RAB, S, W]

Galium circaezans Michaux ***var. hypomalacum*** Fernald, Northern Forest Bedstraw. Mt (NC, VA), Pd (VA), {GA?, SC?}: moist forests; common? April-June. Québec west to MN and NE, south to VA, w. NC, KY, MO, and TX (?). The varieties need additional study. [= C, F, G, K; < *G. circaezans* – RAB, S, W]

Galium concinnum Torrey & A. Gray, Shining Bedstraw. Mt, 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]

* ***Galium divaricatum*** Purret ex Lamarck. Pd (NC, VA), Cp, Mt (VA): pastures, disturbed areas; uncommon, native of Europe. June-July. [= K; *? G. parisiense* Linnaeus – RAB, C, F, G, S, W]

Galium hispidulum Michaux. Cp (GA, NC, SC, VA), Mt (NC): maritime forests, sandhills, dry sandy forests; common, rare in Mountains, rare in VA (VA Watch List). 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), Pd (VA), Cp (VA): moist hardwood forests; uncommon (rare in Coastal Plain and Piedmont). June-July. Québec west to MN, south to w. NC and e. TN. [= RAB, C, F, G, K, S, W]

Galium latifolium Michaux, Wideleaf Bedstraw. Mt (GA, NC, SC, VA), Pd (NC, VA): moist hardwood forests; common (uncommon in Piedmont). May-July. 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 mollugo*** Linnaeus *var.* ***erectum*** (Hudson) Domin. Mt?, Pd?, Cp? (NC?, VA?): moist roadsides, disturbed areas; ??, native of Europe. May-June. The varieties need additional study. [= C, G; < *G. mollugo* – RAB, K, W; = *G. erectum* Hudson – F; *? G. album* P. Miller]

* ***Galium mollugo*** Linnaeus *var.* ***mollugo***. Mt (NC, VA), Pd?, Cp? (VA?), {GA}: moist roadsides, disturbed areas; uncommon, native of Europe. May-June. The varieties need additional study. [= C, G; < *G. mollugo* – RAB, K, W; = *G. mollugo* – F]

Galium obtusum Bigelow *var.* ***filifolium*** (Wiegand) Fernald, Carolina Bedstraw. Cp (GA, NC, SC, VA), Pd (GA?, NC, SC, VA), Mt (VA): marshes, swamps, creekbanks, alluvial forests; common. 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, Pd, Mt (GA, NC, SC, VA): marshes, swamps; common. April-May. Nova Scotia 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; > *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, Pd (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. 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 pilosum Aiton *var.* ***pilosum***. Mt, Pd, Cp (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]

Galium pilosum Aiton *var.* ***puncticulosum*** (Michaux) Torrey & A. Gray. Cp (GA, NC, SC, VA), Pd?: forests, woodland borders, clearings; common. May-August. S. NJ south to FL, west to MS. The varieties need additional study. [= C, F, G, K; < *G. pilosum* – RAB, S, W]

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), Pd, Cp? (NC, SC, VA): swamps, marshes, and ditches; common. April-June. 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; < *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, Pd, Cp (GA, NC, SC, VA): woodlands, roadsides, disturbed areas; common. July-August. Circumboreal, south in North America to FL and Mexico (Veracruz). [= RAB, K, S, W; > *G. triflorum* var. *triflorum* – C, F, G; > *G. triflorum* var. *asprelliforme* Fernald – C, F, G]

Galium uniflorum Michaux. Cp, Pd (GA, NC, SC, VA): moist slope forests and alluvial forests; uncommon. April-September. Ranging from 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), Pd (VA): meadows, pastures, roadsides; uncommon (rare in NC), native of Europe. June-July. [= C, F, G, K; < *G. verum* – RAB, W (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 palustre Linnaeus, Marsh Bedstraw, Ditch Bedstraw, ranges south to NJ, s. PA (Rhoads & Klein 1993), MD, and WV (Kartesz 1999). [= C, F, G, K]

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, K; < *G. verum* – W]

Hedyotis Linnaeus (Bluet)

(see *Houstonia, Oldenlandia, Stenaria*)

Houstonia Linnaeus 1753 (Bluet)

(also see *Stenaria*)

The generic limits of *Houstonia, Hedyotis, Oldenlandia*, and *Stenaria* remain unclear. I do not agree with Terrell's (1991) sinking of the varieties of *H. longifolia* and reduction of *H. tenuifolia* to a variety of *H. longifolia*. 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)=V; Rogers (2005). 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; [section *Houstonia*].
  - 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 (these borne underground); [of the outer Coastal Plain] ..... ***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] ..... ***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 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. micrantha***
      - 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. 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; [plants 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; [plants 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), 1.7-3.3 cm long, 0.4-1.0 cm 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), 0.8-6.3 cm long, 0.6-3.4 cm 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, Pd, Cp (GA, NC, SC, VA): forests, woodlands, openings, lawns, a wide variety of disturbed sites; common. April-May; May-June. 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, 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): dry limestone barrens, locally abundant in shallow soils over limestone; rare (VA Rare). April-June. Ranging from ME and s. Ontario 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, 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), Pd, Cp (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 and GA. The typic variety is more northern, apparently reaching its southern limit in IN, not reaching our area. [= Z; < *Houstonia longifolia* – RAB, C, F, G, S, W; < *Hedyotis longifolia* (Gaertner) Hooker – C, Q; < *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 (NC Watch List). 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 850-1750m. 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, Pd (GA): granitic flatrocks, February-April. E. and c. GA west to sw. TN, nw. AR, south to 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 1250-1950m in elevation; rare (US Endangered, NC Endangered). 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 it sometimes occurs in close proximity to *H. purpurea*, with no sign of intergradation. 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 (VA Rare). 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. Var. *nigricans* ranges from 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. 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. [= *Stenaria nigricans* (Lamarck) Terrell var. *nigricans* – V; = *Hedyotis nigricans* (Lamarck) Fosberg var. *nigricans* – K, U, Y; < *Hedyotis nigricans* – C, Q; < *Houstonia nigricans* (Lamarck) Fernald – F, G; > *Houstonia angustifolia* Michaux – S; > *Houstonia filifolia* (Chapman) Small – S]

Houstonia procumbens (Walter ex J.F. Gmelin) Standley, Creeping Bluet. Cp (GA, SC): beach dunes, moist to wet sandy pinelands; common. October-April. Ranging from 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, 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): dry woodlands, banks, rock outcrops, shallow soils around mafic and calcareous rock outcrops; rare (NC Watch List). 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, 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, Pd, Cp (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. May-July; July-August. Var. *purpurea* ranges from MD and s. PA west to s. OH, s. IL, and sw. MO south to SC, sw. GA, 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, X, Y, Z; < *Houstonia purpurea* – RAB, W; = *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, Cp (GA, NC, SC, VA), Mt (GA, NC): woodlands, lawns, and other disturbed sites; common. March-April. MD south to FL, west to TX, and inland from IL west to NE, south to TN and TX. [= RAB, G, K, S, W, X, Y; = *Houstonia patens* Elliott – F; = *Hedyotis crassifolia* Rafinesque – C, GW; < *Hedyotis caerulea* (Linnaeus) Hooker – Q; = *Houstonia minima* L.C. Beck – S]

Houstonia serpyllifolia Michaux, Appalachian Bluet, Thyme-leaf Bluet. Mt (GA, NC, SC, VA): streambanks, grassy balds, moist forests, seepy rock outcrops, spray cliffs, and moist disturbed areas; common (VA Watch List). (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, X, Y; = *Hedyotis michauxii* Fosberg – C, GW, Q]

Houstonia tenuifolia Nuttall, Diffuse-branched Bluet. Pd, Mt (GA, NC, SC, VA), 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, Z; = *Hedyotis nuttalliana* Fosberg – C; < *Hedyotis longifolia* (Gaertner) Hooker – Q; = *Houstonia longifolia* var. *tenuifolia* (Nuttall) Wood; = *Houstonia longifolia*, "Tenuifolia Group" – X; < *Houstonia longifolia* – K]

Houstonia rosea (Rafinesque) Terrell. AL west to TX. [= K; = *Hedyotis rosea* Rafinesque] {synonymy incomplete}

Mitchella Linnaeus (Partridge-berry)

The only other species in the genus is e. Asian. References: Rogers (2005)=Z.

Mitchella repens Linnaeus, Partidge-berry. Mt, Pd, Cp (GA, NC, SC, VA): deciduous and coniferous forests, stream-banks, heath balds, maritime forests, on rotten logs; common. May-June; June-July. Nova Scotia west to MN, south to 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, Z]

Mitracarpus Zuccarini (Girdle-pod)

A genus of about 30 species, of tropical America. References:

* ***Mitracarpus hirtus*** (Linnaeus) Augustin de Candolle, Girdle-pod. Cp (GA): disturbed areas; rare, native of tropical America. In sw. GA (Jones & Coile 1988) and FL. [= K; *? M. villosus* (Sw.) Chamisso & Schlechtendahl ex Augustin 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; 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 (Augustin de Candolle) Chapman, Bosc's Bluet. Cp (GA, NC, SC, VA), Mt (GA): clay-based Carolina bays, rivershore and millpond drawdown shores, sagponds, other seasonally saturated habitats; rare (GA Special Concern, NC Rare, VA Rare). 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, X, Z; = *Hedyotis boscii* Augustin de Candolle – C, F, GW, Y]

* ***Oldenlandia corymbosa*** Linnaeus, Diamond-flower. Cp (GA, NC, SC), Pd (NC): moist lawns, gardens; rare, native of South America. July-October. Reported for NC by Nesom (2000e). [= RAB, K, S, X, Z; = *Hedyotis corymbosa* (Linnaeus) Lamarck – GW, Y]

Oldenlandia uniflora Linnaeus, Oldenlandia. Cp, Pd (GA, NC, SC, VA): pondshores, muddy drawdown shores, moist to wet ecotones of Coastal Plain streamheads, other moist to wet places; uncommon (rare in Piedmont). August-October. Mostly a species of the Southeastern Coastal Plain, ranging from Long Island, NY south to FL and west to TX, north in the interior to MO. [= RAB, G, K, S, X, Z; = *Hedyotis uniflora* (Linnaeus) Lamarck – C, F, GW, Y]

* *Oldenlandia salzmannii* (de Candolle) Bentham & Hooker ex B.D. Jackson. Roadside ditches, marshes. Native of South America, introduced in s. AL and Panhandle FL. [= K, X]

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 (SC), Pd (NC): disturbed areas, rarely spreading from plantings; rare, native of se. Asia. Diamond (1999) reports its naturalization in Randolph Co., NC. [= RAB, K, S, 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. Schumach. & Thonn.) Vatke. Cp (GA, SC): pond edges, wet meadows, moist ground; rare, apparently native of Africa (GA Special Concern). July-September. In North America, ranging from e. SC south to FL, west to se. TX. [= GW, K, Y, Z; *? P. halei* (Torrey & A. Gray) A. Gray – S; *? Oldenlandia halei* (Torrey & A. Gray) Chapman]

Pinckneya Michaux (Pinckneya, Fever-tree)

Pinckneya is a monotypic genus, 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. References: Godfrey (1988); Rogers (1987)=Z.

Pinckneya bracteata (Bartram) Rafinesque, Pinckneya, Fever-tree. Cp (GA, SC): margins of acidic, peaty (blackwater) swamps; rare (SC Rare). May-June (-July); September. Se. SC south to n. (panhandle) FL. [= GW, K, 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. Hammocks. Ne. FL (Duval County) south to s. FL, West Indies, Central America, and South America. [= K, S, 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 on Krings (2002).

1 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***
1 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 ..... ***R. scabra***

* ***Richardia brasiliensis*** Gomes. Cp, 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, Z]
* ***Richardia scabra*** Linnaeus. Cp, 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, Z]

Sherardia Linnaeus (Field-madder)

A monotypic genus, an herb, native of Europe and w. Asia. References: Rogers (2005)=Z.

Identification notes: Habitally similar to *Galium*, but differing in its involucrate inflorescence and the more tubular, pink to purple flowers.

* ***Sherardia arvensis*** Linnaeus, Field-madder. Pd (GA, NC, SC, VA), Cp, Mt (NC, SC, VA): lawns, disturbed areas; uncommon, native of Europe. February-August. [= RAB, C, F, G, K, S, W, Z]

Spermacoce Linnaeus (Buttonweed)

A genus of ca. 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 (GA): wet sites; rare. 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; *Borreria brachysepala*, misapplied] {synonymy incomplete; not keyed at this time}
Spermacoce glabra Michaux, Smooth Buttonweed. Mt (VA), Cp (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]

* *Spermacoce densiflora* (DC.) Alain. Disturbed areas. Panhandle FL, native of the Neotropics. [= K; = *Borreria densiflora* DC.]
Spermacoce prostrata Aublet. Wet pine flatwoods, floodplain forests. FL, AL, MS, south through the New World tropics. July-September. [= K; = *Borreria ocimoides* (Burmann f.) de Candolle – S, misapplied]
Spermacoce tenuior Linnaeus, reported from sw. GA (Kartesz 1999). {ID needs checking} [= K; *? S. riparia* Chamisso & Schlechtendahl] {not keyed at this time}

RUTACEAE A.L. de Jussieu 1789 (Citrus Family)

A family of about 156 genera and 1800 species, trees, shrubs, vines, and rarely herbs, cosmopolitan.

1 Leaves 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 graveolens***
  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; [subgenus *Rutoideae*, tribe *Zanthoxyleae*] ..... ***Zanthoxylum***
    3 Leaves palmately 3-foliolate.
      4 Branches conspicuously armed with stout spines; [subfamily *Aurantioideae*] ..... ***Citrus***
      4 Branches not armed with spines; [subfamily *Toddalioideae*] ..... ***Ptelea***

Citrus Linnaeus

A genus of about 17 species, trees, of s. and se. Asia. The circumscription is uncertain, but Freitas de Araújo, Paganucci de Queiroz, & Machado (2003) favor a broad circumscription (followed here), including *Poncirus*, based on DNA analyses. References: Mabberley (1997b)=Z; Freitas de Araújo, Paganucci de Queiroz, & Machado (2003)=Y.

Identification notes: *Citrus* has simple to trifoliolate, evergreen, coriaceous, acuminate, and glossy green leaves, and the familiar spherical fruits.

1 Leaves unifoliolate; fruit glabrous, > 8 cm in diameter ..... ***C. ×aurantium***
1 Leaves trifoliolate; fruit densely pubescent, < 6 cm in diameter..... ***C. trifoliata***

* ***Citrus ×aurantium*** Linnaeus (pro sp.), Sour Orange. Cp (GA): cultivated horticulturally, sometimes persistent; rare. Reported from several counties in s. and e. GA (Jones & Coile 1988). [= Z; = *C. aurantium* – K (as species)]

* ***Citrus trifoliata*** Linnaeus, Trifoliate Orange. Pd (GA, NC, SC, VA), Cp (GA, SC, VA): woodlands, thickets, and streambanks, especially in suburban areas; rare, native of China. March-April; September-October. Planted in our area as an ornamental, also used in warmer climates as a grafting stock for citrus, *C. trifoliata* is a small tree or shrub that seems to be made up almost entirely of thorns. The fruits closely resemble an orange, but are small (ca. 4 cm in diameter), densely pubescent, and sour. *Citrus trifoliata* is often considered a separate genus, *Poncirus*, but differs very little from *Citrus* morphologically and has been shown to be phylogenetically nested within Citrus. [= Y; = *Poncirus trifoliata* (Linnaeus) Rafinesque – RAB, F, G, K, S]

* *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. {not keyed}

Poncirus Rafinesque (Trifoliate Orange)
(see *Citrus*)

Ptelea Linnaeus (Hop-tree, Wafer-ash, Stinking Ash)

A genus of about 11 species, of North America (south into Mexico). References: Bailey (1962)=Z.

1 Twigs densely pubescent; leaflets densely soft-pubescent beneath..... ***P. trifoliata* var. *mollis***
1 Twigs glabrous or glabrescent; leaflets usually glabrous or glabrate..... ***P. trifoliata* var. *trifoliata***

Ptelea trifoliata Linnaeus ***var. mollis*** Torrey & A. Gray, Hairy Hop-tree. Cp (GA, NC, SC), Pd (GA, NC, SC), Mt (GA, NC, SC, VA): rocky bluffs, especially calcareous or mafic, open woodlands, calcareous Coastal Plain river bluffs, granitic domes; uncommon. The relative distribution and habitats of the two varieties in our area need further study. April-June; June-August. MD, w. NC, n. GA, n. AL, and c. TX south to e. GA, panhandle FL, and s. TX. Our varieties are both placed by Bailey (1962) as quadrinomials in the eastern ssp. *trifoliata*. [= F; < *P. trifoliata* – RAB; = *P. trifoliata* ssp. *trifoliata* var. *mollis* Torrey & A. Gray – C, K, Z; < *P. trifoliata* var. *trifoliata* – G; >< *P. trifoliata* – S, in part]

Ptelea trifoliata Linnaeus ***var. trifoliata***, Smooth Hop-tree. Mt (GA, NC, VA), Pd (GA, SC, VA), Cp (GA, VA): 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. TX. The relative distribution and habitats of the two varieties in our area need further study. Bailey discusses some odd forms, corresponding in part to Small's

species, which she does not recognize taxonomically; further study is warranted. [= F; < *P. trifoliata* – RAB; = *P. trifoliata* ssp. *trifoliata* var. *trifoliata* – C, K, Z; < *P. trifoliata* var. *trifoliata* – G; > *P. trifoliata* – S, in part; > *P. serrata* Small – S; > *P. microcarpa* Small – S; > *P. baldwinii* Torrey & A. Gray – S]

Ruta Linnaeus (Rue)

A genus of about 7 species, of the Old World.

* ***Ruta graveolens*** Linnaeus, Rue. Pd (NC), Mt (VA): cultivated in gardens as a medicinal herb, persistent and rarely escaping, sometimes locally abundant in pastures over limestone; 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]

Zanthoxylum Linnaeus (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. Mt (VA), Pd (GA, VA), Cp (GA, SC): woodlands and forests over calcareous or mafic rocks, often forming extensive colonies near outcrops; rare (NC Watch List, VA Watch List). March-April; July-August. S. Québec 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, Z; = *Xanthoxylum americanum* – F, orthographic variant]

Zanthoxylum clava-herculis Linnaeus, Toothache Tree, Hercules'-club, Sea-ash, Southern Prickly-ash, Pepper-bark, Tickle-tongue. Cp (GA, NC, SC, VA): maritime forests, dunes, shell middens, shell hammocks, maritime scrub, inland (in GA) in hammock forests; uncommon (VA Watch List). 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 our area 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, Z; = *Xanthoxylum clava-herculis* – F, orthographic variant]

SALICACEAE de Mirbel 1815 (Willow Family)

A family of 2 genera and about 435 species, trees, shrubs, and subshrubs, nearly cosmopolitan.

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 (1977)=Z; Eckenwalder (1984)=Y; Eckenwalder (1996); Hamzeh & Dayanandan (2004).

1 Winter buds viscid (sticky and shiny as if recently varnished); stamens (15-) 20-80.
  2 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*].
    3 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***
    3 Petioles < 2 cm long; leaves obovate, broader past the midpoint; leaf base cuneate to rounded; twigs strongly angled in cross-section ..... ***P. simonii***

2 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.
4 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***
4 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*].
5 Stigmas 3-4; stamens (30-) 40-80; [native tree, common] ..... ***P. deltoides* ssp. *deltoides***
5 Stigmas 2-3; stamens (15-) 20-30; [alien trees, rare out of cultivation].
6 Floral disk 2-4 mm wide; stigmas 2-3; ovules and seeds 6-14 (-20) per placenta ..... ***P.* ×*canadensis***
6 Floral disk 1-2 mm wide; stigmas 2; ovules and seeds 4-8 per placenta ..... ***P. nigra***

1 Winter buds not viscid; stamens 5-20.
7 Stamens 12-20; scales of the catkins deeply fimbriate; petioles terete; [section *Leucoides*] ..... ***P. heterophylla***
7 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*].
8 Petioles strongly flattened laterally; leaves glabrous when mature (pubescent when young in *P. grandidentata*); [native trees].
9 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***
9 Leaf margins finely crenulate-serrulate, with 15-35 (-70) teeth per side, the sinuses 0.5-1.0 mm deep; leaves glabrous; buds glossy brown ..... ***P. tremuloides***
8 Petioles terete or nearly so; leaves densely pubescent (*P. alba*) or glabrescent (*P.* ×*canescens*); [exotic trees].
10 Leaves of vigorous shoots palmately 3-7-lobed (and also toothed); leaves densely white-tomentose beneath when young and mature ..... ***P. alba***
10 Leaves of vigorous shoots merely toothed; leaves glabrescent when mature ..... ***P.* ×*canescens***

* ***Populus alba*** Linnaeus, Silver Poplar, White Poplar. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas, suburban woodlands; uncommon, native of Europe. March-April. [= RAB, C, F, G, K, S, W]

* ***Populus* ×*canadensis*** Moench (pro sp.) [*P. deltoides* × *nigra*], Hybrid Black Poplar. Pd (GA) {NC, VA}: disturbed areas; rare. Reported for a county in c. GA (Jones & Coile 1988) and for NC and VA (Kartesz 1999). [= C, K]

* ***Populus* ×*canescens*** (Aiton) Sm. (pro sp.) [*P. alba* × *tremula*], Gray Poplar. Mt (GA, NC), Pd (GA, NC), Cp (NC), {SC, VA}: roadsides, disturbed areas; uncommon, 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, K; = *P. canescens* (Aiton) Sm. – F, G]

Populus deltoides Bartram ex Marshall *var.* ***deltoides***, Eastern Cottonwood. Pd, Cp (GA, NC, SC, VA), Mt (GA, VA): riverbanks, bottomland forests (not found along blackwater streams); common. March-April. Var. *deltoides* ranges from Québec west to MN, south to 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; > *P. deltoides* var. *deltoides* F; > *P. deltoides* var. *missouriensis* (A. Henry) A. Henry – F; = *P. deltoides* ssp. *deltoides* – K, Z; = *P. balsamifera* Linnaeus – S, misapplied]

Populus grandidentata Michaux, Bigtooth Aspen. Mt (NC, VA), Pd, Cp (VA): dry, rocky, upland forests; common, rare south of VA (NC Watch List). April-May. Nova Scotia west to MN, south to w. NC, sc. TN, and n. MO. [= RAB, C, F, G, K, S, W]

Populus heterophylla Linnaeus, Swamp Cottonwood. Cp (GA, NC, SC, VA), Pd (NC, VA): blackwater and brownwater swamp forests; common (rare in Piedmont). March-April. CT west to MI, south to n. FL and LA, scattered and irregular in distribution, absent from the Appalachians. [= RAB, C, G, GW, K, S]

* ***Populus* ×*jackii*** Sargent [probably *P. balsamifera* × *deltoides*], Balm-of-Gilead. Mt (NC, VA): bottomlands, riverbanks, streambanks; rare or locally abundant, 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, K, Y; = *P. candicans* Aiton – RAB, G, S, misapplied; > *P.* ×*gileadensis* Rouleau – F, W]

* ***Populus nigra*** Linnaeus, Black Poplar, Lombardy Poplar. Pd (GA, VA), Cp (GA): 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, G, K; > *P. italica* (Du Roi) Moench – S]

* ***Populus simonii*** Carrière, Chinese Poplar, Simon's Poplar. Mt (NC): riverbanks; rare, native of China. Naturalized in the Mountains of NC.

Populus tremuloides Michaux, Quaking Aspen. Mt (NC, VA), Pd (VA): heath balds, rocky woodlands, exposed rock oucrops, and clearings; rare (VA Rare). April-May. Labrador west to AK, south to NJ, VA, w. NC, WV, MO, and (in the Rockies) to TX and Mexico. [= C, G, K, S, W; > *P. tremuloides* var. *tremuloides* – F]

Populus balsamifera Linnaeus, Balsam Poplar, Hackmatack, 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). I have been unable to locate herbarium specimens documenting its occurrence in our primary area. {further investigate}. [= C, G; = *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 ×*smithii* Boivin [*P. grandidentata* × *tremuloides*]. South to MD and WV. [= C, K] {not keyed at this time}

Salix Linnaeus 1753 (Willow)

A genus of about 400 species, trees, shrubs, and subshrubs, mostly north temperate and boreal. References: Argus (1986)=Z; Dorn (1995)=Y; Argus (1997). Key adapted from Z.

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 *Salix*].
    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 serrulate or serrate.
        11 Shrubs to 6 m tall; leaves lacking stomates on the upper surface; [native to our area]; [subgenus *Vetrix*].
          12 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***
          12 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***
        11 Trees; leaves with stomates on the upper surface; [introduced in our area]; [subgenus *Salix*].
          13 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***
          13 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.
            14 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*] ..... ***S. babylonica***
            14 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***

10 Leaf margin entire or crenate (to slightly and irregularly serrate); [subgenus *Vetrix*, section *Cinerella*].
15 Leaves glabrate (sparsely pubescent when young), not revolute ..... ***S. discolor***
15 Leaves permanently pubescent, at least on the lower surface (densely villous or tomentose when young), revolute.
16 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.
17 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***
17 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***
16 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.
18 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***
18 Shrubs, 3-7 (12) m tall; decorticated wood of 1-4 year old branches with numerous ridges, many of them longer than 2 cm.
19 Leaves tomentose beneath with a mixture of white and rusty hairs..... ***S. atrocinerea***
19 Leaves tomentose beneath with white or gray hairs ..... ***S. cinerea***

* ***Salix alba*** Linnaeus, European White Willow. Mt (GA, NC, VA), Pd (GA, NC, VA), Cp (VA): disturbed areas; rare, native of Eurasia. March-April. [= RAB, C, F, G, K, S, W, 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). [= K; = *S. cinerea* Linnaeus ssp. *oleifolia* (Smith) Macreight – Z; < *S. cinerea* – RAB, C, F, G]

* ***Salix babylonica*** Linnaeus, Weeping Willow. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas; common, native of Asia. March-April. [= RAB, C, F, G, K, S, W, Z; > *S.* ×*pendulina* Wenderoth (*fragilis* × *?sepulcralis*) – K; > *S.* ×*sepulcralis* Simonkai (*alba* × *?pendulina*) – K]

* ***Salix caprea*** Linnaeus, Goat Willow, Great Sallow. Mt (NC, VA), Pd (VA): disturbed areas; rare, native of Eurasia. April. [= C, F, G, K, Z]

Salix caroliniana Michaux, Carolina Willow, Coastal Plain Willow. Cp, Pd, Mt (GA, NC, SC, VA): riverbanks, sandbars, other wet sites; common (uncomomon to rare 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 FL, the Interior Low Plateau of TN, KY, and n. AL, and the Ozark-Ouachita Highlands of AR and MO. [= RAB, C, F, G, GW, K, Z; = *S. longipes* Andersson – S]

* ***Salix cinerea*** Linnaeus, Gray Willow. Mt (NC, SC, VA), Pd (GA, NC, SC, VA), Cp (NC): disturbed areas; rare, native of Eurasia. April. [= K; = *S. cinerea* ssp. *cinerea* – Z; < *S. cinerea* – RAB, C, F, G (circumscription uncertain but apparently including *S. atrocinerea*)]

Salix discolor Muhlenberg, Pussy Willow. Mt (VA), Pd (NC): calcareous wetlands, disturbed areas; rare, apparently native in VA, introduced only in NC (VA Rare). April. Newfoundland and Alberta south to DE, w. VA, KY, MO, SD, and MT. [= C, K, S, Z; > *S. discolor* var. *discolor* – F, G]

Salix eriocephala Michaux *var.* ***eriocephala***, Heart-leaved Willow. Mt, Pd, Cp (GA, VA): seepage areas, ditches, alluvial areas; common. April-May. Newfoundland and Québec west to Yukon and British Columbia, south to e., c., and w. VA, n. KY, w. TN, n. AR, ne. KS, and CA; disjunct in AL and adjacent w. GA, s. GA, and panhandle FL. Var. *eriocephala* is the more eastern of six varieties, and ranges from Newfoundland west to ND, south to w. FL and s. KS (Dorn 1995). [< *S. eriocephala* – C, K, W, 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. eriocephala* ssp. *eriocephala* var. *eriocephala* – Y]

Salix exigua Nuttall *var.* ***sericans*** (Nees) Nesom, Sandbar Willow. Mt, Pd, Cp (VA): sandbars, riverbanks, creekbanks; rare (VA Rare). March-mid May and June-August. *S. exigua* occurs throughout North America except most of the Southeast, south to DE, 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 – GW, K, S]

Salix floridana Chapman, Florida Willow. Cp (GA): sphagnous seepages; rare (GA Endangered). March-April. C. GA south to c. peninsular and Panhandle FL. [= GW, K, S, Z]

* ***Salix fragilis*** Linnaeus, Crack Willow, Brittle Willow. Pd (VA): low areas; rare, native to Asia Minor, introduced to Europe and thence to here. [= C, F, G, K, S, Z]

Salix humilis Marshall, Upland Willow, Prairie Willow. Mt, Pd (GA, NC, VA), Cp (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. This species is widespread in e. North America. [= C, G, S; < *S. humilis* – RAB, GW (also see *S. occidentalis*); = *S. humilis* var. *humilis* – K, W, Z; > *S. humilis* var. *humilis* – F; > *S. humilis* var. *hyporhysa* Fernald – F]

* ***Salix lucida*** Muhlenberg, Shining Willow. Mt (VA): low areas; rare (VA Watch List). May. Doubtfully indigenous to the one known population in Roanoke County, VA. [= C, W, Z; > *S. lucida* var. *lucida* – F, G; = *S. lucida* ssp. *lucida* – K]

Salix nigra Marshall, Black Willow. Pd, Mt, Cp (GA, NC, SC, VA): riverbanks, sandbars, other moist areas; common. March-April. *S. nigra* occurs nearly throughout e. North America. [= RAB, F, G, GW, K, S, W, Z; *S. nigra* var. *nigra* – C]

Salix occidentalis Walter, Dwarf Upland Willow, Sage Willow. Mt, Pd (GA, NC, VA), Cp (GA, NC, SC, VA): upland areas, often over mafic (amphibolite) or ultramafic (olivine) rocks; uncommon. March-May. This species is less widespread than the related *S. humilis*, with a distribution centered in the central Appalachians. [= C; < *S. humilis* – RAB, GW; = *S. humilis* var. *microphylla* (Andersson) Fernald – F, W, Z; = *S. tristis* Aiton – G, S; = *S. humilis* var. *tristis* (Aiton) Griggs – K]

* ***Salix pentandra*** Linnaeus, Bay Willow. Pd, Mt (NC, VA): disturbed areas; rare (perhaps not established), native of Eurasia. April. [= C, F, G, K, Z]

* ***Salix purpurea*** Linnaeus, Basket Willow, Purple Willow, Purple Osier. Mt (NC, VA), Pd (GA, VA): disturbed areas; rare, native of Europe. April. [= RAB, C, F, G, K, S, Z]

Salix sericea Marshall, Silky Willow. Mt (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): bogs, peaty swamps, banks of small streams; uncommon. 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, G, GW, K, S, W, Z]

Salix amygdaloides Andersson, Peachleaf Willow. East to w. KY. [= C, F, G, K, Z] {add to synonymy}

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, K, Z; > *S. bebbiana* var. *bebbiana* – F] {subgenus *Salix*, section *Fulvae*}

Salix cordata Michaux, south to MD, PA (Kartesz 1999). {investigate} [= C, K; > S. cordata var. cordata – F] {not keyed at this time}

* ***Salix elaeagnos*** Scopoli is reported for SC (Kartesz 1999). [= K] {subgenus *Vetrix*, section *Canae*} {not keyed}

* ***Salix matsudana*** Koidzumi, Corkscrew Willow, is reported for VA (Fairfax and Fauquier counties). [= K] {not keyed}

SAMOLACEAE Rafinesque 1820 (Water-pimpernel Family)

A monogeneric family of 10-15 species, herbs and subshrubs, cosmopolitan. *Samolus* was previously generally treated as an aberrant component of Primulaceae. The traditional families Primulaceae, Myrsinaceae, and Theophrastaceae have been repartitioned by Källersjö, Bergqvist, & Anderberg (2000) in order to create monophyletic groups, with *Samolus* placed in Theophrastaceae. However, *Samolus* remains aberrant in Theophrastaceae and is basal; it is probably best placed in its own family, Samolaceae (Ståhl in Kubitzki 2004). References: Källersjö, Bergqvist, and Anderberg (2000); Ståhl in Kubitzki (2004).

Samolus Linnaeus (Water-pimpernel)

A genus of about 10-15 species, herbs and subshrubs, nearly cosmopolitan. References: 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. floribundus***

Samolus floribundus Humboldt, Bonpland, & Kunth, Water-pimpernel, Brookweed. Cp, Pd (GA, NC, SC, VA), Mt (GA, VA): stream banks, brackish marshes, pools in floodplains, interdune ponds; common. April-October. New Brunswick west to British Columbia, 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. floribundus* has priority over *S. parviflorus* by a month. [= C, G, S; = *S. parviflorus* Rafinesque – RAB, F, GW, W; = *S. valerandi* Linnaeus ssp. *parviflorus* (Rafinesque) Hultén – K]

Samolus ebracteatus Humboldt, Bonpland, & Kunth, Limewater Brookweed. Brackish marshes, swmaps over calcareous substrate. Peninsular FL, coastal Panhandle FL, s. LA, and TX, south into Mexico; West Indies. [= GW; > *S. ebracteatus* ssp. *ebracteatus* – K; > *S. ebracteatus* ssp. *alyssoides* – K]

SANTALACEAE R. Brown 1820 (Sandalwood Family)

A family of about 34 genera and 540 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 roots of other plants. Viscaceae are closely related and should perhaps be included (Angiosperm Phylogeny Group 2003). References: Nickrent & Malécot (2001).

1 Leaves alternate; monoecious herb or shrub.
  2 Herb, < 2 (-3) dm tall; leaves 1-4 cm long; inflorescence a terminal panicle of cymes; [tribe *Comandreae*] ..... ***Comandra***
  2 Shrub, > 4 dm tall; leaves 5-15 cm long; inflorescence a terminal raceme; [tribe *Pyrularieae*] ..... ***Pyrularia***
1 Leaves opposite; dioecious shrub.

3 Staminate flowers in terminal umbel-like dichasia; pistillate flowers solitary, terminal; clumped shrub to 4 m tall; [tribe *Thesiae*]..... ***Buckleya***
3 Staminate flowers in axillary umbels; pistillate flowers solitary, axillary; rhizomatous shrub to 1 m tall; [tribe *Santaleae*] ..... ***Nestronia***

Buckleya Torrey (Piratebush)

A genus of 4 species, shrubs, of temperate e. North America and e. Asia – the 3 other species are *B. lanceolata* (Siebold & Zuccarini) Miquel of Japan, and *B. henryi* Diels and *B. graebneriana* Diels of China. References: Carvell & Eshbaugh 1982=Z; Massey et al. (1983).

Buckleya distichophylla (Nuttall) Torrey, Piratebush. Mt (NC, VA): dry or rocky bluffs and slopes; rare (US Species of Concern, NC Endangered, VA Endangered). 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 umbellata (Linnaeus) Nuttall *var. **umbellata***, Eastern Bastard-toadflax. Pd, Mt (GA, NC, SC, VA), Cp (NC, SC, VA): dry forests and woodlands, woodland borders; common. April-early June; July. Ssp. *umbellata* ranges from ME to MI, south to n. GA and AL; other subspecies are western. [= C; < *C. umbellata* – RAB, W; = *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. 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 (GA Threatened, NC Watch List, SC Rare, VA Endangered). 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]

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 pubera Michaux, Buffalo-nut, Oil-nut. Mt, Pd (GA, NC, SC, VA): moist forests; common. April-May; July-October. A Southern and Central Appalachian endemic, *Pyrularia* 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]

SAPINDACEAE A.L. de Jussieu 1789 (Soapberry Family)

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. Evidence increasingly suggests that the inclusion of the Hippocastanaceae and Aceraceae in the Sapindaceae is warranted.

1 Leaves simple (lobed and/or toothed) ..... ***Acer***
1 Leaves compound.
2 Leaves palmately compound..... ***Aesculus***
2 Leaves pinnately or biternately compound.
3 Vine; leaves biternately compound ..... ***Cardiospermum***

3 Tree or shrub; leaves pinnately compound.
4 Leaflets entire; fruit drupe-like; [native, of coastal hammocks of se. SC southward] ..... ***Sapindus***
4 Leaflets coarsely toothed; fruit a samara or inflated "pod;" [native or alien, collectively widespread].
5 Fruit a samara; [native or alien]..... ***Acer***
5 Fruit inflated; [alien ornamental, rarely escaped]..... ***Koelreuteria***

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 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).
4 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; leaves silvery white beneath; flowers **either** with petals (*A. palmatum*) **or** without petals (*A. saccharinum*).
5 Leaves green beneath (or purplish in many forms); main leaf lobes 5-9, these main lobes merely toothed or variously further divided; small exotic tree, commonly planted and weakly naturalizing]; [section *Palmata*] ... . ***A. palmatum***
5 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***
4 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; leaves green, pale-green, greenish-white, or strongly glaucous-whitened beneath; flowers with petals.
6 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).
7 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***
7 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***
6 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** spring; leaves slightly to strongly glaucous-whitened beneath; medium to large tree (to 100 cm DBH).
8 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]***
8 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*].
9 Mature leaves densely felty-pubescent beneath; mature samaras 2.7-5 cm long..... ***A. drummondii***
9 Mature leaves glabrous (or nearly so) beneath; mature samaras 1.5-3 cm long.
10 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, except peaty wetlands of the Coastal Plain] ..... ***A. rubrum*** *var*. ***rubrum***

10 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***

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.

11 Petioles and young twigs exuding milky sap when broken; inflorescence peduncled, the flowers on ascending, moderately stout pedicels; [section *Platanoidea*].

12 Leaves 3-5-lobed, 5-10 cm wide .....***[A. campestre]***

12 Leaves 5-7-lobed, 10-18 cm wide .....***A. platanoides***

11 Petioles and young twigs exuding clear sap when broken; inflorescence sessile, the flowers on drooping, filiform pedicels; [section *Acer*, series *Saccharodendron*].

13 Leaves pale, grayish, silvery-gray, or strongly heavily 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. barbatum*, and especially in sun-exposed individuals.

14 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***

14 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***

13 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.

15 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***

15 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***

Acer drummondii Hooker & Arnott ex Nuttall, Swamp Red Maple, Drummond Red Maple. Cp (GA, NC, SC, VA): swamps and floodplains; uncommon. January-March; April-June. *A. drummondii* is mostly southern, ranging north to NJ (?), IN, and MO. It reaches its greatest abundance in the basin of the Mississippi River. Because this taxon is more distinctive than the other taxa in the *A. rubrum* complex, it is often (as here) given specific status. [< *A. rubrum* – RAB, C, GW; = *A. rubrum* Linnaeus var. *drummondii* (Hooker & Arnott ex Nuttall) Sargent – F, G, K; = *Rufacer drummondii* (Hooker & Arnott ex Nuttall) Small – S; = *A. rubrum* ssp. *drummondii* (Nuttall) Murray – Z]

Acer floridanum (Chapman) Pax, Southern Sugar Maple, Florida Maple. Pd, Cp (GA, NC, SC, VA), Mt (GA): bottomland forests, mesic slopes, especially common over mafic or calcareous rocks, but not at all limited to such situations; common, rare in Mountains. April-May; June-October. S. VA, w. TN, w. KY (Clark et al. 2005), se. MO, and e. OK south to FL and 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, 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 leucoderme Small, Chalk Maple. Pd, Mt (GA, NC, SC), Cp (GA): rocky slopes and bluffs, particularly over mafic or calcareous rock; uncommon (rare in Mountains and Coastal Plain). 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 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, Z; = *Saccharodendron leucoderme* (Small) Nieuwland – S]

Acer negundo Linnaeus var. ***negundo***, Eastern Box Elder, Ash-leaved Maple. Pd, Cp, Mt (GA, NC, SC, VA): riverbanks, swamps, bottomlands; common (uncommon in Coastal Plain and Mountains). March-April; May-October. The species, broadly treated, ranges nearly across North America, including well into the arid west along rivers. Var. *negundo* is the typical eastern variety, occurring throughout e. North America. *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; > *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. Mt (NC): riverbanks and bottomlands: rare. April; June-October. The status of this variety in our area is poorly known at present. Var. *texanum* is primarily southcentral in distribution

(Texan and Ozarkian), but apparently scattered as far east as w. NC and s. OH. [= 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. Mt (GA, NC, VA): riverbanks, streambanks, cove forests, river slope forests; uncommon in VA, rare in GA and NC (NC Watch List). May-June; June-September. Fairly widespread in nc. North America, *A. nigrum* ranges 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) E. Murray]

* ***Acer palmatum*** Thunberg, Japanese Maple. Pd (NC, VA): suburban woodlands; rare, native of e. Asia. April; August-September. Frequently planted in its numerous cultivars. Infraspecific taxa are recognized in its native area. It is reported as escaped in the DC area (Shetler & Orli 2000). [= K, Z]

Acer pensylvanicum Linnaeus, Striped Maple. Mt (GA, NC, SC, VA), Pd (VA): dry to mesic forests; common, rare in Piedmont (SC Rare). May; June-September. Primarily a broad Appalachian species, but extending into the Great Lakes region, south to PA and OH, and, in the mountains, to w. NC, e. TN, ne. GA, and nw. SC. The prominently striped bark of this common, mid-elevation understory tree is unmistakable. [= RAB, C, F, G, K, S, W, Z]

* ***Acer platanoides*** Linnaeus, Norway Maple. Mt, Pd, Cp (VA): suburban woodlands, disturbed forests, hedgerows; uncommon, 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 rubrum Linnaeus var. ***rubrum***, Eastern Red Maple. Mt, Pd, Cp (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 NC; indeed it is one of the most ubiquitous and common trees in the state. 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; < *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 (GA, NC, SC, VA): wetlands, especially peaty, acid sites; common. 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; < *A. rubrum* var. *rubrum* – G; = *Rufacer carolinianum* (Walter) Small – S]

Acer saccharinum Linnaeus, Silver Maple, Soft Maple. Mt, Pd, Cp (GA, NC, SC, VA): bottomlands, riverbanks, and disturbed areas; uncommon (locally common). February-April; April-July. Widespread in ne. North America, south to AL and MS west of the Appalachians, east of the Appalachians and south of VA, rare and mostly introduced. 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. [= RAB, C, F, G, GW, K, W, Z; = *Argentacer saccharinum* (Linnaeus) Small – S]

Acer saccharum Marshall, Sugar Maple, Hard Maple, Sugar Tree. Mt (GA, NC, VA), Pd (*GA, *NC, *SC, VA): 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); common (rare in Piedmont, where perhaps only introduced south of VA). April-June; June-September. Two varieties are sometimes recognized. Var. *saccharum* is widespread in ne. and nc. North America. 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. Mt (GA, NC, VA): high elevation forests (northern hardwoods or spruce-fir), generally above 1500 m in NC, above 1000m in VA, especially common in periglacial boulderfields; uncommon (GA Special Concern). May-July; August-October. Widespread in ne. North America, south to PA and OH, 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]

* *Acer campestre* Linnaeus, Hedge Maple, native of Europe and w. Asia, is 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 ginnala* Maximowicz, Amur Maple, native of e. Asia, is reported as "cultivated and escaped" in s. PA (Rhoads & Klein 1993). Infraspecific taxa are often recognized in its native area. [subgenus *Acer*, section *Ginnala*] [= F, K, Z] {not keyed at this time}

* *Acer pseudoplatanus* Linnaeus, Sycamore Maple, native of Europe, is planted in our area as a street and yard tree, especially in the mountains. It may be naturalized in our area; northward it is a noxious weed tree. [= C, G, K, Z; = *Acer pseudo-platanus* – F, orthographic variant]

The hybrid *Acer* ×*freemanii* E. Murray [*A. rubrum* × *saccharinum*] has been collected at scattered locations in our area.

Aesculus Linnaeus (Buckeye)

A genus of about 13 species, trees and shrubs, of temperate North America, e. Asia, and se. Europe. References: Hardin (1957a, 1957b)=Z.

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*] ..... ***Ae. hippocastanum***
1 Petals 4 (or 4-5 in *Ae. parviflora*), cream-colored, yellow, red; or white (and then lacking a red blaze); buds not glutinous; fruit smooth (or with some prickles in *Ae. 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*] ..... ***Ae. 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) ..... ***Ae. 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 ..... ***Ae. 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. ..... ***Ae. flava***
        5 Calyx and pedicels puberulent; shrub to small tree; petiolules 3-12 mm long; fruits 2-4 cm in diameter ... . ***Ae. sylvatica***

Aesculus flava Solander, Yellow Buckeye. Mt, Pd (GA, NC, SC, VA): moist forests, up to nearly 2000m, especially prominent in seepy cove forests, in the Piedmont only in "montane" habitats; common (rare in Piedmont). 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. Mt (GA): mesic forests over limestone; rare (GA Special Concern). 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; < *Ae. glabra* – S]

* ***Aesculus hippocastanum*** Linnaeus, Horsechestnut. Mt (NC), Pd (NC, SC): 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; rare, native of se. Europe. [= C, F, G, K, Z]

Aesculus parviflora Walter, Bottlebrush Buckeye. Cp (GA), Pd (GA, SC): mesic forests on bluffs and in ravines (the SC occurrence is on Fall Line river bluffs, with shaley, subcalcareous soils); rare (GA Special Concern, SC Rare). 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. Cp, Pd (GA, NC, SC), Mt (GA): swamp forests, usually stagnant, usually blackwater (not receiving significant alluvium), and especially over marl (coquina limestone); uncommon (rare in Piedmont). April-early May; July-August. Var. *pavia* ranges from se. NC south to n. 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. 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; >< *A. pavia* – F; >< *A. discolor* Pursh – F]

Aesculus sylvatica Bartram, Painted Buckeye. Pd (GA, NC, SC, VA), Cp (GA, NC, VA), Mt (GA, NC, SC): 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; common. 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*); > *Ae. georgiana* Sargent]

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.

Cardiospermum Linnaeus (Balloon Vine)

A genus of about 14 species, vines, of tropical regions (especially America).

* ***Cardiospermum halicacabum*** Linnaeus, Balloon Vine, Heartseed. Mt (GA), Pd (SC): disturbed areas; rare, introduced from tropical America. August-September. [= RAB, F, G, K, S; = *C. halicababum* – C, orthographic error]

Koelreuteria Laxmann (Golden Rain Tree)

A genus of 3 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 paniculata*** Laxmann, Golden Rain Tree. Pd (NC, VA): disturbed areas, roadsides; rare, introduced from n. China (frequently cultivated as an ornamental tree, rarely escaped). June; September. [= RAB, C, F, G, K]

* *Koelreuteria bipinnata* Franchet, Bougainvillea Golden Rain Tree. Becoming popular horticulturally, and producing abundant seedlings near the planted specimens; potentially invasive. Native of s. China. [= Z]
* *Koelreuteria henryi* Dümmer, Flamegold. 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. Native of Taiwan. [*Koelreuteria elegans* (Seem.) A.C. Smith ssp. *formosana* (Hayata) F.G. Meyer – K, Z]

Sapindus Linnaeus (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. Cp (GA, SC?): coastal marsh hammocks, shell middens; rare (GA Special Concern). May-June. Se. SC (?) and e. GA south to c. peninsular FL (Lee and Brevard counties). 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]

SAPOTACEAE A.L. de Jussieu 1789 (Sapodilla Family)

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: 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. Four of the five taxa in or approaching our area were originally named in *Sideroxylon*. References: 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 pubescencestems of shoots of the season pale gray or silvery..... ***S. alachuense***
    6 Lower leaf surface glabrous or glabrescent, green.
      7 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***
      7 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.
        8 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***
        8 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. Cp (GA): sandy hammocks, shell middens; rare (GA Special Concern). [= K; = *Bumelia anomala* (Sargent) R.B. Clark – V, Y; = *S. alachense* – X, misspelled; = *B. lanuginosa* (Michaux) Persoon var. *anomala* Sargent]

Sideroxylon lanuginosum Michaux ***ssp. lanuginosum***, Eastern Gum Bumelia, Eastern Gum Bully. Cp, Pd (GA): mesic to floodplain forests; common. E. GA south to nc. FL, west to LA. Other subspecies are more western. Reported for SC by Kartesz (1999). {investigate} [= 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 lycioides Linnaeus, Buckthorn Bumelia, Buckthorn Bully. Cp (GA, NC, SC, VA), Pd (GA, NC), Mt (GA): 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; uncommon (NC Watch List, VA Watch List). June-July; September-October. Se. VA south to panhandle FL, west to se. TX, north in the interior to 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. [= 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. Cp (GA): longleaf pine sandhills; rare (GA Special Concern). Endemic to sc. GA (Appling, Candler, Emanuel, Evans, Jeff Davis, Laurens, Long, Montgomery, Pierce, Tattnall, Toombs, Treutlen, and Wheeler counties). [= *Sideroxylon macrocarpum* (Nuttall) J.R. Allison – U; < *B. reclinata* (Michaux) Ventenat var. *reclinata* – Q, Y; < *B. reclinata* – V; = *Bumelia macrocarpa* Nuttall]

Sideroxylon reclinatum Michaux ***ssp. reclinatum***, Smooth Bumelia, Florida Bully. Cp (GA, SC): floodplain forests and river margins; rare. Ssp. *reclinatum* ranges from s. SC and se. GA south to c. peninsular FL. Ssp. *austrofloridense* (Whetstone) Kartesz & Gandhi [= K; *Bumelia reclinata* (Michaux) Ventenat var. *austrofloridensis* Whetstone] occurs in peninsular FL. [= K, X; > *Bumelia reclinata* – S; > *B. microcarpa* Small – S; < *B. reclinata* (Michaux) Ventenat var. *reclinata* – Q, Y; < *B. reclinata* – V; < *S. reclinatum* – Z]

Sideroxylon tenax Linnaeus, Tough Buckthorn, Tough Bumelia, Tough Bully. Cp (GA, NC, SC): maritime scrub, maritime forests, also inland; rare (NC Rare). May-June; September-October. Se. NC south to c. peninsular FL. [= 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. Cp (GA): bottomlands and limesink depressions, particularly over calcareous substrates; rare (GA Endangered). May-June; August-early October. Ne. GA south to FL and west to AL. The validity of this species has been supported by Anderson (1996). [= K, X, Z; = *Bumelia thornei* Cronquist – Y]

Sideroxylon lanuginosum Michaux ssp. *oblongifolium* (Nuttall) T.D. Pennington, Western Gum Bumelia, Western Gum Bully. AL and KY west to KS, OK, and TX. [= 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 rufohirtum Herring & Judd, Red-haired Bully. Hammocks. N. FL. [= *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]

SARRACENIACEAE Dumortier 1829 (Pitcherplant Family)

A family of 3 genera and about 17 species, perennial insectivorous herbs, of e. North America (*Sarracenia*), w. North America (*Darlingtonia*), and ne. South America (*Heliamphora*). References: Kubitzki in Kubitzki (2004).

Sarracenia Linnaeus 1753 (Pitcherplant)

A genus of about 11 species, perennial insectivorous herbs, of e. North America. References: McDaniel (1971)=U; Wood (1960)=Z; Schnell & Determann (1997)=Y; Schnell (2002b)=X; Bell (1949)=Q; Case & Case (1976)=V; 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).

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 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; petiolar base of pitchers short, abruptly widened into the pitcher; [of pine savannas]; [widespread from se. NC southward] ..... ***S. minor*** *var.* ***minor***
    - 8 Pitchers and scapes 40-100 cm tall; petiolar base of pitchers elongate, gradually widened into the pitcher; [of floating peat mats and otrher very wet sites; [endemic to the Okeefenokee Swamp, 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 s. AL and s. MS] ..... ***[S. alabamensis ssp. alabamensis]***

13 Pitchers background color tan, the upper pitcher strongly reticulately veined on the outer surface; [of c. AL (Autauga, Elmore, and Chilton counties] ..... ***[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 flava Linnaeus, Yellow Pitcherplant, Trumpets. Cp, Pd (GA, NC, SC, VA): savannas, seepage bogs, pocosins; common, rare in Piedmont and rare in VA (VA Rare). 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, G, GW, K, Q, U, W, Z; < *S. flava* – S (also see *S. oreophila*); > *S. flava* var. *flava* – X; > *S. flava* var. *atropurpurea* (Bull) 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. Mt (NC, SC): bogs; rare (US Endangered, NC Endangered, SC Rare). 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. [= V, W; < *S. rubra* – RAB, GW, Q, U, Z; = *S. rubra* ssp. *jonesii* (Wherry) Wherry – K, X]

Sarracenia leucophylla Rafinesque, Whitetop Pitcherplant, Crimson Pitcherplant. Cp (GA, *NC): wet pine savannas; rare (GA Endangered). 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. [= GW, K, U, X, Z; = *S. drummondii* Croom – Q, S]

Sarracenia minor Walter *var. **minor***, Hooded Pitcherplant. Cp (GA, NC, SC): wet savannas; uncommon, rare in NC (NC Watch List). April-May; June-July. Se. NC south through SC and GA to c. peninsular and e. panhandle FL. [< RAB, GW, K, Q, S, U, X, Z]

Sarracenia minor Walter *var. **okeefenokeensis*** Schnell, Okeefenokee Hooded Pitcherplant. Cp (GA): on floating vegetation mats, ditches, and other very wet sites; rare (endemic to Okeefenokee Swamp, se. GA). See Schnell (2002a) for additional information. [< GW, K, Q, S, U, X, Z]

Sarracenia oreophila (Kearney) Wherry, Green Pitcherplant. Mt (GA, NC): seepage bogs; rare (US Endangered, GA Endangered, NC Endangered). 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). [= GW, K, Q, U, W, X, Z; < *S. flava* – S]

Sarracenia psittacina Michaux, Parrot Pitcherplant. Cp (GA): savannas; uncommon (GA Threatened). 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. [= GW, K, Q, S, U, X, Z]

Sarracenia purpurea Linnaeus *var.* ***montana*** Schnell & Determann, Southern Appalachian Purple Pitcherplant. Mt (GA, NC, SC), Pd (NC, SC): mountain bogs, seepage bogs; rare (GA Endangered). 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. *venosa* (Rafinesque) Fernald var. *montana* Schnell & Determann – K, Y]

Sarracenia purpurea Linnaeus *var.* ***purpurea***, Northern Purple Pitcherplant. Cp (VA): bogs; rare (VA Rare). 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* is northeastern, extending south to ne. VA, MD, DE, and NJ. 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; = *S. purpurea* ssp. *gibbosa* (Rafinesque) Wherry – K; = *S. purpurea* var. *terrae-novae* de la Pylaie – Reveal (1993); = *S. purpurea* ssp. *purpurea* – X]

Sarracenia purpurea Linnaeus *var.* ***venosa*** (Rafinesque) Fernald, Southern Purple Pitcherplant. Cp (NC, SC, VA), Pd? (NC?): wet savannas, sandhill seepage bogs; common (VA Rare). 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; 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 and 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* 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. Cp (GA): wet pine savannas and seepage bogs; rare (GA Endangered). Sw. GA 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*. [< *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. Cp (GA): seepage bogs and savannas; rare. 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*." [= K, X; < *S. rubra* – GW, S, U, V, Z]

Sarracenia rubra Walter *ssp.* ***rubra***, Sweet Pitcherplant, Redflower Pitcherplant. Cp (GA, NC, SC): sandhill seepage bogs, pocosins, wet savannas; uncommon (GA Endangered, SC Rare). 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). [= K, X; < *S. rubra* – RAB, GW, Q, S, U, V, Z (also see *S. jonesii* and/or *S. species 2*)]

Sarracenia alabamensis F.W. and R.B. Case ssp. *alabamensis*, Alabama Pitcherplant. Seepage bogs. Endemic to c. AL. See Case (2005). [= 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). [= V; = *S. rubra* Walter ssp. *wherryi* (F.W. & R.B. Case) Schnell – K, X; < *S. rubra* – GW, S, U, Z]

Sarracenia alata Wood, Pale Pitcherplant. Savannas, seepage bogs in the Coastal Plain. S. AL west to e. TX. [= GW, K, U, X, Z; = *S. sledgei* Macfarlane – Q, S]

Hybrids between the various species of pitcher-plants are relatively frequent; see Bell (1952) and Bell & Case (1956) 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. *S.* ×*catesbaei* is by far the most frequent of the hybrids. The following hybrids are known to occur in our area:

Sarracenia flava* × *leucophylla [*S.* ×*moorei* Masters]. Known from GA. [= K, X]
Sarracenia flava* × *minor [*S.* ×*harperi* Bell]. Known from GA and SC (Charleston and Hampton counties). [= K, X]
Sarracenia flava* × *purpurea [*S.* ×*catesbaei* Elliott]. Known from NC (Brunswick, Carteret, Harnett, Iredell, Montgomery, and Pender counties), SC (Chesterfield County), and VA (Greensville County). [= K, X]
Sarracenia flava* × *rubra [*S.* ×*popei* hort. ex Masters]. Known from NC (Moore County). [= K, X]

Sarracenia minor × ***psittacina*** [*S.* ×*formosa* Veitch ex Masters]. Known from GA. [= K, X]
Sarracenia minor × ***purpurea*** [S. ×*swaniana* (W. Robinson) Bell]. Known from NC (Brunswick and Bladen counties). [= K, X]
Sarracenia minor × ***rubra*** [*S.* ×*rehderi* Bell]. Known from NC (Brunswick County). [= K, X]
Sarracenia psittacina × ***rubra*** [*S.* ×*gilpinii* Bell & Case]. [= K]
Sarracenia purpurea × ***rubra*** [*S.* ×*chelsonii* Veitch ex Masters]. Known from NC (Scotland County). [= K, X]
Sarracenia jonesii × ***purpurea.*** Known from NC (Henderson County).

SAURURACEAE E. Meyer 1827 (Lizard's-tail Family)

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).

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. Cp, Pd, Mt (GA, NC, SC, VA): swamps, ditches, overwash pools in stream floodplains, usually where in water seasonally or periodically; common (rare in Mountains). May-July; August-September. CT, s. Québec, s. Ontario, 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 (rather 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]

SAXIFRAGACEAE A.L. de Jussieu 1789 (Saxifrage Family)
(also see *GROSSULARIACEAE*, *HYDRANGEACEAE, ITEACEAE, PARNASSIACEAE,* and *PENTHORACEAE*)

If narrowly circumscribed (as here), a family of about 30 genera and 650 species, herbs, 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: Spongberg (1972); Morgan & Soltis (1993).

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 *Saxifraga*).
    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 ..... ***Saxifraga***
    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.
      4 Stem leaves opposite; petals fimbriate; inflorescence a raceme; flowers on pedicels 1.5-3 mm long..... ***Mitella***
      4 Stem leaves absent or alternate; petals not fimbriate; inflorescence a panicle or raceme; flowers mostly on pedicels > 3 mm long.
        5 Inflorescence racemose; stamens 10..... ***Tiarella***
        5 Inflorescence paniculate; stamens 5.
          6 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***
          6 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.
            7 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***
            7 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 (False Goat's-beard)

A genus of 14 species, perennial herbs, of e. Asia and e. North America.

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. Mt (GA, NC, SC, VA): cove forests, seepage slopes; common. May-June; July-August. VA, sw. WV, and KY south to n. GA. [= C, F, G, K, S, W; < *A. biternata* – RAB (also see *A. crenatiloba*)]

Astilbe crenatiloba (Britton) Small, Roan Mountain False Goat's-beard. Mt (NC): mountain forests; rare (believed extinct) (US Species of Concern, NC Rare). July?; September. This species has apparently not seen since the original collections by N.L Britton on the NC and TN flanks of Roan Mountain; the habitat, flowering and fruiting dates, and other characteristics of this species are therefore poorly known. The morphologic characters are striking. [= K, S, W; < *A. biternata* – RAB]

Boykinia Nuttall (Boykinia)

A genus of 9-12 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 Alaska and e. Siberia.

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. Mt (GA, NC, SC, VA): streambanks, riverbanks, in crevices in spray cliffs around waterfalls, seepages; uncommon (SC Rare). 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. [= RAB, C, F, G, GW, K, W; = *Therophon aconitifolium* (Nuttall) Millspaugh – S]

Chrysosplenium Linnaeus (Golden-saxifrage)

A genus of about 60 species, herbs, of Europe, ne. Asia, n. North America, n. Africa, and temperate South America.

Chrysosplenium americanum Schweinitz ex Hooker, Golden-saxifrage, Water-mat, Water-carpet. Mt (GA, NC, SC, VA), Pd, Cp (VA): in shallow seepage in shade; uncommon (GA Special Concern). March-June. Québec west to Saskatchewan, south to e. VA, w. NC, n. GA, e. TN, and IN. [= RAB, C, F, G, GW, K, S, W]

Heuchera Linnaeus 1753 (Alumroot)

A genus of about 55 (or fewer) 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 (1984)=Z; Rosendahl, Butters, & Lakela (1936)=Y; Wells (1979). 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 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 Free hypanthium < 1.5 mm long; petals greenish, white, creamy, or pink, the margins entire or bearing short teeth..... ***H. americana***

7 Free hypanthium 1.5-1.9 mm long; petals purple, the margins fimbriate..... ***H. hispida***

5 Free hypanthium > 2 mm long; calyx weakly to strongly zygomorphic; calyx subglobose, campanulate, or tubular.

8 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***

8 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.

9 Calyx 2.8-4.5 mm long, subglobose; [of the Piedmont of sc. VA southward to SC] ..... ***H. caroliniana***

9 Calyx 5.5-13.2 mm long, narrowly campanulate; [primarily of the Mountains and upper Piedmont of VA and nc. NC].

10 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***

10 Flowers smaller, with greenish or purplish-green petals; [of lower elevations on circumneutral or subacidic substrates]..... ***H. pubescens***

Heuchera alba Rydberg. Mt (VA): quartzitic outcrops at high elevations; rare. Further study of *H. alba* Rydberg is needed; its recognition as distinct from *H. pubescens* is probably warranted (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). [= K; < *H. pubescens* – C, F, S, W, Z; < *H. pubescens* var. *brachyandra* Rosendahl, Butters, & Lakela – F, G, Y]

Heuchera americana Linnaeus, American Alumroot. Mt, Pd (GA, NC, SC, VA), Cp (GA, NC, VA): rocky forests, rock outcrops, particularly where soils are subacidic to circumneutral; common (uncommon in Coastal Plain). April-June. CT and NY west to s. Ontario, n. IN, s. IL, and sc. MO south to c. GA, c. AL, n. MS, and n. LA, and the most widespread in our area, *H. americana* is the only *Heuchera* in the Coastal Plain, though *H. caroliniana* reaches the lower Piedmont. Within the range of *H. caroliniana*, *H. americana* is absent. [= C; > *H. americana* var. *americana* – F, G, K, Z; < *H. americana* – RAB, W; > *H. americana* var. *heteradenia* Fernald – F; > *H. americana* var. *interior* Rosendahl, Butters, & Lakela – F, Y; > *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. Wells, Carolina Alumroot. Pd (NC, SC, VA): rocky forests, rock outcrops, particularly where soils are subacidic to circumneutral, replacing *H. americana* in much of the upper Piedmont; uncommon (NC Watch List). 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). [= K, Z; = *H. americana* Linnaeus var. *caroliniana* Rosendahl, Butters, & Lakela – Y; < *H. americana* – RAB, S, in part]

Heuchera hispida Pursh, Purple Alumroot. Mt (VA), Pd (NC, VA): calcareous rocky forests, rock outcrops, particularly where soils are subacidic to circumneutral; rare (NC Watch List, VA Watch List). 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, Y; < *H. americana* – RAB, W; = *H.* ×*hispida* Pursh – C; = *H. americana* var. *hispida* (Pursh) E. Wells – K, Z]

Heuchera longiflora Rydberg, Long-flowered Alumroot. Mt (NC, VA): rich shaded forests and woodlands over calcareous rocks such as limestone, dolostone, or calcite-cemented shales, siltstones, or sandstones, in circumneutral soils; rare (NC Watch List). 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, G, K, W, Z ; = *H. pubescens* – RAB, misapplied; >

H. longiflora Rydberg var. *aceroides* (Rydberg) Rosendahl, Butters, & Lakela – Y; > *H. longiflora* – S; > *H. aceroides* Rydberg – S; > *H. scabra* Rydberg – S; > *H. longiflora* var. *typica* – Y]

Heuchera parviflora Bartling, Cave Alumroot. Mt (GA, NC, SC, VA), Pd (NC): 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; rare (NC Watch List, SC Rare, VA Watch List). 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. 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, K, Z; > *H. parviflora* var. *parviflora* – F, G; > *H. parviflora* var. *rugelii* (Shuttleworth) Rosendahl, Butters, & Lakela – F, G, Y; > *H. parviflora* var. *typica* – Y]

Heuchera pubescens Pursh, Marbled Alumroot. Mt (SC?, VA), Pd (NC, VA): rocky forests, rock outcrops, particularly where soils are subacidic or circumneutral; uncommon (NC Watch List). May-June. 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}. [= K; < *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 villosa Michaux ***var. villosa***, Crag-jangle, Rock Alumroot. Mt, Pd (GA, NC, SC, VA): 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 1920m), 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*; common (rare in upper Piedmont). 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, K, Z; > *H. villosa* var. *villosa* – F; = *H. villosa* – S; > *H. villosa* var. *typica* – Y; >< *H. villosa* var. *intermedia* Rosendahl, Butters, & Lakela – F, Y]

Heuchera puberula Mackenzie & Bush, east to c. KY (Medley 1993) and c. TN (?). [= F, G, Y; = *H. parviflora* Bartling var. *puberula* (Mackenzie & Bush) E. Wells – K, Z]

* *Heuchera sanguinea* Engelmann var. *sanguinea*, Coral Bells. Cultivated as an ornamental "wildflower;" native of w. North America. [= K; < *H. sanguinea* – G; = *H. sanguinea* var. *typica* – Y] {not keyed}

Heuchera villosa Michaux var. *macrorhiza* (Small) Rosendahl, Butters, & Lakela, Giant Alumroot. 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. *macrorhiza* – F, Y; = *H. macrorhiza* Small – S; >< *H. villosa* var. *intermedia* Rosendahl, Butters, & Lakela – F, Y]

Mitella Linnaeus (Miterwort)

A genus of about 20 species, herbs, of cold temperate e. North America, w. North America, and e. Asia.

Mitella diphylla Linnaeus, Two-leaved Miterwort. Mt (GA, NC, SC, VA), Pd, Cp (VA): moist rich forests, especially in the Mountains, and especially rocky; common (uncommon in Piedmont, rare in Coastal Plain) (SC Rare). April-June. Québec 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, G, GW, K, S, W]

Saxifraga Linnaeus (Saxifrage)

As currently circumscribed, a large and heterogeneous genus of about 440 species, mostly perennial herbs, of north temperate areas. As shown by molecular data, *Saxifraga* as currently defined is polyphyletic, and all of our species will be transferred to *Micranthes* (Soltis 1995, Soltis et al. 1996, Mort & Soltis 1999). 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*. Four of our seven species are Southern Appalachian or Southern Appalachian/Central Appalachian endemics.

1 Larger leaf blades oblanceolate, 4-10× as long as wide.
  2 Leaf margin entire to crenate; petals greenish-white, lacking yellowish spots..... ***S. pensylvanica***
  2 Leaf margin coarsely serrate; petals white, either 3 or 5 of them with yellowish spots.

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] ..... ***S. michauxii***

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] ..... ***S. micranthidifolia***

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; [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] ..... ***S. 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] ..... ***S. 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; [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 ..... ***S. michauxii***

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×); body of fruit (excluding the beak) 2.5-5 mm long; petals not spotted, or each with 2 obscure yellow spots ..... ***S. careyana***

7 Sepals spreading, later reflexed; filaments slightly clavate (use 10×); body of fruit (excluding the beak) 4-5 mm long; petals each with 2 yellow spots ..... ***S. caroliniana***

Saxifraga careyana A. Gray, Carey Saxifrage. Mt (GA, NC, VA): moist rock outcrops and cliffs, often under overhangs, often in moist soil at the base of a vertical or overhanging rock outcrop; rare (GA Special Concern, NC Watch List, SC Rare, VA Rare). May-June. A Southern Appalachian endemic: sw. VA south to e. TN, w. NC, and nw. SC. There remains a great deal of doubt regarding the taxonomic relationship between *S. careyana* and *S. caroliniana*. Many of the characters appear to be poorly correlated, and most specimens have been annotated at one time or another, by one investigator or another, as both species. The synonymization of *Micranthes tennesseensis* Small under *S. careyana* seems questionable, since the capsule size (seemingly one of the more stable characters in this complex) suggests *S. caroliniana*. I here retain the two taxa more to draw continued attention to them than out of conviction that the two are entirely satisfactory taxa (at least as currently defined). [= RAB, C, F, G, GW, K, W; = ***Micranthes careyana*** (A. Gray) Small – S]

Saxifraga caroliniana A. Gray, Carolina Saxifrage. Mt (NC, VA): moist rock outcrops and cliffs, often under overhangs, often in moist soil at the base of a vertical or overhanging rock outcrop; rare (US Species of Concern, NC Rare, VA Rare). May-June. A Southern Appalachian endemic: WV south to w. NC and ne. TN. See *S. careyana* for discussion of the two taxa. [= RAB, C, F, G, K, W; = ***Micranthes caroliniana*** (A. Gray) Small – S; > *Micranthes tennesseensis* Small – S]

Saxifraga michauxii Britton, Cliff Saxifrage. Mt (GA, NC, SC, VA), Pd (NC, VA): in crevices in exposed rock outcrops at high elevations, other rock outcrops (moist to rather dry), periglacial boulderfields, rocky seeps; common (rare in VA Piedmont). 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). [= RAB, C, F, G, GW, K, W; = *Hydatica petiolaris* (Rafinesque) Small – S; = ***Micranthes petiolaris*** (Rafinesque) Brouillet & Gornall in prep.]

Saxifraga micranthidifolia (Haworth) Steudel, Branch-lettuce. Mt (GA, NC, SC, VA), Pd (NC, VA): wet soils of seepages, in the beds of high elevation brooks, brookbanks; rocky seepages; common (rare in VA Piedmont). 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. [= RAB, C, F, G, GW, K, W; = ***Micranthes micranthidifolia*** (Haworth) Small – S]

Saxifraga pensylvanica Linnaeus, Swamp Saxifrage. Mt, Pd (NC, VA), Cp (VA): mountain bogs, mucky seeps; uncommon, rare in NC (NC Rare). April-June. ME west to MN, south to e. VA, c. and w. NC, and MO. [= RAB, C, F, K, W; > *S. pensylvanica* ssp. *pensylvanica* – G; = ***Micranthes pensylvanica*** (Linnaeus) Haworth]

Saxifraga texana Buckley, Texas Saxifrage. Pd (GA): granite outcrops; rare (GA Special Concern). 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.). [= F, G, K; = ***Micranthes texana*** (Buckley) Small – S]

Saxifraga virginiensis Michaux, Early Saxifrage. Mt, Pd, Cp (GA, NC, SC, VA): rock outcrops, moist alluvial and slope forests, streambanks, riverbanks; common (rare in Coastal Plain). March-May. New Brunswick west to Manitoba, south to c. GA, LA, and AR. [= RAB, C, F, G, GW, W; > *S. virginiensis* var. *virginiensis* – K; = ***Micranthes virginiensis*** (Michaux) Small – S]

Sullivantia Torrey & A. Gray ex A. Gray (Sullivantia)

A genus of 4 species, perennial herbs, of c. North America. References: Soltis (1980)=Z.

Sullivantia sullivantii (Torrey & A. Gray) Britton, Sullivantia. Mt (VA): moist limestone cliffs; rare (VA Rare). 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, G, K, Z]

Tiarella Linnaeus (Foamflower)

A genus of about 5 species, perennial herbs, of temperate North America and e. Asia. References: Lakela (1937)=Y; Spongberg (1972)=Z; Wherry (1940, 1949)=X; Fernald (1943)=V.

1 Plant with stolons; capsules 8-12 mm long, subacuminate; lower fruiting pedicels 7-13 mm long; [of the Mountains] .... ***T. cordifolia***

1 Plant without stolons; capsules 6-10 mm long, round-tipped; lower fruiting pedicels 6-10 mm long; [of the Mountains, Piedmont, and (less commonly) Coastal Plain]..... ***T. wherryi***

Tiarella cordifolia Linnaeus. Mt (GA, NC, SC, VA): moist forests, cove forests, rock outcrops; common. April-June. Nova Scotia west to Ontario and WI, south to w. NC, nw. SC, n. GA, and MO. [= F, V, Z; = *T. cordifolia* var. *cordifolia* – RAB, C, G, K; < *T. cordifolia* – S, W (also see *T. wherryi*); *? T. macrophylla* Small – S (type a combination of *Heuchera* and *Tiarella*); = *T. cordifolia* var. *typica* – Y]

Tiarella wherryi Lakela. Pd, Mt, Cp (GA, NC, SC, VA), Cp (VA): moist forests, cove forests, rock outcrops; common. April-June. VA and KY south to sw. GA, AL, and MS. 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. [= F, V, Z; = *T. cordifolia* Linnaeus var. *collina* Wherry – RAB, C, G, K; < *T. cordifolia* – S, W; > *T. cordifolia* var. *collina* – X; > *T. wherryi* – X, Y; > *T. cordifolia* var. *austrina* – K, X, Y]

SCHISANDRACEAE Blume 1830 (Star-vine Family)

A family of 2 genera and about 40-50 species, woody vines, of e. Asia and e. North America (only our single species). 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. Cp (GA, NC, SC), Pd (GA, NC), Mt (GA): rich slopes adjacent to bottomland forests, mesic "islands" surrounded by bottomlands; rare (GA Threatened, NC Threatened). May-June; July-August. Ne. NC (Martin County), sc. NC (Gaston County), n. GA, w. TN, sc. KY, and e. AR south south to the FL panhandle and LA; Mexico (Sierra Madre Oriental, Hidalgo). [= RAB, K, Y, Z; = *Schizandra coccinea* Michaux – S (orthographic variant); = *S. coccinea* Michaux – W]

SCROPHULARIACEAE A.L. de Jussieu 1789 (Snapdragon Family)
(also see *OROBANCHACEAE, PAULOWNIACEAE, PHRYMACEAE, and PLANTAGINACEAE*)

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. References: Pennell (1935)=P; Olmstead & Reeves (1995); Young, Steiner, & dePamphilis (1999); Olmstead et al. (2001); Beardsley & Olmstead (2002).

Disposition of the traditional Scrophulariaceae (including Antirrhinanthaceae), Orobanchaceae, Plantaginaceae, Callitrichaceae, Buddlejaceae, Phrymaceae:

Scrophulariaceae s.s.: *Buddleja, Scrophularia, Verbascum.*

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.*
Linderniaceae: *Lindernia, Micranthemum*

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 davidii*** Franchet, Summer-lilac, Orange-eye Butterfly-bush. Mt (GA, NC, VA), Pd (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]

EXCLUDED: *B. alternifolia* Maximowicz is 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.

Scrophularia Linnaeus (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, Pd, Cp (VA): woodlands and forests; common (rare in Piedmont and Coastal Plain). May-early July. Québec and Nova Scotia west to British Columbia, south to VA, MO, NM, and n. CA. [= C, F, G, K, P, W]
Scrophularia marilandica Linnaeus, Eastern Figwort. Mt, Pd, Cp (GA, NC, SC, VA): moist to dry, nutrient-rich woodlands and forests, especially over mafic or calcareous rocks; common (rare in Piedmont and Coastal Plain south of VA). July-October. Québec west to MN, south to SC, ne. GA, sw. GA, and LA. [= RAB, C, F, G, K, P, S, W]

Verbascum Linnaeus (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, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, native of Eurasia. May-June; June-July. [= RAB, C, F, G, K, P, S, W]
* ***Verbascum lychnitis*** Linnaeus, White Mullein. Cp, Pd (VA): disturbed areas, fields; rare, native of Eurasia. [= RAB, C, F, G, K, P, S]
* ***Verbascum phlomoides*** Linnaeus, Clasping Mullein, Orange Mullein. Mt, Pd, Cp (NC, VA): disturbed areas, roadsides; rare, native of Europe. May-June; July. [= RAB, C, F, G, K, P, W]
* ***Verbascum thapsus*** Linnaeus, Woolly Mullein, Common Mullein, Flannel-plant, Velvet-plant. Mt, Pd, Cp (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, native of Europe. June-September; July-October. [= RAB, C, F, G, K, P, S, W]
* ***Verbascum virgatum*** Stokes, Twiggy Mullein. Cp (NC, SC): sandhills, sandy disturbed areas, roadsides; rare, native of Europe. April-May; June. [= RAB, C, F, G, K, P, S]

* *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]

SIMAROUBACEAE DC. 1811 (Quassia Family)

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; Bogle in FNA (1997). References: Angiosperm Phylogeny Group (1998, 2003).

1 Leaves compound; [species alien, aggressively naturalizing in upland sites] ..... ***Ailanthus***
1 Leaves simple; [species native, in wetland sites] ..... ***Leitneria***

Ailanthus Desfais (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. Pd, Mt, Cp (GA, NC, SC, VA): roadsides, forests, disturbed areas, including cities, especially in moist, fertile soils; common, 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 (Corkwood)

A monotypic genus, endemic to se. North America. References: Bogle in FNA (1997); Channell & Wood (1962).

Leitneria floridana Chapman, Corkwood. Cp (GA): swamps and cabbage palm / sawgrass marshes; rare (GA Special Concern). February-March. This species occurs in scattered sites from the Coastal Plain of sw. GA west to e. TX, and north in the Mississippi Embayment to AR and MO. [= FNA, GW, K, S]

SOLANACEAE A.L. Jussieu 1789 (Nightshade Family)

A family of about 94 genera and nearly 3000 species, shrubs, trees, vines, and herbs, nearly cosmopolitan but especillay diverse in South America. References: Hunziker (2001).

Subfamily Cestroideae, Tribe Cestreae: *Cestrum*
Subfamily Cestroideae, Tribe Nicotianeae: *Calibrachoa, Nicotiana, Nierembergia, Petunia*
Subfamily Solanoideae, Tribe Solaneae: *Capsicum, Physalis, Salpichroa, Solanum*
Subfamily Solanoideae, tribe Datureae: *Datura*

Subfamily Solanoideae, tribe Lycieae: *Lycium*
Subfamily Solanoideae, tribe Nicandreae: *Nicandra*

Bouchetia Dunal (Bouchetia)

A genus of about 3-4 species, tropical American.

Bouchetia erecta Augustin de Candolle. MS and TX. [= K] {synonymy incomplete}

Calibrachoa Llave & Lexarza (Seaside Petunia)

References: Hunziker (2001)=Z.

* ***Calibrachoa parviflora*** (Antoine Laurent de Jussieu) D'Arcy, Wild Petunia, Seaside Petunia. Cp (NC, VA): upper edges of salt marshes, waste areas, garbage dumps; rare, naturalized from tropical America. Tatnall (1946) documents its occurrence in Virginia: "upper edge of salt marsh, Wachapreague," Accomack Co. (Fernald & Long 4169, 26 July 1934). [= K; = *Petunia parviflora* Antoine Laurent de Jussieu – RAB, C, F, G, S, Z]

Capsicum Linnaeus (Red Pepper, Chile)

A genus of about 10 species, herbs and shrubs, of tropical America. References: D'Arcy & Eshbaugh (1974)=Z; Heiser & Pickersgill (1975). Key based on Z.

1 Flowers usually only one per node after the first flowering node, rarely more; corolla pure white (rarely bluish or violet) .... ***C. annuum***
1 Flowers 2 or more per node above the first flowering node; corolla greenish-white ..... ***C. frutescens***

* ***Capsicum annuum*** Linnaeus, Red Pepper, Chile. Pd, Cp (GA?, NC, SC, VA): naturalized or persistent from gardens; commonly cultivated, rare as a naturalized species. 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, various African, Mexican, and others. [= RAB, S, Z; = *C. annuum* var. *annuum* – K]
* ***Capsicum frutescens*** Linnaeus, Tabasco Pepper. Cp (GA): persistent from gardens; rarely cultivated, rare as a waif. Reported in e. GA (Duncan 1985; Jones & Coile 1988). [= *C. annuum* Linnaeus var. *frutescens* (Linnaeus) Kuntze; = *Capsicum annuum* Linnaeus var. *glabriusculum* (Dunal) Heiser & Pickersgill – K]

Cestrum Linnaeus (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): cultivated, weakly (if at all) established; rare, introduced from West Indies. See Small (1933). [= K, Z; *? C. parqui* – S, misapplied]

Datura Linnaeus (Jimsonweed)

{needs thorough rework, based on herbarium material and clarification of nomenclature}

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:

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 ..... ***D. stramonium***
1 Calyx 5-15 cm long, the tube terete or slightly angled; corolla 12-20 cm long; capsule inclined or nodding, irregularly dehiscent.
  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. Cp, Pd (NC, SC, VA?): disturbed areas, rare, introduced from Mexico; September-October. This species may not be distinct from *D. wrightii*. [It is currently not known which records in our area apply to which taxon] [= K; = *D. innoxia* – F, S, 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]

* ***Datura stramonium*** Linnaeus, Jimsonweed. Cp, Pd, Mt (GA, NC, SC, VA): fields, pastures, disturbed areas, especially common in severely over-grazed pastures; common, presumably introduced from further south and west. July-September; August-October. The plant is dangerously poisonous. [= RAB, C, K, S, W; > *D. stramonium* var. *stramonium* – F; > *D. stramonium* var. *tatula* (Linnaeus) Torrey – F; > *D. tatula* Linnaeus]

* ***Datura wrightii*** Regel, Indian-apple. Pd (NC, SC, VA?), Cp (VA): disturbed areas; rare, introduced from Mexico. July-September; September-October. [= K; *? D. meteloides* Dunal – RAB, S, misapplied; *? D. metel* – G, misapplied]

* ***Datura quercifolia*** Kunth is reported for sw. GA by Jones & Coile (1988). [= K] {not keyed at this time}

Lycium Linnaeus (Matrimony-vine)

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. Cp (NC, SC, VA), Pd, Mt (GA, NC, VA): old home sites, disturbed areas, along railroad tracks; introduced from s. Europe. May-November; August-December. [= K; *? L. halimifolium* P. Miller – RAB, F, G, S, W; < *L. barbarum* – C (also see *L. chinense*)]

Lycium carolinianum Walter, Christmas-berry, Carolina Matrimony-vine. Cp (GA, SC): shell middens, shell mounds, shelly sand dunes, brackish marshes, maritime sand spits; rare (GA Special Concern). 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; > *L. carolinianum* var. *carolinianum* – K]

* ***Lycium chinense*** P. Miller, Chinese Matrimony-vine. Mt (NC, VA), Pd, Cp (VA): old home sites; rare, introduced from China. May-November; August-December. [= RAB, F, G, K; < *L. barbarum* – C]

Lycopersicon P. Miller (Tomato)
(see *Solanum*)

Nicandra Adanson (Apple-of-Peru)

A monotypic genus, an annual herb native of Peru.

* ***Nicandra physalodes*** (Linnaeus) Gaertner, Apple-of-Peru. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): disturbed places, such as cultivated fields; uncommon, native of Peru. July-September; August-October. [= RAB, C, F, G, K, W; = *Physalodes physalodes* (Linnaeus) Britton – S]

Nicotiana Linnaeus (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 rustica*** Linnaeus, Indian Tobacco, Wild Tobacco. Cp, Pd, 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, Cp, 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]

* *Nicotiana longiflora* Cavanilles, Long-flower Tobacco. Also cultivated and may be found as a waif or persistent. Native of South America. [= K, S, Z]

Nierembergia Ruiz & Pavón (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 (Petunia)
(also see *Calibrachoa*)

* ***Petunia ×hybrida*** Vilmorin [*P. axillaris* × *integrifolia*], Petunia. Cp, Pd (GA, NC, SC, VA): disturbed areas, garden edges; common in cultivation, uncommonly spread from cultivation, 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. [= *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)
(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. The pre-Columbian ranges of these species are unclear; they may have been introduced to e. North America by native Americans. Of the species treated here, only a few are definitely introduced.

1 Plants obviously covered with dense, stellate hairs, especially the young growth, flowering calyces, and pedicels ....***Ph. walteri***
1 Plants glabrous to variously pubescent, the pubescence not stellate.
2 Leaves glabrous or essentially so.
3 Perennials from rhizomes, frequently with remnant of last year's stem attached to crown; corolla with 5 dark maculations in the throat.
4 Hairs on the pedicels and young stems retrorse or retrorse-spreading; fruiting calyx 5-angled, indented at base .....***Ph. virginiana*** *var.* ***virginiana***
4 Hairs on the pedicels and young stems antrorse; fruiting calyx subterete, with 10 ribs, not indented at base..... ..... ***Ph. longifolia*** *var.* ***subglabrata***
3 Annuals from taproots; corolla with or without 5 dark maculations in the throat.
5 Upper part of the stem with long, spreading hairs; corolla with 5 dark maculations in the throat.

6 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 ..... ***Ph. cordata***

6 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.

7 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 ..... ***Ph. pubescens*** *var.* ***pubescens***

7 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 ..... ***Ph. pubescens*** *var.* ***integrifolia***

5 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.

8 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 ..... ***Ph. angulata*** *var.* ***angulata***

8 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 ..... ***Ph. philadelphica***

2 Leaves variously pubescent, the hairs copious and villous to sparse and appressed.

9 Flowering calyces 6 mm or less long; annuals from taproots.

10 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 ..... ***Ph. grisea***

10 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.

11 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 ..... ***Ph. pubescens*** *var.* ***pubescens***

11 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 ..... ***Ph. pubescens*** *var.* ***integrifolia***

9 Flowering calyces 6 mm or more long; perennials from rhizomes.

12 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) ..... ***Ph. heterophylla***

12 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).

13 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 ..... ***Ph. longifolia*** *var.* ***subglabrata***

13 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.

14 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 ..... ***Ph. lanceolata***

14 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 ..... ***Ph. virginiana*** *var.* ***virginiana***

Physalis angulata Linnaeus var. ***angulata***, Smooth Ground-cherry. Cp, Pd (GA, NC, SC, VA), Mt (GA): disturbed areas, open woodlands, agricultural fields; common (VA Watch List). 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). [< *Ph. angulata* – RAB, C, K, S; = *Ph. angulata* – F, G]

Physalis cordata P. Miller, Toothleaf Ground-cherry. Cp (NC), {GA, SC}: disturbed areas; rare. July-October. This species is scattered in the Southeastern United States, and is more widespread in Mexico, Central America, and West Indies. [= K; = *Ph. pubescens* var. *glabra* (Michaux) Waterfall – RAB; = *Ph. barbadensis* var. *glabra* (Michaux) Fernald – F]

Physalis grisea (Waterfall) M. Martínez, Gray Ground-cherry, Strawberry-tomato, Dwarf Cape-gooseberry. Mt, 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; = *Ph. pubescens* var. *grisea* Waterfall – RAB, C; < *P. pruinosa* Linnaeus – F, G, S, W, misapplied]

Physalis heterophylla Nees, Clammy Ground-cherry. Pd, Mt, Cp (GA, NC, SC, VA): disturbed areas, dry rocky woodlands; common (uncommon in Mountains, rare in Coastal Plain). May-July; July-September. Widespread in e. and c. United States and adjacent Canada. [= RAB, C, S, W; > *Ph. heterophylla* var. *heterophylla* – F, G; > *Ph. heterophylla* var. *ambigua* (A. Gray) Rydberg – F, G; > *Ph. heterophylla* var. *clavipes* Fernald – F; > *Ph. heterophylla* var. *nyctaginea* (Dunal) Rydberg – F; > *P. heterophylla* var. *heterophylla* – K; > *Ph. heterophylla* – S; > *Ph. ambigua* (A. Gray) Britton – S; > *Ph. nyctaginea* Dunal – S]

Physalis lanceolata Michaux, Sandhills Ground-cherry. Cp (GA, NC, SC): sandhills; rare (NC 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. [= RAB; < *Ph. lanceolata* – F, G, S (also see *Ph. hispida* (Waterfall) Cronquist)]

Physalis longifolia Nuttall *var.* ***subglabrata*** (Mackenzie & Bush) Cronquist, Longleaf Ground-cherry. Mt, Pd (NC, VA), {GA, SC}: open woodlands, gardens and disturbed areas; uncommon. June-August; August-October. The species is widespread in e. and c. United States; var. *subglabrata* is more eastern, var. *longifolia* more western. [= C, G, K, W; = *Ph. virginiana* P. Miller var. *subglabrata* (Mackenzie & Bush) Waterfall – RAB; = *Ph. subglabrata* Mackenzie & Bush – F, S]

* ***Physalis philadelphica*** Lamarck, Tomatillo. Pd (NC): naturalized after cultivation; rare, 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 *Ph. philadelphica* in the narrow sense) that is weakly naturalized after cultivation in c. NC. [= C; < *Ph. ixocarpa* Brotero ex Hornemann – F, G, misapplied; > *Ph. philadelphica* var. *immaculata* Waterfall – K]

Physalis pubescens Linnaeus *var.* ***integrifolia*** (Dunal) Waterfall, Thinleaf Downy Ground-cherry. 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; < *Ph. pubescens* var. *pubescens* – RAB; = *Ph. pubescens* – F; > *Ph. pubescens* – G, S; > *Ph. turbinata* Medikus – G, S; < *Ph. pubescens* – W; *Ph. pruinosa* Linnaeus, misapplied]

Physalis pubescens Linnaeus *var.* ***pubescens***, Thickleaf Downy Ground-cherry. 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; < *Ph. pubescens* var. *pubescens* – RAB; > *Ph. barbadensis* Jacquin var. *barbadensis* – F; > *Ph. barbadensis* Jacquin – G, S; > *Ph. pubescens* – S; > *Ph. barbadensis* Jacquin – S; < *Ph. pubescens* – W]

Physalis virginiana P. Miller *var.* ***virginiana***, Virginia Ground-cherry. Pd, Mt, Cp (GA, NC, SC, VA): woodlands and disturbed areas; common. 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 *Ph. longifolia*. [= RAB, K; < *Ph. virginiana* – C, F, G, W; > *Ph. virginiana* – S; > *Ph. intermedia* Rydberg – S; > *Ph. monticola* C. Mohr – S]

Physalis walteri Nuttall, Dune Ground-cherry. Cp (GA, NC, SC, VA): dunes of sea-beaches, openings in maritime forests; uncommon (VA Rare List). 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 *Ph. angustifolia*, with which it locally intergrades in peninsular FL. *Ph. viscosa* Linnaeus is South American. [= C, K; < *Ph. viscosa* Linnaeus ssp. *maritima* (M.A. Curtis) Waterfall – RAB; < *Ph. maritima* M.A. Curtis – F; < *Ph. viscosa* – G, S]

* *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. It is probably not established. It is most similar to *Ph. 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]

* *Physalis alkekengi* Linnaeus, Chinese-lantern Plant, native of Japan, Korea, and n. China, is 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. [= K]

Physalis arenicola Kearney, Sandhill Ground-cherry, reported from nc. GA by Jones & Coile (1988) and for "cypress-heads and scrub thickets" by GANHP (GA Special Concern). [= K; > *Ph. arenicola* var. *ciliosa* (Rydberg) Waterfall] {not keyed at this time; 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 *Ph. 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] {not keyed at this time and full treatment}

Physalis longifolia Nuttall *var.* ***longifolia*** occurs east to PA, WV, KY, TN, and GA (Kartesz 1999). [= K]

Physalis missouriensis Mackenzie & Bush, reported from nc. GA in Jones & Coile (1988); record not repeated in Kartesz (1999). [= K; *Ph. pubescens* Linnaeus var. *missouriensis* (Mackenzie & Bush) Waterfall] {investigate; not keyed at this time; 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. AL, MS. [= K]

Salpichroa Miers

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, introduced from 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)

(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).

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 or more 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, north to e. GA (SC). [= K; < *S. americanum* – RAB, F; < *S. nigrum* – C, G, S]

* ***Solanum capsicoides*** Allioni. Cp (SC), Pd (NC): disturbed areas; rare, introduced. [= K; *S. aculeatissimum* – RAB, S, misapplied]

Solanum carolinense Linnaeus *var.* ***carolinense***, Horse-nettle, Ball-nettle. Cp, Pd, Mt (GA, NC, SC, VA): [= K; < *S. carolinense* – RAB, C, F, G, W; = *S. carolinense* – S]

Solanum carolinense Linnaeus *var.* ***floridanum*** (Shuttleworth ex Dunal) Chapman. Cp (GA): sandhills; rare. GA and FL (Kartesz 1999). [= K; < *S. carolinense* – RAB; = *S. floridanum* Shuttleworth ex Dunal – S]

* ***Solanum dimidiatum*** Rafinesque. Cp (SC), {GA}: disturbed areas; rare, introduced from w. North America. April-June. [= C, K; = *S. torreyi* A. Gray – RAB, F, G; = *S. perplexum* Small – S]

* ***Solanum dulcamara*** Linnaeus, Bittersweet, Nightshade. Mt (NC, VA), Pd, Cp (VA), {GA}: introduced from Europe. [= RAB, C, W; > *S. dulcamara* var. *dulcamara* – F, K]

* ***Solanum elaeagnifolium*** Cavanilles, Silverleaf Nightshade, White Horse-nettle. Cp (GA, NC, SC), Pd (NC). Mt (GA): disturbed areas; rare, introduced from sc. North America. June-September. [= C, F, G, K; = *S. eleagnifolium* – RAB, S, orthographic error]

* ***Solanum lycopersicum*** Linnaeus, Tomato. Cp, Pd, 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 introduced from the New World to the Old World. 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. Anderson, & 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, introduced from Mediterranean Europe. [= K; = *S. pseudo-capsicum* – F, orthographic variant]

Solanum pseudogracile Heiser, Dune Nightshade. Cp (GA, NC, SC): ocean dunes, usually with *Uniola paniculata*; 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, Pd, Cp (GA, NC, SC, VA): disturbed areas; common. June-December. [= K, W, Z; < *S. americanum* P. Miller – RAB, F, 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, Pd, (GA, NC, VA): disturbed areas; uncommon, introduced from w. North America. [= RAB, C, F, G, K, W; = *Androcera rostrata* (Dunal) Rydberg – S; *? S. cornutum* Lamarck, misapplied]

* ***Solanum sarrachoides*** Sendtner, Hairy Nightshade. Cp, Pd (NC, VA): disturbed areas; introduced from 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), {VA}: disturbed areas; uncommon, introduced from South America. July-September; September-October. [= RAB, C, F, G, K, S]

* ***Solanum tuberosum*** Linnaeus, Potato, Irish Potato, White Potato. Cp, Pd, Mt (GA, NC, SC, VA): commonly cultivated, rarely escaped or spontaneous from thrown-out tubers, introduced from Andean South America. June-August. [= RAB, C, F, G, K]

* ***Solanum viarum*** Dunal, Tropical Soda Apple. Cp (GA, NC, SC): pastures; rare, introduced from 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*. Introduced in scattered states, including DE and FL (Kartesz 1999). [= K; < *S. citrullifolium* – C, F, G]

* *Solanum melongena* Linnaeus, Eggplant, is planted in gardens but does not persist. [= F, G, K, S]

* *Solanum nigrescens* Mart. & Gal. Reported from NC, SC, GA, etc. (Kartesz 1999), but actual status unclear. [= K] {not keyed}

* *Solanum nigrum* Linnaeus ssp. *nigrum*, European Black Nightshade. Disturbed areas; rare, introduced from Eurasia. May-November. [= K, Z; = *S. nigrum* – RAB; < *S. nigrum* – C, F, G, S]

* Solanum torvum Swartz. In AL.

* *Solanum triflorum* Nuttall. Introduced in c. TN. [= C, F, G, K]

SPHENOCLEACEAE von Martius ex DC. 1839 (Chickenspike Family)

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 (SC), Pd (GA, NC): rice plantations, reservoirs, other disturbed wetlands; rare, native of Old World tropics. August-October. [= K, S, Z; = *S. zeylandica* – RAB, GW, orthographic error (presumably from a mistaken notion that the epithet refers to New Zealand rather than Ceylon)]

STAPHYLEACEAE (DC.) Lindley 1829 (Bladdernut Family)

A family of 5 genera and about 27 species, trees and shrubs, of temperate Northern Hemisphere, especially e. Asia. References: Spongberg (1971)=Z.

Staphylea Linnaeus (Bladdernut)

A genus of 11 species, trees and shrubs, of temperate Eurasia and e. North America.

Identification notes: The opposite, trifoliolate leaves with serrulate margins are diagnostic.

Staphylea trifolia Linnaeus, Bladdernut. Pd, Mt, Cp (GA, NC, SC, VA): nutrient-rich bottomland forests, extending upslope over calcareous or mafic rocks; common. April; September-October. Québec west to MN, south to sw. GA, Panhandle FL, n. AL, n. MS, and OK. [= RAB, C, F, G, GW, K, S, W, Z]

STERCULIACEAE (Chocolate Family)

(see *MALVACEAE*)

STYRACACEAE Dumortier 1829 (Storax Family)

A family of about 11 genera and 160 species, trees and shrubs, of warm temperate and tropical regions of America, Mediterranean, se. Asia, Malesia. References: 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 Ellis ex Linnaeus (Silverbell, Snowdrop Tree)

A genus of about 5 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 & 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.
    4 Corolla (18-) 20-30 mm long, the style included, the anthers well inside the mouth of the corolla tube; large tree, to 40 m tall ..... ***H. tetraptera*** *var.* ***monticola***
    4 Corolla (12-) 15-20 mm long, the style slightly exserted, the anthers just within the mouth of the corolla tube; shrub to small tree, rarely exceeding 10 m in height ..... ***H. tetraptera*** *var.* ***tetraptera***

Halesia carolina Linnaeus, Little Silverbell. Pd (GA, SC): sandy alluvial forests; rare (SC Rare List). March-April; September-October. S. SC south to panhandle FL, west to s. MS. [= K, Y, Z; = *H. parviflora* Michaux – RAB, GW, S; < *H. carolina* – X]

Halesia diptera Ellis *var.* ***diptera***, Common Two-wing Silverbell. Cp (GA, SC): bottomland forests, forested edges of brackish marshes; rare (SC Rare List). 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, GW, K, S]

Halesia diptera Ellis *var.* ***magniflora*** Godfrey. Cp (GA): dry to moist hammocks; rare. Endemic to sw. GA and panhandle FL. [= Y, Z; < *H. diptera* – GW, K, S]

Halesia tetraptera Ellis *var.* ***monticola*** (Rehder) Reveal & Seldin, Mountain Silverbell. Mt (NC, VA?): cove forests, moist ridges, mostly above 1000m in elevation; common (VA Watch List). April-May; August-September. Apparently limited to the higher mountains of the Southern Appalachians of NC, TN, and VA (?), but the range obscure, perhaps limited to the area south of Linville Gorge, notably the Great Smoky Mountains. [= K, Y; < *H. carolina* – RAB, F, G, W; < *H. tetraptera* – C; = *H. monticola* (Rehder) Sargent – S; < *H. carolina* – X]

Halesia tetraptera Ellis *var.* ***tetraptera***, Common Silverbell. Mt (GA, NC, SC, VA), Pd, Cp (GA, NC, SC): moist slopes, coves, creek-banks, bottomlands; common (uncommon in lower Piedmont and Coastal Plain). March-May; August-September. W. VA, WV, s OH and s IL, south to FL and e. TX (and cultivated elsewhere). [= K, Y; < *H. carolina* – RAB, F, G, W; < *H. tetraptera* – C; = *H. carolina* Linnaeus – S; < *H. carolina* – X]

Styrax Linnaeus (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. The differences of opinion about the correct grammatical gender (covering all 3 possibilities!) are ignored in the synonymy, all endings standardized to the masculine "*-us*."

1 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***
1 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.

2 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***

2 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. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, VA): swamp forests, pocosin edges, other moist to wet habitats; uncommon (rare in Piedmont, rare in VA) (VA Watch List). 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, F, Z; < *S. americanus* – RAB, G, GW, K, W; = *Styrax americanus* – S]

Styrax americanus Lamarck *var.* ***pulverulentus*** (Michaux) Perkins ex Rehder, Downy American Snowbell. Cp (GA, SC): wet pine flatwoods; rare. 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, F, Z; < *S. americanus* – RAB, G, GW, K, W; = *S. pulverulentus* Michaux – S]

Styrax grandifolius Aiton, Bigleaf Snowbell, Bigleaf Storax. Pd, Cp, Mt (GA, NC, SC, VA): upland forests, bluffs; uncommon (rare in Mountains) (VA Watch List). April-May; August-September. Se. VA south to s. FL, west to e. TX, north to se. MO. [= RAB, C, F, K, S, W, Z]

SYMPLOCACEAE Desfontaines 1820 (Sweetleaf Family)

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 (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 *Hopea*, section *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 *Epigenia*] ..... ***S. tinctoria***

Symplocos tinctoria (Linnaeus) L'Heritier de Brutelle, Sweetleaf, Horsesugar. Cp (GA, NC, SC, VA), Mt, Pd (GA, NC, SC): moist bottomland forests, pocosin edges, mesic forests, ridgetop forests; common (rare in Piedmont). 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; > *S. tinctoria* var. *tinctoria* – F, G; > *S. tinctoria* var. *pygmaea* Fernald – F, G (probably based on fire sprouts)]

* *Symplocos paniculata* (Thunberg) Miq., Sapphire-berry, Asiatic Sweetleaf, native of e. Asia, has been reported as spreading from plantings in the District of Columbia (Whittemore 2003).

TAMARICACEAE Link 1821 (Tamarisk Family)

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 (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 equalling 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 canariensis*** Willdenow, Canary Island Tamarisk. Cp (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]

* ***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): 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*** Augustin 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, introduced from the Middle East. Established on Cumberland Island, Camden County, GA (Crins 1989b). [= K, Y, 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]

TETRACHONDRACEAE Wettstein 1924 (Tetrachondra Family)

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. References: Oxelman et al. (1999); Wagstaff in Kadereit (2004).

Polypremum Linnaeus (Polypremum)

The genus is monotypic; its assignment to family controversial, problematic, and unresolved. A recent molecular analysis strongly suggests that its closest relationship is with *Tetrachondra* (Oxelman et al. 1999). References: Rogers (1986)=Z; Wagstaff in Kadereit (2004).

Polypremum procumbens Linnaeus, Polypremum, Rustweed, Juniperleaf. Cp, Pd, 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 tropical America. [= RAB, C, F, G, GW, K, S, W, Z]

THEACEAE D. Don 1825 (Tea Family)

With a more circumscribed definition (excluding Ternstroemiaceae), a family of about 8 genera and 195-460 species, trees and shrubs, of primarily tropical and subtropical regions of the Old and New Worlds. References: 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. Cp (GA, NC, SC): frequently cultivated, sometimes persistent around old home sites (especially in the Coastal Plain of NC and SC); rare, native of China and Japan. [= K]
* ***Camellia sinensis*** (Linnaeus) Kuntze, Tea. Cp (SC): cultivated in plantations and as a horticultural novelty, rarely escaped; rare, native to China. [= K; = *Thea sinensis* Linnaeus]

* *Camellia sasanqua* Thunberg, Sasanqua Camellia, is reported as introduced in NC, SC, GA, and FL (Kartesz 1999). [= K] {not keyed at this time}

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: Bozeman & Rogers (1986); Stevens, Dressler, & Weitzman in Kubitzki (2004).

Franklinia alatamaha Bartram ex Marshall, Franklinia. Cp (GA): habitat speculative, probably dry sandy ridges, near the mouth of the Altamaha River; rare (believed to be extinct in the wild) (GA Special Concern). 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 1790 and is now believed to be extinct in the wild. It is sometimes cultivated in our area. Bozeman & Rogers (1986) discuss the history of this tree. [= 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: 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. Cp (GA, NC, SC): pocosins, acidic, organic-rich swamp forests, wet pine savannas, bay forests; common. 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, GW, K, S]

Stewartia Linnaeus 1753 (Stewartia, Wild Camellia)

A genus of about 10 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: 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; fruits lobed, the lobes rounded; leaves mostly 4-10 cm long; petioles narrowly winged, not enclosing and concealing the terminal and lateral buds; calyx subtended by 2 persistent bracts, each 2-4 mm long ..... ***S. malacodendron***

1 Styles 5, separate; seeds 8-10 mm long, dull, flat, thin (to slightly winged); fruits lobed, the lobes angled; leaves mostly 7-15 cm long; petioles widely winged, enclosing and concealing the terminal and lateral buds; calyx subtended by 1 persistent bract, 11-14 mm long ..... ***S. ovata***

Stewartia malacodendron Linnaeus, Silky Camellia, Virginia Stewartia. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC): mesic forests, especially on beech-dominated bluffs or "islands" in Coastal Plain swamps; uncommon, rare in Piedmont and Mountains (GA Rare, VA Rare List). 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, K, W, Z; = *Stewartia malachodendron* – C, F, G (orthographic variant); = *Stuartia malachodendron* – S (orthographic variant)]

Stewartia ovata (Cavanilles) Weatherby, Mountain Camellia, Mountain Stewartia. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp (VA): mesic forests, especially acidic bluffs, often in openings in rhododendron thickets ("hells"), in the Coastal Plain of VA restricted to ravines; rare (SC Rare List, NC Watch List, VA Rare List). 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, G, K, W, Z; = *Malachodendron pentagynum* (L'Héritier) Small – S]

THYMELAEACEAE A.L de Jussieu 1789 (Mezereum Family)

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). References: Van der Bank, Fay, & Chase (2002); Herber in Kubitzki & Bayer (2003).

Dirca Linnaeus 1753 (Leatherwood, Leatherbark)

A genus of 3 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; the other species is *D. occidentalis* A. Gray of California (Schrader & Graves 2004). *Dirca* is in subfamily Thymelaeoideae (Van der Bank, Fay, & Chase 2002). References: Nevling (1962)=Z.

Dirca palustris Linnaeus, Leatherwood, Leatherbark, Wicopee, Rope-bark. Pd (GA, NC, SC, VA), Mt (GA, NC, VA), Cp (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; uncommon, rare south of VA and in VA Coastal Plain (NC Watch List, SC Rare List). March-April; June-July. Widespread in e. North America, from Nova Scotia and s. Québec, south to FL, AL, and OK. The curiously flexible twigs and swollen nodes are distinctive. The tan-brown bark is extraordinarily tough and was used by the native Americans for cordage; the common names refer to this property. [= RAB, C, F, G, K, S, W, Z]

Edgeworthia Meisner 1841 (Paperbush)

A genus of 3 species, shrubs, of e. Asia.

* *Edgeworthia papyrifera* Siebold & Zuccarini, Paperbush, is reported for Rabun County, GA by Jones & Coile (1988). [= K] {not keyed at this time}

TILIACEAE (Basswood Family)
(see MALVACEAE)

TROPAEOLACEAE A.L de Jussieu ex DC. 1824 (Nasturtium Family)

A family of 1-3 genera and about 90 species, herbs, of Central and South America. References: 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: 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. [= K, Z]

TURNERACEAE Kunth ex DC. 1828 (Turnera Family)

A family of about 10 genera and 100 species, shrubs, herbs, and trees, of tropical and subtropical Africa and America.

Piriqueta Aublet

A genus of about 21 species, of tropical and subtropical America and Africa. References: Arbo (1990, 1995)=Z; Maskas & Cruzan (2000).

Piriqueta caroliniana (Walter) Urban *var.* ***caroliniana***. Cp (GA, SC): longleaf pine sandhills, sandy soils of roadsides, woodland edges, and disturbed areas; uncommon. May-September. SC south to n. 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, Z; = *P. caroliniana* – S]

Piriqueta cistoides (Linnaeus) Grisebach is reported for GA (Kartesz 1999) with untraceable documentation. {not keyed; rejected pending better documentation} [= *P. cistoides* ssp. *cistoides* – K, Z]

ULMACEAE de Mirbel 1815 (Elm Family)
[also see *CANNABACEAE*]

As here circumscribed (excluding the Celtidaceae), 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).

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. Cp (GA, NC, SC): river swamps where flooded (often to depths of 1-2 m) in the winter; common (uncommon in NC and limited to the Waccamaw River and the Lumber River). Se. NC 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, and 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 immediately west 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. Cp, Pd, Mt (GA, NC, SC, VA): rock outcrops, dry and mesic forests and woodlands, bottomlands, old fields, disturbed areas, common (rare in the Mountains). 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, Z]

Ulmus americana Linnaeus *var.* ***americana***, American Elm, White Elm. Cp, Pd, Mt (GA, NC, SC, VA): swamps, bottomland forests, moist slopes, especially on relatively or strongly nutrient-rich substrates; common (rare in Mountains of NC and SC). February-March; March-April. Nova Scotia, New Brunswick, and Québec west to se. Saskatchewan, 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; = *U. americana* – S]

Ulmus americana Linnaeus *var.* ***floridana***, Florida Elm. Cp (GA, NC, SC): shell middens, other calcareous forests; uncommon. 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 parvifolia*** Jacquin, Chinese Elm, Lacebark Elm. Cp, Mt (VA), Pd (NC, VA): disturbed areas; rare, introduced from China and Japan. August-October; September-November. [= FNA, K]

* ***Ulmus procera*** Salisbury, English Elm, English Cork Elm. Cp (NC, VA), Pd, Mt (VA): disturbed areas; rare, introduced from Europe. [= C, FNA, K; *U. minor* P. Miller, misapplied]

* ***Ulmus pumila*** Linnaeus, Siberian Elm, Dwarf Elm. Cp (NC, VA), Pd, Mt (VA): disturbed areas; rare, introduced from Asia. [= C, F, FNA, K]

Ulmus rubra Muhlenberg, Slippery Elm, Red Elm. Mt, Pd, Cp (GA, NC, SC, VA): moist to fairly dry calcareous forests, rich bottomlands, rich cove forests in the low Mountains; common (rare in Coastal Plain of GA, NC, and SC). February-March; March-April. ME, Québec, and Ontario west to MN and ND, south to panhandle FL and c. TX. [= RAB, C, FNA, G, K, W, Z; = *U. fulva* Michaux – S]

Ulmus serotina Sargent, September Elm. Mt (GA): mesic limestone forests; rare (GA Rare). 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 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. Introduced from Europe in ne. United States; reported from VA and DC (Sherman-Broyles in FNA 1997), but may only be cultivated. [= FNA, C, F, K]

Ulmus thomasii Sargent, Cork Elm, Rock Elm. Rocky or rich slopes, especially over limestone. Québec to MN and NE, south to NJ, MD, PA, WV, KY, TN, AR, and KS. [= C, FNA, K; = *U. thomasi* – F, G, orthographic variant]

URTICACEAE A.L. de Jussieu 1789 (Nettle Family)

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. Cp, Pd, Mt (GA, NC, SC, VA): swamp forests, bottomlands, bogs, marshes, other wetlands; common. July-August; September-October. Québec and MN south to FL and NM. [= RAB, C, FNA,

G, GW, K, W; > *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. Cp (SC), {VA}: waste ground; rare, introduced from Asia. This plant is cultivated for the fiber of its stems, which is extracted and used for fabric in a manner reminiscent of linen (from *Linum usitatissimum*). [= 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 canadensis (Linnaeus) Weddell, Wood-nettle. Mt, Pd, Cp (GA, NC, SC, VA): moist, nutrient-rich forests, especially abundant in cove forests in the Mountains and bottomlands in the Piedmont; common (rare in Coastal Plain). Late June-August; late July-October. Nova Scotia and se. Manitoba 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; *? 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. Cp (GA, NC, SC): coastal shores, sometimes weedy in calcareous situations; rare, perhaps only introduced in our area (NC Watch List). 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, Z; *P. nummularia* Small – C, F, S]

* ***Parietaria judaica*** Linnaeus, Pellitory-of-the-wall. Cp (VA): disturbed urban areas; rare, introduced from Europe. [= FNA, K; *P. diffusa* Mertens & Koch]

Parietaria pensylvanica Muhlenberg ex Willdenow *var*. ***pensylvanica***, Pennsylvania Pellitory, Rock Pellitory. Mt (GA, NC, VA), Pd, Cp (NC, VA): in circumneutral soils, such as in thin soils at the bases of calcareous or subcalcareous cliffs or on calcareous shale barrens; uncommon, rare in VA Coastal Plain and NC (GA Special Concern, NC Watch List). April-October; May-October. ME west to British Columbia, south to e. NC, w. NC, AL, TX, NV, and Mexico (though scattered and irregular in much of that area). Var. *pensylvanica* is eastern and northern; var. *obtusa* (Rydberg ex Small) Shinners is southwestern. [< *P. pensylvanica* – C, FNA, G, GW, K, RAB, S, W, infraspecific taxa not recognized; = *P. pensylvanica* – F (sensu stricto)]

Parietaria praetermissa Hinton, Coastal Pellitory. Cp (GA, NC, SC): shell middens, coastal hammocks; rare (NC Watch List). March-frost; April-frost. E. NC south to FL and west to LA. [= FNA, GW, K, 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. Cp, Mt, Pd (NC, SC, VA): swamp forests, freshwater marshes, calcareous wetlands; uncommon (SC Rare List). 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; < *Adicea pumila* (Linnaeus) Rafinesque – S]

* ***Pilea microphylla*** (Linnaeus) Liebmann, Rockweed, Artillery Weed. Cp (GA, SC): old rock and brick walls, urban areas; rare. 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]

Pilea pumila (Linnaeus) A. Gray, Greenfruit Clearweed, Coolwort, Richweed. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): swamp forests, bottomlands, freshwater marshes; common. August-September; September-November. Québec west to MN, south to FL, LA, and OK. [= RAB, C, FNA, G, GW, W; > ***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. Cp (GA, NC, SC), Pd (NC, SC): rich moist soil, usually on floodplains; rare (NC Rare). 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 (Richmond 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, Z]

* ***Urtica dioica*** Linnaeus, European Stinging Nettle, Great Nettle. Mt , Cp (GA, NC, VA), Pd (NC, VA): disturbed areas, primarily in calcareous soils; uncommon, introduced from Europe. May-July; July-September. See *U. gracilis* for discussion of the two taxa. [= F, S; < *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. Mt (NC?, VA), Pd (VA): bottomland forests and edges, particularly over limestone; rare (NC Watch List). May-July; July-September. Labrador and Nova Scotia 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; < *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. Cp (SC), Mt (VA), {GA}: disturbed areas; rare, introduced from Eurasia. April-May; May-July. [= RAB, C, F, FNA, G, K, S, Z]

VALERIANACEAE Batsch 1802 (Valerian Family)

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 pinnately compound..... ***Valeriana***
1 Stem leaves simple..... ***Valerianella***

Valeriana Linnaeus (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 3-4 mm long..... ***[V. officinalis]***
1 Corolla tube 12-16 mm long..... ***V. pauciflora***

Valeriana pauciflora Michaux, Pink Valerian, Long-tube Valerian. Pd (VA): very nutrient-rich alluvium in floodplain forests; rare. 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]

* *Valeriana officinalis* Linnaeus, Garden-heliotrope, is a European species sometimes cultivated in our area; it may escape or persist. May-August. [= C, F, G, K]

Valerianella P. Miller (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 Corolla 1.5-2 mm long, the corolla lobes 0.4-0.8 mm long..... ***V. radiata***
  2 Corolla 3-5 mm long, the corolla lobes 1-2 mm long ..... ***V. umbilicata***

* ***Valerianella locusta*** (Linnaeus) Lat., European Corn-salad. Pd (GA, NC, SC, VA), Cp (NC, VA), Mt (GA, NC, VA): roadsides, moist forests, bottomlands, disturbed areas; common, introduced from Europe. April-May. [= RAB, C, K, S, Z; = *V. olitoria* (Linnaeus) Pollich – F, G]

Valerianella radiata (Linnaeus) Dufresne. Cp, Pd, Mt (GA, NC, SC, VA): moist forests, bottomlands, disturbed areas; common. April-May. VA, s. IL, and KS, south to FL and TX. [= RAB, C, K, S, Z; > *V. radiata* var. *fernaldii* Dyal – F, G; > *V. radiata* var. *radiata* – F, G]

Valerianella umbilicata (Sullivant) Wood. Pd, Mt (NC, VA), 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. [= RAB, C; > *V. umbilicata* – F, G, K, S, Z; > *V. patellaria* (Sullivant ex A. Gray) Wood – F, S; *V. intermedia* Dyal – F; = *V. radiata* var. *intermedia* (Dyal) Gleason – G; > *V. woodsiana* (Torrey & A. Gray) Walpers – K, S, Z]

Valerianella chenopodiifolia (Pursh) Augustin de Candolle ranges south to s. PA, MD, and WV (Kartesz 1999) and might be expected in the northern part of our area. [= K; = *V. chenopodifolia* – C, F, G, orthographic variant] {not keyed at this time; synonymy incomplete}

* ***Valerianella dentata*** (Linnaeus) Pollich is 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 keyed at this time; synonymy incomplete}

VERBENACEAE J. St.-Hilaire 1805 (Verbena Family)
(also see *LAMIACEAE* and *PHRYMACEAE*)

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).

tribe Verbeneae: *Glandularia, Stylodon, Verbena*.
tribe Lantaneae: *Aloysia, Lantana, Phyla.*

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. [= K]

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, Mt (GA): dry prairies on clay soils; rare (GA Special Concern). 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] {not keyed at this time; synonymy incomplete}

Glandularia canadensis (Linnaeus) Nuttall, Rose Vervain, Rose Verbena, Creeping Vervain. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): 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, introduced from 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 (GA, NC, SC): disturbed areas, especially near the coast; rare, introduced. [= RAB, K, S, Z]

*? ***Lantana depressa*** Small *var*. ***floridana*** (Moldenke) R. Sanders, Florida Lantana. Cp (SC): edges of brackish marshes, dunes; rare, 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 (GA): disturbed areas; rare, introduced. 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, "Fogfruit")

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 ..... ***Ph. 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 ..... ***Ph. nodiflora***

Phyla lanceolata (Michaux) Greene, Marsh Frogfruit, Northern Frogfruit. Cp (GA, NC, SC, VA), Pd, Mt (VA): brackish marshes, other marshes, ditches; common (GA Special Concern). June-November. Ontario west to SD, south to ne. 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; = *Lippia lanceolata* Michaux – RAB; > *L. lanceolata* var. *lanceolata* – F; > *Lippia lanceolata* var. *recognita* Fernald & Griscom – F]

Phyla nodiflora (Linnaeus) Greene, Creeping Frogfruit, Capeweed, Turkey-tangle, Matgrass. Cp (GA, NC, SC, VA): sandy soils of roadsides, lawns, ditches, disturbed areas; common (VA Rare List). 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; = *Lippia nodiflora* (Linnaeus) Michaux – RAB, F]

Stylodon Rafinesque 1825 (Carolina-vervain)

A monotypic genus, an herb, of se. North America. References: Atkins in Kadereit (2004).

Stylodon carneus (Medikus) Moldenke, Carolina-vervain. Cp (GA, NC, SC, VA?): sandy woodlands, sandhills; uncommon. April-July. E. NC (se. VA?) south to c. peninsular FL, west to e. TX. [= K; = *Verbena carnea* Medikus – RAB, F; = *Stylodon carolinensis* (Walter) Small – S]

Verbena Linnaeus 1753 (Verbena, Vervain)
(also see *Glandularia* and *Stylodon*)

A genus of about 200-250 species, herbs, of tropical, subtropical, and warm temperate regions of the New World and (rarely) Old World. References: Barber (1982)=Z; Atkins in Kadereit (2004).

* ***Verbena bonariensis*** Linnaeus. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC): roadsides, disturbed areas, old fields; common, introduced from South America. May-October. [= RAB, C, G, GW, S; > *V. bonariensis* var. *bonariensis* – K; > *V. bonariensis* var. *conglomerata* Briq. – K]

*? ***Verbena bracteata*** Lagasca & Rodriguez, Prostrate Vervain. Cp (GA, NC, SC, VA), Pd (GA, NC), Mt (NC): disturbed areas, waste areas near wool-combing mills; rare. June-October. The original distribution uncertain, now distributed from ME west to British Columbia, south to FL and Mexico. [= RAB, C, F, G, K, Z; =*? V. bracteosa* Michaux – S]

* ***Verbena brasiliensis*** Vellozo, Brazilian Vervain. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC): roadsides, disturbed areas, old fields; common, introduced from South America. May-October. [= RAB, C, F, G, GW, K, S]

* ***Verbena halei*** Small, Texas Vervain. Cp (GA, NC, SC): roadsides, pastures; rare, presumably introduced from farther west. April-June. NC, MO, and AZ south to FL, TX, and Mexico. [= RAB, K, S; = *V. officinalis* ssp. *halei* (Small) Barber – Z]

Verbena hastata Linnaeus, Common Vervain, Blue Vervain, Simpler's-joy. Cp, Pd, Mt (NC, VA), {GA, SC}: marshes, bogs, low fields; common (rare south of VA). June-October. The hybrid with *V. urticifolia*, *Verbena* ×*engelmannii* Moldenke, is known from our area. [= RAB, C, F, G, GW, S, W, Z; > *V. hastata* var. *hastata* – K; > *V. hastata* var. *scabra* Moldenke – K]

* ***Verbena officinalis*** Linnaeus, European Vervain, Juno's Tears, Herb-of-the-cross. Cp (GA, NC, SC, VA), Mt (NC, VA), Pd (VA): disturbed areas; rare, introduced from Europe. June-October. [= RAB, C, F, G, S; > *V. officinalis* var. *officinalis* – K; > *V. officinalis* var. *prostrata* Gren. & Godr. – K; = *V. officinalis* ssp. *officinalis* – Z]

* ***Verbena rigida*** Sprengel. Cp (GA, NC, SC, VA), Pd (GA): roadsides, disturbed areas; common (uncommon north of SC), introduced from South America. Late March-July. [= K, S]

*? ***Verbena riparia*** Rafinesque ex Small & Heller, Riverbank Vervain. Mt (NC, VA), Pd (NC): riverbanks; rare. June-July. This species is enigmatic; there are only a few collections, and the taxonomic status of the taxon is unclear. It may represent unusual forms of *V. officinalis*. [= RAB, C, F, G, K, S, W]

Verbena scabra Vahl, Rough Vervain, Harsh Vervain. Cp (GA, NC, SC, VA), Pd (GA, VA), Mt (VA): brackish marshes, shell deposits, other wet habitats; common. May-October. VA and WV south to FL, west to TX and CA, south into tropical America; mainly coastal in our area but with scattered inland records. [= RAB, C, F, G, GW, K, S]

Verbena simplex Lehmann, Narrowleaf Vervain. Pd (GA, NC, SC, VA), Mt (GA, VA), Cp (VA): glades, woodlands, forests, and roadsides, over mafic or calcareous rocks; common. May-September. NH west to MN and NE, south to Panhandle FL (Jackson County) and TX. [= RAB, C, F, G, K, W, Z; *? V. angustifolia* Michaux – S]

* ***Verbena stricta*** Ventenat, Hoary Vervain. Cp* (NC*, VA*), Pd (GA): pastures and roadsides; rare, introduced from 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, Z]

Verbena urticifolia Linnaeus *var.* ***leiocarpa*** Perry & Fernald, Velvetleaf Vervain. {Cp, Pd, Mt (NC, SC, VA): } May-November. CT, MI, and ND, south to SC, TN, AR, and TX. [= C, F, G, K; < *V. urticifolia* – RAB, GW, W, Z; < *V. urticaefolia* – S, orthographic variant]

Verbena urticifolia Linnaeus *var.* ***urticifolia***, White Vervain. {GA, NC, SC, VA}: mesic to dry-mesic forests, marshes, disturbed areas; common. May-November. New Brunswick west to Saskatchewan, south to FL and TX. The hybrid with *V. hastata*, *Verbena* ×*engelmannii* Moldenke, is known from our area. [= C, F, G, K; < *V. urticifolia* – RAB, GW, W, Z; < *V. urticaefolia* – S, orthographic variant]

Verbena canescens Kunth. AL. [= K]

Verbena carolina Linnaeus. AL and MS. [= K]

Verbena litoralis Kunth. Cp (GA): scattered sites in e. and s. GA (Jones & Coile 1988). [= K; = *V. littoralis* – S, orthographic variant] {synonymy incomplete}

Verbena xutha Lehmann, Gulf Vervain. AL west to TX. [= K, S]

VIOLACEAE Batsch 1802 (Violet Family)

A family of about 20 genera and 900 species, herbs, shrubs, and vines, cosmopolitan in distribution. References: McKinney & Russell (2002)=X.

1 Plants caulescent, 4-10 dm tall, the leaves narrowly cuneate to a petiole 0-20 mm long, also long acuminate; petals green; fruit 15-20 mm long ..... ***Hybanthus***
1 Plants acaulescent or caulescent, 0-5 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; fruit < 13 mm long ..... ***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. 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. Pd, Mt (GA, NC, SC, VA), Cp (GA, VA): very nutrient-rich and mesic forests; uncommon. Cleistogamous flowers: April-early May; late May-June. Chasmogamous flowers: Late May-June; August-October. VT and s. Ontario west to MI and KS, south to SC, GA, and AR. [= RAB, C, F, G, K, W, X; = *Cubelium concolor* (T.F. Forster) Rafinesque – S]

* ***Hybanthus parviflorus*** (Mutis ex Linnaeus f.) Baill. Cp (GA): disturbed area; rare, introduced from 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).

Viola Linnaeus 1753 (Violet, Johnny-jump-up, Pansy)
(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; Gil-ad (1998)=Y; McKinney & Russell (2002)=X; Haines (2001)=V; McKinney (1992); Ballard & Wujek (1994); Russell (1955); Ballard, Sytsma, & Kowal (1999). Key adapted, in part, from Ballard (1992) and Ballard & Wujek (1994).

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) ..... **Key B**
1 Plant acaulescent (with leaf petioles and flower stalks arising separately from the base of the plant).
  3 Corolla yellow; leaves borne more-or-less flat on the ground ..... **Key C**
  3 Corolla white, blue-violet, or blue-and-white variegated.
    4 Plant producing stolons; corolla white (or blue in *V. appalachiensis*, *V. walteri*, and *V. odorata*) ..... **Key D**

4 Plant not producing stolons; corolla blue-violet ..... **Key E**

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 Leaves 3-lobed ..... ***V. tripartita* var. *tripartita***
2 Leaves cordate or hastate.
3 Leaves at least as broad as long.
4 Stems 2-several; basal leaves 4 or more; foliage glabrous to glabrate ..... ***V. pubescens* var. *scabriuscula***
4 Stems 1; basal leaves 0-2; foliage densely pubescent ..... ***V. pubescens* var. *pubescens***
3 Leaves distinctly longer than broad.
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* var. *glaberrima***

Key B – Caulescent Violets with blue, cream, or multicolored flowers

1 Stipules foliaceous, deeply lobed; leaves cuneate at base; [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 along the margin; leaves truncate or cordate at the base; [section *Viola*].
4 Above-ground stems absent (surficial stolons present; style terminating in a slender hook ca. 1 mm long; capsules hirtellous; [introduced, cultivated, rarely persistent or spreading] ..... ***V. odorata***
4 Above-ground stems present, ascending or prostrate (and stolon-loke rhizomes present in *V. appalachiensis* and *V. walteri*); style straight or terminating in a bent or recurved hook 0-0.5 mm long; capsules glabrous; [native].
5 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).
6 Leaf blades with scattered hairs near the margin only; petioles, peduncles and stems glabrous; stipules shallowly lacerate, with marginal processes < 1/4 as long as the stipule ..... ***V. appalachiensis***
6 Leaf blades moderately to densely puberulent over the entire surface; petioles, peduncles and stems moderately to densely puberulent; stipules deeply laciniate with marginal processes > 1/2 as long as the stipule ..... ***V. walteri***
5 Stems ascending to erect at time of flowering and fruiting; stems deciduous at end of growing season, not rooting at nodes (plants thus solitary).
7 Lateral sepals glabrous within; corolla lavender, with a purple-black eyespot surrounding the throat; spur 7-20 mm long ..... ***V. rostrata***
7 Lateral sepals bearded within; corolla uniformly creamy-white or blue (rarely white), lacking a contrasting eyespot around the throat; spur 3-6 mm long.
8 Sepal margins eciliate; flowers lavender to violet (rarely white in albino forms); spur mostly > 5 mm long ..... ***V. labradorica***
8 Sepal margins distinctly ciliate; flowers creamy-white; spur mostly < 5 mm long ..... ***V. striata***

Key C – Acaulescent Violets with yellow flowers

One species in our area ..... ***V. rotundifolia***

Key D – Acaulescent Violets with stolons and white or blue flowers

1 Flowers generally blue (white or blue-and-white variegated in *V. odorata*, which has the style terminating in a conic hook).
2 Above-ground stems absent (surficial stolons present); style terminating in a slender hook ca. 1 mm long; capsules hirtellous; [introduced, cultivated, rarely persistent or spreading] ..... ***V. odorata***
2 Above-ground stems generally present, ascending or prostrate (and stolon-like rhizomes present); style straight or terminating in a bent or recurved hook 0-0.5 mm long; capsules glabrous; [native].
3 Leaf blades with scattered hairs near the margin only; petioles, peduncles and stems glabrous; stipules shallowly lacerate with marginal processes < 1/4 as long as the stipule ..... ***V. appalachiensis***

3 Leaf blades moderately to densely puberulent over the entire surface; petioles, peduncles and stems moderately to densely puberulent; stipules deeply laciniate with marginal processes > 1/2 as long as the stipule ..... ***V. walteri***

1 Flowers white (and the style broad at the tip, in most species resembling a scoop).
4 Leaf blades > 1.5× as long as broad.
5 Leaf blades lance-ovate, broadly cuneate to subcordate at the base ..... ***V. primulifolia***
5 Leaf blades linear to lanceolate, narrowly cuneate at the base.
6 Leaf blades lanceolate, < 8× as long as wide; plant glabrous ..... ***V. lanceolata*** *var*. ***lanceolata***
6 Leaf blades linear or narrowly lanceolate, > 10× as long as wide; plant glabrous to pubescent..... ..... ***V. lanceolata*** *var*. ***vittata***
4 Leaf blades < 1.5× as long as broad.
7 Leaf blades completely glabrous (petioles may be villous); [of wet, acidic seepage or streamsides] .... ***V. macloskeyi*** *var*. ***pallens***
7 Leaf blades pubescent, at least on the upper surface of the basal lobes.
8 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***
8 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 E – Acaulescent Violets without stolons, with blue-violet flowers

1 Leaf blades deeply divided throughout, or lobed basally, or deeply toothed basally (the earliest 1-2 leaves may be simply cordate); [some species keyed both here and below].
2 Leaf blades deeply divided throughout into linear or lanceolate segments (or with several narrow lateral segments and a broadly lanceolate central segment), the leaf blade (in outline) about as broad as long.
3 Lateral petals glabrous within; stamens orange, conspicuously exserted; [of dry habitats]..... ***V. pedata***
3 Lateral sepals bearded; stamens not orange and conspicuously exserted; [of moist to wet habitats, or dryish, basic sites].
4 Petioles and leaf blades (the lower leaf surface at least) moderately to densely pubescent; [of mesic to fairly dry, woodlands, over circumneutral to basic soils] ..... ***V. palmata*** *var*. ***subsinuata***
4 Petioles and leaves glabrous or glabrate with marginal ciliate hairs; [of moist to wet habitats].
5 Leaf segments 9-11, with a narrow central lobe 1-2× as wide as the lateral lobes; peduncle equal to or shorter than the leaves; sepal auricles much longer than wide; [of ecotones at upper edges of alluvial or levee forests] ..... ***V. brittoniana*** *var*. ***brittoniana***
5 Leaf segments 5-7, with a broadly lanceolate central lobe 3-5× as wide as the lateral lobes; peduncle normally much longer than the leaves; sepal auricles wider than long or equal; [of mesic pine savannas and pocosin ecotones] ..... ***V. septemloba***
2 Leaf blades lobed or deeply toothed only toward the base.
6 Leaf blade outline oblong-lanceolate to ovate-triangular, much longer than wide.
7 Petioles distinctly shorter than the leaf blades; leaf blades densely pubescent, the apex blunt, the basal teeth undeveloped or with a few coarse teeth on mature leaves; [of dry sandy clearings and banks] .... ***V. fimbriatula***
7 Petioles equal to or longer than the leaf blades; leaf blades glabrate, the apex acute, the basal teeth well-developed, very coarse to lobe-like; [of mesic sandy soil of fields, meadows, and pine savannas] .... ***V. sagittata***
6 Leaf blade outline ovate to subrotund, about as wide as long.
8 Plant moderately to densely pubescent, at least on petioles and undersurfaces of leaves; mature leaves trilobed; [of mesic to dryish woodlands, in circumneutral or basic soils] ..... ***V. palmata*** *var*. ***palmata***
8 Plant glabrous or glabrate (hairs on leaf margins or on upper surface of the lobes); mature leaves either trilobed or 5-7-lobed; [of moist to wet habitats].
9 Mature leaves trilobed, with 1 (-2) reniform or obovate lobes on each side; spurred petal glabrous; [of streamsides, floodplains, levee forests] ..... ***V. esculenta***
9 Mature leaves deeply lobed with 2-3 lanceolate lobes on ech side; spurred petal bearded; [of moist to wet pine savannas and pocosin ecotones]..... ***V. septemloba***

1 Leaf blades merely serrate along the margin, ovate to subrotund in outline, cordate to truncate at the base.
10 Leaf blades mostly longer than broad, narrowly ovate to long-triangular, tapering to an acute or even short-acuminate apex.
11 Foliage moderately to densely pubescent; leaves distinctly longer than wide; [of dry to mesic clearings and banks] ..... ***V. fimbriatula***
11 Foliage glabrous or glabrate; [plants of various habitats].
12 Lateral petals bearded with clavate hairs; spurred petal glabrous within; [of swamps and sphagnous streamsides]..... ***V. cucullata***

12 Lateral petals with hairs of essentially uniform width; spurred petal bearded within; [of various habitats].
13 Basal teeth no larger than the others; leaf bases cordate; [of mesic forests, streamsides, and seeps] ..... ***V. affinis***
13 Basal teeth longer than the others; leaf bases truncate to subcordate (ignore earliest 1-2 leaves).
14 Leaf outline broadly triangular, not much longer than wide; teeth on lower half of leaf numerous, pectinate ..... ***V. brittoniana var. pectinata***
14 Leaf outline narrowly triangular-ovate, much longer than wide; basal teeth few, very coarse ..... ***V. sagittata***

10 Leaf blades about as wide as long or wider, ovate to suborbicular, the apex obtuse to acute.
15 Lateral petals bearded with clavate hairs; foliage glabrous or glabrate.
16 Petals light blue or light violet-blue, with a dark eye and dark veins; sepals 8-12 mm long; all plants in population with unlobed leaves; [primarily of the Mountains] ..... ***V. cucullata***
16 Petals violet-blue, with a white eye and dark veins; sepals 6-7 (-8) mm long; at least some plants in population with trilobed leaves; [primarily of the Coastal Plain] ..... ***V. esculenta***
15 Lateral petals bearded with hairs of uniform width; foliage distinctly pubescent, glabrate, or glabrous.
17 Leaf blades glabrous or glabrate, or with hairs confined to just the basal lobes; petioles glabrous or glabrate.
18 Leaf blades with obvious area of hairs confined to upper surface of the basal lobes; spurred petal bearded; all plants in population with unlobed leaves ..... ***V. affinis***
18 Leaf blades glabrous or glabrate, not as above; spurred petal glabrous or glabrate; all plants in population with unlobed leaves, or some leaves trilobed.
19 Blades green beneath; spurred petal glabrous; at least some plants in population with trilobed leaves ..... ***V. esculenta***
19 Blades red-dotted or red-tinged beneath; spurred petal glabrous or glabrate; all plants in population with unlobed leaves ..... ***V. sororia***
17 Leaf blades moderately to densely pubescent on one or both surfaces, or on the petioles.
20 Leaf blades equally pubescent on both surfaces, or glabrate on both surfaces.
21 Leaf blades large, the apex acute, held high above the ground on long, ascending petioles, deciduous; peduncles shorter than to equalling the petioles ..... ***V. sororia***
21 Leaf blades small, blunt or rounded, essentially flat on the ground, evergreen or tardily deciduous; peduncles much longer than the petioles ..... ***V. villosa***
20 Leaf blades much more pubescent on one surface than the other.
22 Leaf blades densely pubescent above, sparsely so below and on the petiole; leaf apex blunt to rounded; leaf blade often purple-tinged below ..... ***V. hirsutula***
22 Leaf blades much more pubescent beneath and on petiole, glabrate above; leaf apex acute; leaf blade green beneath ..... ***V. septentrionalis***

Viola affinis Le Conte, Thinleaf Violet, LeConte's Violet. Pd, Cp, Mt (GA, NC, SC, VA): swamp forests, wet bottomlands; common. March-May. VT and MA west to WI, south to c. peninsular FL and e. TX. [= RAB, F, G, GW, K, S, V, W, Y; < *V. sororia* – C]

Viola appalachiensis L.K. Henry, Appalachian Violet. Mt (NC): serpentine barrens, rich cove forests (especially old road beds through coves); rare (NC Rare). April-May. PA and WV south to sw. NC. [= K, Z; = *V. walteri* House var. *appalachiensis* (L.K. Henry) L.E. McKinney – X]

***** ***Viola arvensis*** Murray, European Field-pansy. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): roadsides, fields; common, introduced from Europe. March-July. [= RAB, C, F, G, K, S, W, X]

Viola bicolor Pursh, Wild Pansy. Mt, Pd, Cp (GA, NC, SC, VA): pastures, roadsides, lawns, other disturbed habitats; common. March-May. MA and NY west to SD and CO, south to FL, TX, and AZ. [= K, X; = *V. rafinesquii* Greene – RAB, C, G, S, W; = *V. kitaibeliana* J.A. Schultes var. *rafinesquii* Fernald – F; = *V. rafinesquei*, orthographic variant]

Viola blanda Willdenow, Sweet White Violet. (GA, NC, SC, VA} [= F, G, S; < *V. blanda* – RAB, C, W, X (also see *V. incognita*); = *V. blanda* var. *blanda* – K, V]

Viola brittoniana Pollard *var.* ***brittoniana***. Cp (NC, SC, VA): low ground, including brackish areas; uncommon (NC Watch List, VA Watch List). April-May. ME to SC, along the coast. [= RAB, G, K; < *V. palmata* var. *palmata* – C; = *V. brittoniana* – F; < *V. pedatifida* G. Don ssp. *brittoniana* (Pollard) McKinney – X; < *V. brittoniana* – V, Y]

Viola brittoniana Pollard *var.* ***pectinata*** (Bicknell) Alexander. Cp (NC, VA): low ground; rare. April-May. MA to NC, along the coast. [= RAB, G, K; < *V. palmata* var. *palmata* – C; = *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, NC, SC, VA), Pd (NC, VA): rich cove forests, other rich mesic situations, such as floodplains; common. April-July. Newfoundland to Ontario, 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, NC, SC, VA): bogs, seeps, margins of spring branches; common. April-June. Newfoundland to MN, south to w. NC, n. GA, TN, and e. AR. Records from the Piedmont and Coastal Plain of SC and GA are presumably misidentifications. [= RAB, C, G, GW, K, S, V, W, X, Y; > *V. cucullata* var. *cucullata* – F; > *V. obliqua* Hill]

Viola esculenta Elliott. {GA, NC, SC, VA} (VA Rare List). [= F, G, GW, S; < *V. septemloba* – RAB; < *V. palmata* var. *palmata* – C; = *V.* ×*esculenta* Elliott (pro sp.) (*septemloba* × *triloba*) – K]

Viola fimbriatula Smith. {NC, VA} In e. TN (Chester, Wofford, & Kral 1997). [= RAB, F, G, S, W, Y; < *V. sagittata* Aiton – C; = *V. sagittata* Aiton var. *ovata* (Nuttall) Torrey & A. Gray – K, V, X*; V. sagittata* var. *fimbriatula* Sm.]

Viola hastata Michaux, Spearleaf Violet, Silverleaf Violet, Halberd-leaf Violet. Mt, Pd (GA, NC, SC, VA): acidic coves, dry-mesic oak forests; common. Late March-May. PA and OH south to Ga and AL. [= RAB, C, F, G, K, S, W, X]

Viola hirsutula Brainerd. {GA, NC, SC, VA} [= RAB, F, G, K, S, W, V, X; < *V. villosa* Walter – C]

Viola incognita Brainerd. Mt (NC, SC?, VA): rare (VA Watch List). April-June. [= S; < *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, NC, SC, VA), Cp (VA): moist alluvial woodlands and forests, seepage slopes, marl ravines; uncommon. Late March-May. Labrador west to AK, south to e. VA, nw. SC, AL, and OH. Ballard concluded that *V. conspersa* was not distinct from *V. labradorica*. [= K, V, X, Z; > *V. conspersa* Reichenbach – RAB, C, F, G, GW, S, W]

Viola lanceolata Linnaeus *var.* ***lanceolata***, Lanceleaf Violet. {NC, SC, VA}: [= C, F, V; < *V. lanceolata* – RAB, W, X; = *V. lanceolata* ssp. *lanceolata* – GW, K; = *V. lanceolata* – G, S]

Viola lanceolata Linnaeus *var.* ***vittata*** (Greene) Weatherby & Griscom, Strap-leaf Violet. {GA, NC, SC, VA}: [= 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 Augustin de Candolle) C.L. Hitchcock, Wild White Violet. Mt (GA, NC, SC, VA), Pd (NC, VA): brookbanks, seepages; uncommon. 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 Augustin de Candolle) Brainerd – F, G, GW, S; > *V. pallens* var. *pallens* – G; > *V. pallens* var. *subreptans* Rousseaux – G; = *V. macloskeyi* ssp. *pallens* (Banks ex Augustin de Candolle) M.S. Baker – K, V, W; < *V. macloskeyi* F. Lloyd – X]

* ***Viola odorata*** Linnaeus, Sweet Violet, English Violet. Pd (NC, VA?), {GA}: gardens, lawns, disturbed places, persistent or weakly spreading from horticultural use; rare, introduced from Europe. [= C, F, G, K, S, V, Z]

Viola palmata Linnaeus *var.* ***palmata***, Wood Violet. [> *V. palmata* var. *palmata* – RAB; > *V. palmata* var. *triloba* (Schweinitz) Gingins ex Augustin de Candolle – RAB; < *V. palmata* var. *palmata* – C; > *V. triloba* Schweinitz var. *triloba* – F, G, K; > *V. stoneana* – F, G; >< *V. palmata* – F, G, S, V, W, X, in the narrow sense; > *V. chalcosperma* Brainerd – F, S; < *V* ×*palmata* Linnaeus (pro sp.) – K; *? V. triloba* Schweinitz – S, W]

Viola palmata Linnaeus *var.* ***subsinuata*** Greene. (VA Watch List). [< *V. palmata* var. *palmata* – C; *? V. triloba* Schweinitz var. *dilatata* (Elliott) Brainerd – F, G, K; = *V. subsinuata* Greene – V, X]

Viola pedata Linnaeus, Bird's-foot Violet. Mt, Pd, Cp (GA, NC, SC, VA): dry rocky or sandy forests, woodlands, glades, and roadbanks; common (uncommon in the outer Coastal Plain south of VA). March-May; May-June. Var. *ranunculifolia* is accepted by some recent authors; it needs additional study. [= RAB, C, K, S, V, W; > *V. pedata* var. *pedata* – F, G; > *V. pedata* var. *lineariloba* Augustin de Candolle – F, G; > *V. pedata* var. *pedata* – X; > *V. pedata* var. *ranunculifolia* (Jussieu ex Poiret) Ging. ex Augustin de Candolle – X]

Viola primulifolia Linnaeus, Primrose-leaf Violet. Cp, Pd, Mt (GA, NC, SC, VA): bogs, wet savannas, pocosins, moist organic soils along small streams; common. March-May. Newfoundland to Ontario, south to FL, and west to TX and se. OK. [= RAB, C, GW, S, V, W, 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 *var.* ***pubescens***, Hairy Yellow Forest Violet. Pd, Mt (NC, VA): {GA, NC, SC, VA} March-May. [= 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. pubescens* – G, S; *V. eriocarpon* (Nuttall) Schweinitz var. *eriocarpon*]

Viola pubescens Aiton *var.* ***scabriuscula*** Schweinitz ex Torrey, Smooth Yellow Forest Violet. {GA, NC, SC, VA} March-May. [= K, V, X; = *V. eriocarpa* (Nuttall) Schweinitz var. *leiocarpa* Fernald & Wiegand – RAB; < *V. pubescens* – C, GW, W, in part; > *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 rostrata Pursh, Long-spurred Violet. Mt (GA, NC, SC, VA), Pd (VA): mesic forests, often under *Tsuga*; common. April-May. NH and Québec west to WI, south to GA and AL. [= RAB, F, G, K, S, V, W, X, Z]

Viola rotundifolia Michaux, Round-leaf Yellow Violet, Early Yellow Violet. Mt (GA, NC, SC, VA): rich coves; common. March-April. ME to s. Ontario, south to w. NC, n. GA, and e. TN. [= RAB, C, F, G, K, S, V, W, X]

Viola sagittata Aiton, Arrowhead Violet. {GA, NC, SC, VA} [= RAB, F, S, W, 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. sagittata* var. *sagittata* – G, K, V, X; *? V. emarginata* – S]

Viola septemloba Le Conte. Cp (GA, NC, SC): sandy pinelands; rare. Late March-early May. [= 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. {NC, VA}: (VA Watch List). NC (McMillan pers. comm.). e. TN (Chester, Wofford, & Kral 1997). [= G, K, W, Y; < *V. sororia* – C, V; *? V. septentrionalis* var. *septentrionalis* – F; < *V. sororia* var. *sororia* – X]

Viola sororia Willdenow, Dooryard Violet, Confederate Violet, Common Blue Violet. Mt, Pd, CP (NC, SC), {GA, VA} [= W, Y; > *V. palmata* var. *sororia* (Willdenow) Pollard – RAB; > *V. papilionacea* Pursh – RAB, F, S; < *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, Pd (GA, NC, SC, VA), Cp (VA): mesic forests and woodlands, disturbed areas; common. March-June. MA west to WI, south to GA, AR, and e. OK. [= RAB, C, F, G, GW, K, S, V, W, X, Z]

* ***Viola tricolor*** Linnaeus, Pansy, Johnny-jump-up. Cp, Pd, Mt (GA, NC, SC, VA): lawns, garden borders, railroad rights-of-way; commonly cultivated, uncommonly persistent and weakly spreading, introduced. March-June (and sporadically later). [= RAB, C, F, G, K, V]

Viola tripartita Elliott *var.* ***glaberrima*** (Augustin de Candolle) Harper. Cp (GA): {NC, SC, VA} [= RAB, G, S, W; < ***V. tripartita*** – C, F, K, X]

Viola tripartita Elliott *var.* ***tripartita***, Three-parted Violet. {GA, NC, SC, VA} [= RAB, G, S, W; < ***V. tripartita*** – C, F, K, X]

Viola villosa Walter, Southern Woolly Violet. Cp (GA, NC, SC), Pd (GA, SC): pocosin ecotones, other sites with moist soils; uncommon (NC Watch List, VA Watch List). Late February-early April. 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, 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) (NC Watch List, VA Rare List). March-May. W. VA west to s. OH and AR, south to FL and TX. [= RAB, F, G, K, S, W, Z; = ***V. walteri*** var. *walteri* – X]

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 missouriensis Greene. Throughout TN (probably in NC and VA), in KY (Kartesz 1999), and scattered in PA (Rhoads & Klein 1993). [= K, Y; < ***V. sororia*** Willdenow – C; = ***V. sororia*** var. *missouriensis* (Greene) L.E. McKinney – X] {add to synonymy}

Viola nephrophylla Greene, Northern Bog Violet, south to PA and WV (Kartesz 1999). [= C, K, V] {add to synonymy; not keyed at this time}

Viola pedatifida G. Don, Crowfoot Violet. Mt (VA): shale barrens; rare. April-May. Ontario west to Alberta, 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] {add to synonymy; not keyed at this time}

VISCACEAE Batsch 1802 (Mistletoe Family)

A family of about 7 genera and 385 species, epiphytic hemiparasites, of cosmopolitan distribution. The recognition of the Viscaceae as distinct from Loranthaceae appears well warranted (see Kuijt 1982); however, the Viscaceae should perhaps be combined into the Santalaceae (Angiosperm Phylogeny Group 2003). References: Kuijt (1982)=Z.

Phoradendron Nuttall (Mistletoe)

A genus of about 235 species, epiphytic hemiparasites, of tropical and rarely temperate America. References: Kuijt (2003)=Y; Kuijt (1982)=Z.

Phoradendron serotinum (Rafinesque) M.C. Johnston *ssp.* ***serotinum***, American Mistletoe, Christmas Mistletoe. Cp, Pd, Mt (GA, NC, SC, VA): 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. The other three subspecies are distributed in sw. United States and n. Mexico. *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 ***Ph. leucarpum*** are extremely poisonous. Their sticky flesh promotes the dispersal of the seeds by birds from tree to tree. 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*." [= Y; = *Phoradendron leucarpum* (Rafinesque) Reveal & M.C. Johnston – K; < ***Ph. serotinum*** (Rafinesque) M.C. Johnston – RAB, C, W, Z; < ***Ph. flavescens*** (Pursh) Nuttall – F, G, S]

VITACEAE A.L. de Jussieu 1789 (Grape Family)

A family of about 14 genera and 850 species, vines (rarely small trees or herbs), of tropical, subtropical, and temperate regions of the Old and New Worlds. References: Soejima & Wen (2006).

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 ..... ***Ampelopsis arborea***
6 Leaflets 2-6 cm long; [common native species of mesic to wet habitats] ..... ***A. arborea***
6 Leaflets 5-12 cm long (at least the larger > 8 cm long); [introduced species, rarely escaped] ..... ***[A. 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 (Peppervine)

A genus of about 25 species, 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).

1 Leaves bipinaate 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, rarely escaped] ..... ***[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. Pd (NC): planted as an ornamental, rarely escaping to suburban woodlands; rare, introduced from n. China. [= K]

Ampelopsis arborea (Linnaeus) Koehne, Peppervine. Cp, Pd (GA, NC, SC, VA), Mt (NC): swamp forests, marshes, wet thickets, moist to wet maritime forests; common (rare in Piedmont and Mountains). June-October. Se. VA (and MD?) south to s. FL, west to TX and n. Mexico, north in the interior to s. IL. [= RAB, C, F, G, GW, K, S, W]

* ***Ampelopsis brevipedunculata*** (Maximowicz) Trautvetter, Porcelain-berry. Pd, Cp (NC, VA), Mt (VA): thickets and disturbed areas; rare, introduced from 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. Mt, Cp, Pd (GA, VA): moist forests, bottomlands, and thickets, particularly where disturbed; rare (perhaps introduced only in all or part of our area). 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]

* *Ampelopsis megalophylla* Diels & Gilg, Bigleaf Peppervine. Planted in the Southeast; has potential to naturalize. Reports of its occurrence as naturalized in MS are based on *Cayratia* (S.W. Leonard, pers. comm.. 2006). Native of China.

Cayratia A.L. de Jussieu 1818 (Bushkiller)

A genus of ca. 50 species, of the Old World tropics and subtropics. References: Krings & Richardson (2006).

* ***Cayratia japonica*** (Thunberg) Gagnepain, Bushkiller, Sorrel Vine. Pd (NC): suburban woodlands; rare, native of temperate and subtropical se. Asia. Reported for NC from a single but aggressive restablished population in Forsyth County (Krings & Richardson 2006). Also reported as naturalized in MS, LA, and TX. [= K]

Cissus Linnaeus

A genus of about 200 species, of tropical and warm temperate areas.

Cissus trifoliata (Linnaeus) Linnaeus, Marine-ivy. Cp (GA, *SC): dredge spoil; rare, probably introduced from further south. Se. SC (Jasper County) south through GA, FL, and west along the Gulf Coast to TX, AR, and Mexico. [= K, S; > *C. incisa* (Nuttall) Des Moulins – GW, S]

Parthenocissus Planchon (Virginia-creeper, Woodbine)

A genus of about 10 species, vines, of temperate Asia and North America.

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 usually with numerous adhesive disks (though young shoots may not have the disks yet formed); leaves usually dull above; leaflets sessile or with petiolules < 10 mm long; [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; tendrils usually lacking adhesive disks (though sometimes swollen at the tip); leaves usually glossy above; leaflets with petiolules 5-20 (-30) mm long; [in our area only in e. VA] ..... ***P. vitacea***

Parthenocissus quinquefolia (Linnaeus) Planchon, Virginia-creeper. Cp, Pd, Mt (GA, NC, SC, VA): swamp forests, bottomlands, maritime forests and thickets, rock outcrops, mesic forests; common. May-July; July-August. ME west to IA, and NE, south to FL and TX. [= RAB, C, F, G, K, W; > *P. quinquefolia* – S; > *P. hirsuta* (Pursh) Graebner – S]

* ***Parthenocissus tricuspidata*** (Siebold & Zuccarini) Planchon, Boston-ivy. Pd (NC): frequently grown for ornament, rarely persisting or escaped; rare, introduced from Japan and China. [= C, F, G, K]

Parthenocissus vitacea (Knerr) A. Hitchcock. Cp (VA): rich alluvial forests, roadsides and dumps; rare. Québec west to Manitoba, WY, and CA, south to e. VA, OH, MO, TX, and AZ. [= C, G, K; = *P. inserta* (Kerner) Fritsch – F, probably misapplied]

Vitis Linnaeus 1753 (Grape)

A genus of about 65 species, vines, of temperate regions of Eurasia and North America. Rossetti et al. (2002) conducted a molecular phylogenetic study of Vitaceae and suggest that recognition of *Muscadinia* as a genus may be warranted; Soejima & Wen (2006) conclude that *Vitis* s.l. is monophyletic, the muscadines apparently basal to the rest of the genera. References: Moore (1991)=Z; Ward (2006b)=Y. 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; [west of our area, approaching it in w. KY, w. TN, and sc. AL] .....***[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. Cp, Pd, Mt (GA, NC, SC, VA): forests and woodlands, mostly upland; common. May-June; September-October. MA west to MO and IA, south to FL and e. TX. [= RAB, C, F, G, K, Y, Z; = *V. aestivalis* – S; < *V. aestivalis* – GW, W]

Vitis aestivalis Michaux *var***. *bicolor*** Deam, Silverleaf Grape. Mt (GA, NC, SC, VA): forests and woodlands, mostly upland; common. May-June; September-October. Ontario and MN south to n. GA and n. AL. [= Z; = *V. aestivalis* var. *argentifolia* (Munson) Fernald – RAB, C, F, G, K; = *V. bicolor* Le Conte – S; < *V. aestivalis* – GW, W]

Vitis cinerea (Engelmann in A. Gray) Engelmann ex Millardet *var***. *baileyana*** (Munson) Comeaux, Possum Grape. Mt, Pd, Cp (GA, NC, SC, VA): forests and woodlands, mostly bottomlands; common (rare in Coastal Plain). 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]

Vitis cinerea (Engelmann in A. Gray) Engelmann ex Millardet *var***. *floridana*** Munson, Florida Grape. Cp (GA, NC, SC, VA), Pd? (NC?, SC?, VA?): floodplain and other moist forests; common (rare in Piedmont). Late May-June; August-October. Se. VA south to FL, west to s. MS. [= RAB, C, F, G, K, Z; = *V. simpsonii* Munson – S, Y; < *V. cinerea* – GW, W]

Vitis labrusca Linnaeus, Fox Grape. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): forests and woodlands, wet, moist, and dry; common (uncommon in Mountains). 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 palmata Vahl, Red Grape, Cat Grape, Catbird Grape. Cp (GA): floodplain forests, riverbanks; rare (GA Special Concern). Mid June-late June; late July-October. IN, c. TN (Chester, Wofford, & Kral 1997), sc. GA (Jones & Coile 1988), and FL Panhandle west to MO and TX. [= C, F, G, GW, K, S, Y, Z]

Vitis riparia Michaux, Riverbank Grape. Mt, Pd, Cp (NC?, VA): forests and woodlands, mostly moist to wet; uncommon. April-June; August-September. New Brunswick west to se. Saskatchewan, 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; > *V. riparia* var. *riparia* – F]

Vitis rotundifolia Michaux *var***. *munsoniana*** (Simpson ex Munson) M.O. Moore, Munson Grape, Bullace Grape. Cp (GA): floodplain forests, banks of blackwater rivers; rare. Late April-May; late July-September. Sc. GA, s. AL, and FL. [= K, Y, Z; **= *Muscadinia munsoniana*** (Simpson ex Munson) Small – S; = *Vitis munsoniana* Simpson ex Munson]

Vitis rotundifolia Michaux *var***. *rotundifolia***, Muscadine, Scuppernong. Cp, Pd, Mt (GA, NC, SC, VA): forests, swamps, dunes; common (uncommon in Mountains). May-June; August-October. DE west to KY and MO, south to FL and TX. Cultivars of this species are popular in the Southeastern United States for eating grapes and for a distinctive wine. [= K, Y, Z; = *V. rotundifolia* – RAB, C, F, GW, W; **= *Muscadinia rotundifolia*** (Michaux) Small – S]

Vitis rupestris Scheele. Mt, Pd (VA): along streams and in riverbank scour areas, especially in calcareous areas; uncommon (VA Rare List). April-May; August-September. MD, WV, sw. PA west to MO, south to VA, c. TN, and n. AR. [= C, F, K, W, S, Z]

Vitis vulpina Linnaeus, Frost Grape, Winter Grape, Chicken Grape. Pd, Mt, Cp (GA, NC, SC, VA): forests and woodlands, primarily upland, but also in bottomlands; common. May; July-September. Se. NY west to MO and e. KS, south to FL and nc. TX. [= RAB, C, F, G, K, W, Y, Z; < *V. vulpina* – GW; > *V. vulpina* – S; > *V. cordifolia* Michaux – S]

Vitis cinerea (Engelmann in A. Gray) Engelmann ex Millardet var. *cinerea*, Graybark Grape, Pigeon Grape, may occur in our primary area, but is primarily more western, ranging from VA (?), w. KY, wc. TN, IN, and WI, south to sc. AL and TX. [= RAB, C, F, G, K, Z; = *V. cinerea* – S; < *V. cinerea* – GW, W]

* *Vitis* ×*labruscana* Bailey [*aestivalis* × *labrusca*] is the commonly cultivated Concord Grape (and related cultivars). It is sometimes persistent after cultivation. [= K; = *V. labruscana* Bailey – F] {not keyed}

* *Vitis vinifera* Linnaeus, the European Wine Grape, has been increasingly cultivated in our area, especially in VA, now one of the leading wine-producing states in the United States. The climate of our area is too humid to be ideal for this species, and special measures are needed to reliably produce good crops of "vinifera" grapes. [= K] {not keyed at this time}

ZYGOPHYLLACEAE R. Brown 1814 (Creosote-bush Family)

A family of about 27 genera and 285 species, trees, shrubs, and (rarely) herbs, of tropical and subtropical regions of the Old and New Worlds.

1 Fruit with tubercles, at maturity separating into 10 mericarps ..... ***Kallstroemia***
1 Fruit with spines, at maturity separating into 5 mericarps ..... ***Tribulus***

Kallstroemia Scopoli

A genus of about 17 species, of tropical and subtropical America. References: Porter 1969)=Z

*? ***Kallstroemia maxima*** (Linnaeus) Hooker & Arnott, Greater Caltrop. Cp (GA, SC): disturbed areas, dunes; rare, native status uncertain. SC south to FL; West Indies; Mexico (Sinaloa and Tamaulipas) south throuigh 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, Z]

Tribulus Linnaeus

A genus of about 25 species, of tropical and subtropical regions.

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 (GA): disturbed areas; rare, native of Africa. Introduced in GA, FL, LA, and TX (Kartesz 1999). [= K, S]

* ***Tribulus terrestris*** Linnaeus, Puncture-weed, Caltrop, Devil's-thorn. Cp (GA, NC, SC): dunes, sandy roadsides, ballast; rare, introduced from Mediterranean Europe. June-December. [= RAB, C, F, G, K, S]

MONOCOTYLEDONS

ACORACEAE Martinov 1820 (Calamus Family)

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.

1 Midvein of the leaves not well-developed, about equally as prominent as the lateral veins; mature fruits produced ..... ***A. americanus***
1 Midvein of the leaves well-developed, distinctly more prominent than the lateral veins; mature fruits not produced..... ***A. calamus***

Acorus americanus (Rafinesque) Rafinesque, American Calamus, Sweetflag. Cp (VA?), Mt (GA): marshes, wet meadows, other wet areas, limey seeps; rare (GA Special Concern). 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. Cp, Mt (GA, NC, SC, VA), Pd (NC, SC, VA): marshes, wet meadows, other wet areas; uncommon, introduced from 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]

AGAVACEAE Endlicher 1841 (Agave Family)

A family of about 11 genera and 315 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 some 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. Mt (GA, VA), Cp (NC), Pd (SC): moist forests, over circumneutral soils, in VA on limestone, in NC on slopes and natural levees along the Roanoke River, in SC over gabbro; rare (NC Threatened, SC Rare, VA Rare). April-May. W. PA and s. Ontario 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. Pd (GA, NC, SC), Cp (GA, NC, SC), Mt (GA, NC, SC, VA): granite flatrocks, diabase glades, xeric woodlands over mafic or calcareous rocks, sandhill woodlands; uncommon (VA Rare). Late May-mid July; August-October. E. SC, c. NC, sw. VA, WV, s. OH, s. IN, s. IL, and MO south to n. FL and TX. [= FNA, K, W; = *Agave virginica* Linnaeus – RAB, C, F; > ***M. tigrina*** (Engelmann) Small – S; > ***M. virginica*** – S; = *Polianthes virginica* (Linnaeus) Shinners]

Nolina
(see *RUSCACEAE*)

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 ..... ***Sch. albiflorum***
1 Inflorescence rarely branched; leaves with fleshy bases, not fibrous.
  2 Perianth white ..... ***[Sch. wrightii]***
  2 Perianth golden-yellow ..... ***Sch. croceum***

Schoenolirion albiflorum (Rafinesque) R.R. Gates, White Sunnybell. Cp (GA): wet pinelands, cypress depressions, and *Hypericum* depressions; rare (GA Special Concern). E. GA south to FL and west to AL. [= FNA, K; = ***Sch. elliottii*** Feay ex A. Gray – GW; = *Oxytria albiflora* (Rafinesque) Pollard – S]

Schoenolirion croceum (Michaux) Wood, Yellow Sunnybell. Pd (GA, SC), Cp (GA, NC?), Mt (GA): seepages on granite flatrocks, wet seepages in sandhills (allegedly); rare (NC Watch List, SC Rare). April-May; May-June. SC (and allegedly NC) south to n. 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; = *Oxytria crocea* (Michaux) Rafinesque – S]

Schenolirion wrightii Sherman, Texas Sunnybell, occurs east to AL. [= 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; 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 ..... ***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 ..... ***Y. flaccida***
1 Leaf margins not fraying, minutely notched-serrulate or entire, and hyaline; plant with a trunk; fruit pendulous (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. Cp (GA, NC, SC): dunes; uncommon. June-early July; October-December. Ne. NC (Dare County) south to FL and west to LA. [= RAB, FNA, K, S]

Yucca filamentosa Linnaeus, Curlyleaf Yucca, Spoonleaf Yucca. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): woodlands, forests, dunes, roadsides, disturbed areas; common. Late April-early June; September-October. MD or s. NJ south to GA, west to MS; escaped from cultivation over a broader area of e. United States. [= FNA, F, S, W, Z; = *Y. filamentosa* var. *filamentosa* – RAB; < *Y. filamentosa* – C, G, K (also see *Y. flaccida*); = *Y. concava* Haworth – S]

Yucca flaccida Haworth, Weakleaf Yucca. Cp, Pd, Mt (GA, NC, SC, VA*): woodlands, roadsides, disturbed areas; rare (NC Watch List). Late April-early June; September-October. C. NC and TN south to 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. [= FNA, S, W; = *Y. filamentosa* var. *smalliana* (Fernald) Ahles – RAB; < *Y. filamentosa* – C, G, K, in part; = *Y. smalliana* Fernald – F; > *Y. flaccida* var. *flaccida* – Z; > *Y. flaccida* var. *smalliana* (Fernald) D.B. Ward – Z]

Yucca gloriosa Linnaeus, Mound-lily Yucca, Spanish Bayonet. Cp (GA, NC, SC): dunes, shell middens; uncommon, rare in NC (NC Rare). (April), October; November-December. E. NC (Dare County) south to ne. FL, west to LA (Kartesz 1999). [= RAB, K, S; = *Y. gloriosa* var. *gloriosa* – FNA]

Yucca recurvifolia Salisbury, Curve-leaf Yucca. Cp (GA): dunes, dry sandy soils; rare. GA west to LA (?). [= S; = *Y. gloriosa* Linnaeus var. *recurvifolia* (Salisbury) Engelmann – FNA]

ALISMATACEAE Ventenat 1799 (Water-plantain Family)

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. Cp (VA): in seasonally flooded areas in impoundments; rare (VA Watch List). 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. Mt, Pd (GA, NC, SC, VA), Cp (NC, VA): marshes, ponds, stream edges; uncommon. April-November. MA west to ND, south to FL and TX. [= RAB, C, F, FNA, G, GW, K, S, W; = *A. plantago-aquatica* Linnaeus ssp. *subcordatum* (Rafinesque) Hultén; *A. plantago-aquatica* var. *parviflorum* (Pursh) Torrey]

Alisma triviale Pursh, Northern Water-plantain, ranges south to s. PA and KY (and according to Fernald to MD and WV). [= C, F, FNA, K; < *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. Cp (GA): {habitats}; rare. OH, IL, and ND south to w. FL, sw. GA, and TX. [= FNA, K; > *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. Cp (GA, NC, SC, VA): swamps, ditches, wet thickets, especially on base-rich substrates, such as over calcareous or mafic rocks; common. June-November. MD south to 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; = *E. cordifolius* var. *cordifolius* – C; = *E. radicans* (Nuttall) Engelmann – S]

Echinodorus tenellus (Martius) Buchenau, Mud-babies, Dwarf Burhead. Cp (GA, NC, SC, VA), Mt (GA, VA): on drawdown zones of Coastal Plain ponds, pineland ponds, blackwater riverbanks, or ponds in the Mountains with Coastal Plain affinities (Augusta County, VA); rare (GA Special Concern, NC Rare, VA Rare). 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; > *E. parvulus* Engelmann – G, GW; > *E. tenellus* (Martius) Buchenau var. *parvulus* (Engelmann) Fassett – C; > *Helanthium parvulum* (Engelmann) Britton – S]

Echinodorus floridanus R.R. Haynes & J.R. Burkhalter, Florida Burhead, is a recently named endemic, known only from Escambia County, FL. [= FNA, K]

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; 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 stellate-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*).

16 Stamen filaments linear, less thick than the anther, changing little in diameter from near base to near summit.

17 Bracts of the inflorescence firm in texture, smooth; stamen filaments glabrous; [of inland acidic wetlands] ..... ***S. engelmanniana***

17 Bracts of the inflorescence either papillose or longitudinally striate-ribbed; stamen filaments roughened with minute scales; [of estuarine areas and associated nontidal wetlands].

18 Bracts and sepals striate-ribbed; stamen filaments 2-5 mm long; [rare, from e. SC southward] ..... ***S. lancifolia** var. **lancifolia***

18 Bracts and sepals papillose; stamen filaments 1.5-3.5 mm long; [common, throughout our coastal area] .. ***S. lancifolia** var. **media***

16 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.

19 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***

19 Lowermost (pistillate) flowers on longer pedicels; inflorescence normally not bent.

20 Leaves all phyllodia, the phyllodia terete or nearly so; [of DE and NJ northward] ..... ***[S. teres]***

20 Leaves with blades and petioles, or if all phyllodia, the phyllodia flattened or triangular in cross-section; [collectively widespread].

21 Plants with corms and/or stolons, lacking coarse rhizomes.

22 Blades of emersed leaves lanceolate, narrowly spatulate; [of Mountain and upper Piedmont bogs, swamp forests, and adjacent ditches] ..... ***S. fasciculata***

22 Blades of emersed leaves linear (< 3 mm wide); [of Coastal Plain depression wetlands] ..... ***S. isoetiformis***

21 Plants with coarse rhizomes, lacking corms and stolons.

23 Abaxial wing of fruit scalloped or toothed; [plants of n. AL] ..... ***S. secundifolia***

23 Abaxial wing of fruit entire; [plants collectively widespread].

24 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***

24 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.

25 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***

25 Inflorescence unbranched at the base; bracts of the inflorescence slightly to almost fully connate ..... ***S. graminea***

1 Leaves bladeless.

2 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 ..... ***S. isoetiformis***

2 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 ..... ***S. macrocarpa***

1 Leaves with distal blades.

3 Pistillate pedicels thickened and recurved in fruit ..... ***S. platyphylla***

3 Pistillate pedicels not thickened, not recurved.

4 Plants with thick rhizomes; achene faces with markedly raised keels, forming a deep bowl ..... ***S. graminea*** *ssp.* ***graminea***

4 Plants with slender rhizomes or none; achene faces with slightly raised keels.

5 Leaf blades at least 5 mm wide and anthers about 0.6-0.7 mm long ..... ***S. fasciculata***

5 Leaf blades < 4.5 mm wide and anthers about 0.9-1.1 mm long.

6 Achenes (2.2-) 2.4-3.0 mm long, beaks 0.5-0.9 mm long ..... ***S. macrocarpa***

6 Achenes 1.4-2.0 (-2.5) mm long, beaks 0.2-0.6 mm long.

7 Achene faces with markedly raised keels, forming a deep bowl; leaf blades at least 3.0 mm wide ..... ***S. graminea*** *ssp.* ***graminea***

7 Achene faces with slightly raised keels; leaf blades < 2.3 mm wide ..... ***S. isoetiformis***

Sagittaria australis (J.G. Smith) Small. Cp (NC, SC, VA), Pd, Mt (GA, NC, SC, VA): marshes, swamps, margins of ponds and lakes; common. June-October. NY west to s. IN and se. MO, south to SC and MS. [= C, F, FNA, K, W, X; > *S. australis* – S; = *S. longirostra* – RAB, S, misapplied; = *S. engelmanniana* J.G. Smith ssp. *longirostra* – G, GW, Z, misapplied]

Sagittaria brevirostra Mackenzie & Bush, Midwestern Arrowhead. Mt (VA): {habitat}; rare. 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. Pd* (NC*, SC*), Mt (VA): ponds; rare (VA Rare). 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 North Carolina and South Carolina. First reported for South Carolina by Hill & Horn (1997). [= RAB, C, W; = *Lophotocarpus calycinus* (Engelmann) J.G. Smith – F; = *S. montevidensis* Chamisso & Schlechtendahl ssp. *calycina* (Engelmann) Bogin – FNA, G, GW, Z; > *S. calycina* var. *calycina* – K]

Sagittaria chapmanii (J.G. Smith) C. Mohr, Chapman's Arrowhead. Cp (GA, NC, SC): limesink (doline) ponds with drawdown hydrology, mucky ditches; rare (NC Rare). May-September. Se. NC south to s. FL, west to s. AL. First reported for SC by Nelson & Kely (1997). 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, Y; = *S. graminea* Michaux var. *chapmani* J.G. Smith – Z, orthographic variant]

Sagittaria engelmanniana J.G. Smith. Cp (GA, NC, SC, VA), Pd (GA?, NC, VA): blackwater streambanks, sphagnum bogs, pocosins, beaver ponds; rare (NC Watch List, VA Rare). 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. Mt (GA, NC, SC), Pd (SC): bogs, ditches adjacent to drained bogs, wooded seepage areas; rare (US Endangered, NC Endangered). 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. Cp (GA, NC, SC, VA?): swiftly flowing water of blackwater rivers and streams, blackwater lake shores; rare (NC Rare). 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* Glück of spring-fed streams of FL. 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. Cp (GA, NC, SC, VA), Pd (VA), Mt (GA, VA): marshes, ponds, tidal areas; uncommon (rare in the Piedmont and Mountains). May-November. Newfoundland and 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, 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*)]

Sagittaria isoetiformis J.G. Smith. Cp (GA, NC, SC): clay-based Carolina bays, other seasonally flooded depressions; rare (NC Rare). June-September. Se. NC south to c. 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, in part]

Sagittaria lancifolia Linnaeus *var.* ***lancifolia***. Cp (GA, SC): marshes, swamps; rare. 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, Z; > *S. angustifolia* Lindley – S; > *S. lancifolia* – S, in a narrow sense]

Sagittaria lancifolia Linnaeus *var.* ***media*** Micheli. Cp (GA, NC, SC, VA): freshwater to brackish tidal marshes, ditches; common. June-October. S. DE south to n. FL, 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, Z]

Sagittaria latifolia Willdenow *var.* ***latifolia***. July-October. Cp, Pd, Mt (GA, NC, SC, VA): marshes, swamps, farm ponds, ditches, bogs; common. June-September. Nova Scotia west to British Columbia, 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, in a narrower sense; > *S. latifolia* var. *obtusa* (Engelmann) Wiegand – RAB, F; > *S. planipes* Fernald – F; < *S. latifolia* – FNA, K; > *S. latifolia* – S, in the narrow sense; > *S. ornithorhyncha* Small – S]

Sagittaria latifolia Willdenow *var.* ***pubescens*** (Muhlenberg ex Nuttall) J.G. Smith. Mt, Pd, Cp (GA, NC, SC, VA): bogs, marshes; common. 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; = *S. pubescens* Muhlenberg ex Nuttall – S]

* ***Sagittaria montevidensis*** Chamisso & Schlechtendahl. Cp (GA, NC, SC): disturbed areas, marshes; rare, introduced from 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; = *S. montevidensis* ssp. *montevidensis* – FNA, GW, Z]

Sagittaria platyphylla (Engelmann) J.G. Smith. Cp (GA, SC, VA), Pd (NC): marshes, ditches, farm ponds; rare (GA Special Concern, NC Watch List, VA Watch List), perhaps introduced from the s. Midwest. 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, 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. Mt (VA): mountain ponds, wet meadows; rare (VA Rare). July-October. ME and MN, south to w. VA, nc. TN, MO, and NE. [= C, F, FNA, G, K, S, W, Y, Z]

Sagittaria secundifolia Kral, Little River Water-plantain. Mt (GA): crevices in sandstone bedrock in streambeds; rare (US Threatened, GA Threatened). Nw. GA and nc. AL. See Kral (1982) and Threlkeld & Soehren (2003) for additional information. [= FNA, K]

Sagittaria spatulata (J.G. Smith) Buchenau. Cp (NC, VA): tidal marshes; uncommon (NC Watch List, VA Rare). May-September. New Brunswick south to e. NC along the coast. [= C, G; > *Lophotocarpus spongiosus* (Engelmann) J.G. Smith – F; > *S. calycina* var. *spongiosa* Engelmann – K; > *S. montevidensis* Chamisso & Schlechtendahl ssp. *spongiosa* (Engelmann) Bogin – FNA, Z]

Sagittaria subulata (Linnaeus) Buchenau. Cp (GA, NC, SC, VA): tidal marshes and mud flats; uncommon. May-September. MA and NY south to FL and AL. [= FNA, GW, K, S; = *S. subulata* var. *subulata* – RAB, G, Z; < *S. subulata* – C, in part (also see *S. stagnorum*); > *S. subulata* var. *subulata* – F; > *S. subulata* var. *natans* (Michaux) J.G. Smith – F]

Sagittaria weatherbiana Fernald. Cp (GA, NC, SC, VA): fresh to brackish marshes, streambanks, pineland pools; uncommon. April-June. Se. VA south to n. 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, Y, Z; = *S. graminea* Michaux ssp. *weatherbiana* (Fernald) R.R. Haynes & C.B. Hellquist – FNA]

Sagittaria kurziana Glück, Spring-tape. Spring-runs. Panhandle and northern peninsula of FL. [= GW, K, S; = *S. subulata* (Linnaeus) Buchenau var. *kurziana* (Glück) Bogin -- Z]

Sagittaria macrocarpa J.G. Smith. Cp (NC, SC): beaverponds, old millponds; rare. Apparently endemic to the Coastal Plain of the Carolinas. [< *S. graminea* Michaux var. *macrocarpa* (J.G. Smith) Bogin – Z, misapplied] {not keyed at this time}

Sagittaria teres S. Watson. Ponds. MA south to DE and NJ. [= C, F, FNA, G, K; = *S. graminea* Michaux var. *teres* (S. Watson) Bogin – Z]

ALLIACEAE J. Agardh 1858 (Onion Family)

References: Fay & Chase (1996); Rahn in Kubitzki (1998a).

1 Inflorescence a solitary flower; flowers blue, lavender, or white; fresh plant with an onion odor; [subfamily *Gillesioideae*] ... .***Tristagma***
1 Inflorescence an umbel; flowers white, greenish white, cream, pink, or magenta-purple; fresh plant with or without an onion odor.
2 Tepals 2-9 mm long; ovary 3-celled, each with 1-2 ovules; fresh plant with an onion odor; [subfamily *Allioideae*] ....***Allium***
2 Tepals 10-15 mm long; ovary 3-celled, each with 6-10 ovules; fresh plant usually without an onion odor; [subfamily *Gillesioideae*]....***Nothoscordum***

Allium Linnaeus 1753 (Onion, Garlic, Leek, Ramps, Chives)
(also see *Nothoscordum*)

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).

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*].....***A. vineale***
3 Leaves variously flattened or keeled (flat or V-shaped in cross section), not hollow.
5 Stem leafy for half its length; leaves 1.5-4.5 cm wide; [subgenus *Allium*].
6 Inflorescence of flowers only.....***A. ampeloprasum***
6 Inflorescence of flowers and bulblets.....***A. sativum***
5 Stem scapose, leafy only at its base; leaves < 1.4 cm wide; [subgenus *Amerallium*].
7 Inflorescence erect, the peduncle not bent.
8 Ovary or capsule crested with projections about 1 mm long; perianth segments acuminate.
9 Spathe bracts usually 5-nerved; ovary crests contorted, ascending; tepals reflexed; leaves 3-10 mm wide.....***A. cuthbertii***
9 Spathe bracts 1-nerved; ovary crests plane, flattened, spreading; tepals spreading; leaves 1-2 mm wide.....***A. speculae***
8 Ovary or capsule not crested with projections; perianth segments acute.
10 Inflorescence partly or entirely of bulblets.....***A. canadense*** *var.* ***canadense***
10 Inflorescence entirely of normal flowers.....***A. canadense*** *var.* ***mobilense***
7 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).
11 Flowers stellate, the tepals spreading; scape nodding in bud, becoming erect in flower or fruit; bulb ovoid .....***[A. stellatum]***
11 Flowers urceolate, campanulate, to nearly rotate, the tepals strongly to slightly incurved; scape nodding in bud, flower, and fruit; bulb elongate.
12 Perianth urceolate, deep magenta-purple; sepals obtuse; [plants of moderate to high elevations in the Mountains]..... ***A. allegheniense***
12 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].
13 Plants flowering late August-early October; petals 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***
13 Plants flowering June-early August; petals 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].
14 Pedicels relatively stout, 1.6-3 cm long; petals 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***

14 Pedicels relatively slender, 2-4 cm long; petals greenish white to white; plants flowering August; [of barrens developed over strongly acid shales in e. WV] .....***[A. oxyphilum]***

Allium allegheniense Small, Allegheny Onion. Mt (NC, VA): 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); uncommon (VA Watch List). 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, distribution, and range to warrant taxonomic recognition. [= K, S; < *A. cernuum* – RAB, C, F, FNA, G, W]

* ***Allium ampeloprasum*** Linnaeus, Wild Leek. Cp, Pd, Mt (NC, SC, VA), {GA}: roadsides and other disturbed areas; rare, introduced from 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. Mt (NC?, VA): northern hardwood forests, primarily at higher elevations than *A. tricoccum*, perhaps also in cove forests and rich mountain slopes; rare (VA Watch List). June; August. Only recently determined to be a separate taxon, *A. burdickii* is apparently rare in the Southern Appalachians. 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. Pd, Cp, Mt (NC, SC, VA), {GA}: bottomland forests, pastures, roadsides; common. Mid April-May; late May-June. Though native, often appearing weedy. New Brunswick west to ND, south to FL and TX. [= RAB, C, FNA, K; = *A. canadense* – F, G, S, W]

Allium canadense Linnaeus *var. **mobilense*** (Regel) Ownbey. Cp, Pd (SC), {GA, NC}: dry woodlands; rare. Mid April-May; Late May-June. S. SC south to FL, west to TX. This taxon is perhaps better treated as a distinct species. [= RAB, FNA, K; > *A. microscordion* Small – S; = *A. mutabile* Michaux – F; > *A. arenicola* Small – S; *A. canadense* ssp. *mobilense* (Regel) Traub & Ownbey]

* ***Allium cepa*** Linnaeus, Garden Onion. Cp, Pd, Mt (NC, SC): persisting from gardens, or appearing around compost or trash piles; rare as an escape (commonly grown), native to Eurasia. May-June; July. [= RAB, C, FNA, G; > *A. cepa* var. *cepa* – K]

Allium cernuum Roth, Nodding Onion. Pd, Mt (GA, NC, SC, VA): generally in open woodlands or around outcrops of shale, mafic, or calcareous rocks, in the mountains at low elevations; uncommon (SC Rare). June-early August; August-October. NY, MI, MN, and British Columbia, south to GA and AZ. 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. Pd (GA, NC, SC), Cp (GA, SC): in thin soils around rock outcrops, receiving nutrient-rich seepage and occurring with many strict calciphiles; rare (NC Rare). 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 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]

* ***Allium sativum*** Linnaeus, Garlic. Cp, Pd (SC): gardens, trash heaps, fields; commonly cultivated, rarely occurring as a waif or persistent in gardens. [= C, F, FNA, G, K, Z]

Allium species 1, Savanna Onion. Cp (NC): wet savannas over coquina limestone (marl); rare (NC Rare). 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. Pd (GA): seepy edges of vegetation mats on Lithonia granitic gneiss (and on sandstone in ne. AL); rare (GA Threatened). May-June; mid June-mid July. Endemic to wc. GA and ne. AL. See Patrick, Allison & Krakow (1995) for additional information. [= FNA, K]

Allium tricoccum Aiton, Ramps, Red Ramps, Wild Leek, Rampscallions. Mt (GA, NC, VA): cove forests and mesic slope forests; common. June-July: August-September. See *A. burdickii* for a discussion of the two species of ramps. Nova Scotia 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 vineale*** Linnaeus, Field Garlic. Pd, Cp, Mt (GA, NC, SC, VA): lawns, pastures, other disturbed places; common, introduced from 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]

Allium oxyphilum Wherry occurs on shale barrens in 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 stellatum Nuttall ex Ker-Gawler occurs east to c. TN. [= C, F, FNA, G, K]

Other members of the genus are widely cultivated for food, spice, or ornament; some may escape or persist. Some of the more familiar are *A. porrum* Linnaeus (Leek), *A. oleraceum* Linnaeus (Field Garlic), and *A. schoenoprasum* Linnaeus (Chives), introduced from Eurasia.

Brodiaea
(see *Dichelostemma* in *THEMIDACEAE*)

Dichelostemma Kunth
(see *THEMIDACEAE*)

Ipheion
(see *Tristagma*)

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 mm wide; flowers 17 or fewer per umbel; flowers fragrant ..... ***N. bivalve***
1 Leaves 4-12 mm wide; flowers 15 or more per umbel; flowers not fragrant ..... ***N. gracile***

Nothoscordum bivalve (Linnaeus) Britton, Grace Garlic, False Garlic. Cp, Pd (GA, NC, SC, VA), Mt (GA): around granite flatrocks, in glades and barrens of various kinds, in open woodlands, and also weedy in fields and along roadsides; common (VA Rare). 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 FL, TX, and South America. An onion-like plant, but generally lacking the odor of onion. [= C, F, G, K, S, W, Z; = *Allium bivalve* (Linnaeus) Kuntze – RAB]

* ***Nothoscordum gracile*** (Aiton) Stearn. Cp (GA, SC): disturbed areas; rare, introduced from South America. [= FNA, K; = *Nothoscordum borbonicum* Kunth – Z, misapplied?; = *Allium inodorum* Aiton – RAB; = *N. fragrans* (Ventenat) Kunth – S]

Tristagma Poepp. (Star-of-Bethlehem)

A genus of 3 species, herbs, of South America. References: Rahn in Kubitzki (1998a).

* ***Tristagma uniflorum*** (Graham) Traub, Star-of-Bethlehem. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): commonly cultivated, escaping to lawns, suburban woodlands, bottomlands, disturbed places; rare, introduced from South America. March-April. Reported for South Carolina by Hill & Horn (1997). [= K; = *Ipheion uniflorum* (Graham) Rafinesque – RAB]

ALSTROEMERIACEAE Dumortier 1829 (Peruvian-lily Family)

Alstroemeria

* ***Alstroemeria pulchella*** Linnaeus f., Peruvian-lily. Cp (GA): disturbed areas, roadsides near plantings; rare, native of Brazil. Naturalized in GA, FL, AL, MS, LA, and TX (Holmes in FNA 2002; Singhurst, Keith, & Holmes 2005). [= FNA]

AMARYLLIDACEAE J. St. Hilaire 1805 (Amaryllis Family)
(also see *AGAVACEAE* and *HYPOXIDACEAE*)

A family of about 59 genera and 850 species, nearly cosmopolitan (especially diverse in the tropics). References: Dahlgren, Clifford, & Yeo (1985); Müller-Doblies & Müller-Doblies (1996); Meerow & Snijman in Kubitzki (1998a).

1 Corona present (a fused tubular or flattened petaloid structure in the center of the flower, above the tepals).
  2 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*] ..... ***Hymenocallis***
  2 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*] ..... ***Narcissus***

1 Corona absent.
  3 Flowers red; stamens about 2× as long as the tepals; [tribe *Lycoridae*] ..... ***Lycoris***
  3 Flowers white, yellow, or white-pink; stamens shorter than or about as long as the tepals.
    4 Flowers yellow; [tribe *Narcisseae*, subtribe *Narcissinae*] ..... ***Sternbergia***
    4 Flowers white or white-pink.
      5 Tepals 3-10 cm long, white or sometimes white-pink.
        6 Tepals spreading, separate, the perianth rotate; inflorescence a several-flowered umbel terminating the stem; [tribe *Amaryllideae*, subtribe *Crininae*] ..... ***Crinum***
        6 Tepals ascending, overlapping, the perianth tubular; inflorescence of a single flower; [tribe *Hippeastreae*, subtribe *Zephyranthinae*] ..... ***Zephyranthes***
      5 Tepals 0.4-2.5 cm long, white, with small green or yellow spots; [tribe *Narcisseae*, subtribe *Galanthinae*].
        7 Inner 3 tepals distinctly shorter and blunter than the outer 3 tepals ..... ***Galanthus***
        7 Inner 3 tepals and outer 3 tepals of similar size and shape ..... ***Leucojum***

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 Flowers sessile; umbels 2-7-floweredl sepals and petals shorter than the tube ..... ***C. americanum***
1 Flowers pedicellate; umbels 8-13-flowered; sepals and petals longer than the tube ..... ***C. bulbispermum***

Crinum americanum Linnaeus, Swamp Lily, String Lily. Cp (GA, NC, SC): swamp forests; rare (NC Rare). June-October. Se. NC south to s. FL and west to TX. [= GW, K, S; *C. americanum* var. *americanum* – FNA]

* ***Crinum bulbispermum*** (Burman f.) Milne-Redhead & Schweickerdt. Cp (GA?, NC, SC): commonly cultivated, occasional in waste areas; rare, introduced. June-July. [= FNA, K; *C. longifolium* (Linnaeus) Thunberg – S]

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 (1997)=Z; Straley & Utech in FNA (2002a); Bishop, Davis, & Grimshaw (2001); Meerow & Snijman in Kubitzki (1998a).

1 Leaves inrolled as they unfold, at least one leaf > 1 cm wide at flowering; inner tepals with green blotch at base and apex; [series *Latifolii*] ..... ***[G. elwesii]***
1 Leaves flat as they unfold, all leaves <1 cm wide at flowering; inner tepals with green blotch at apex only; [series *Galanthus*] ..... ***G. nivalis***

* ***Galanthus nivalis*** Linnaeus, Snowdrop. Pd (NC, VA): persistent after cultivation; rare, introduced from a native range in southern and central Europe. February-March. [= F, FNA, K, Z]

* *Galanthus elwesii* Hooker f., Giant Snowdrop, Greater Snowdrop, is reported as cultivated and rarely naturalized in PA (Rhoads & Klein 1993). It is native of the eastern Meditteranean. [= FNA, Z; = *G. elewesii* – K, orthographic error]

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 greatly improved 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 on 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 Staminal cup >4.5 cm long; [of rocky river shoals of the Piedmont] ..... ***H. coronaria***
1 Staminal cup <4.5 cm long; [of the Coastal Plain, Piedmont floodplains, and the GA Ridge and Valley].
  2 Leaves oblanceolate, distinctly wider toward the tip.

3 Leaves coriaceous, not glaucous; scape bracts 3-4 (-6) cm long, the tip acute; bulbs rhizomatous; [of wet habitats]. ..... ***H. choctawensis***

3 Leaves not coriaceous, distinctly glaucous; scape bracts 4-7 cm long, the tip long-acuminate; bulbs rhizomatous; [of moist but not mucky habitats]..... ***H. occidentalis* *var.* *occidentalis***

2 Leaves liguliform, not wider toward the tip, the margins parallel throughout.

4 Staminal cups rotate at full anthesis; leaves chiefly arching low, often appearing prostrate; [of s. GA south into FL] ..... ***H. duvalensis***

4 Staminal cups funnelform at full anthesis but gradually spreading in time; leaves suberect to erect; [of se. NC south to FL].

5 Perianth segments (6-) 7-11.5 cm long; leaves 3-7 dm long ..... ***H. crassifolia***

5 Perianth segments 5.0-6.5 cm long; leaves 1.5-2.5 dm long ..... ***H. pygmaea***

Hymenocallis choctawensis Traub, Florida Panhandle Spiderlily, Choctaw Spiderlily. Cp (GA): floodplains; rare (GA Watch List). GA (floodplain of the Ochlockonee River) and FL west to LA. [= FNA, K, Z; < *Hymenocallis sp. ?* – GW]

Hymenocallis coronaria (LeConte) Kunth, Shoals Spiderlily, Cahaba Lily. Pd (GA, SC): rocky river shoals, usually with *Justicia americana* and *Podostemum ceratophyllum*; rare (GA Endangered). 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. Cp (GA, NC, SC): tidal marshes, margins of tidal guts, banks of blackwater rivers; common. May-June; June-July. Se. NC south to n. FL. [= RAB, FNA, S, Z; < *Hymenocallis sp. ?* – GW; *? H. floridana* (Rafinesque) Morton – K, misapplied]

Hymenocallis duvalensis Traub, Dixie Spiderlily, Duval Spiderlily. Cp (GA): blackwater floodplain (Suwanee River); rare (GA Watch List). S. GA (floodplain of the Suwanee River) south to n. FL. [= FNA, K, Z; < *Hymenocallis sp. ?* – GW]

Hymenocallis occidentalis (LeConte) Kunth *var. occidentalis*, Hammock Spiderlily, Woodland Spiderlily. Cp (GA, SC), Pd (GA, NC), Mt (GA, NC?): mesic soils of slopes and floodplain forests, gabbro glades and other calcareous upland flats; uncommon. NC west to AR and LA. Var. *eulae* (Shinn ers) G.L. Smith & Flory is endemic in the West Gulf Coastal Plain. [= FNA, Z; < *Hymenocallis sp. ?* – GW; < *H. occidentalis* – S; *H. caroliniana* (Linnaeus) Herbert – K, misapplied]

Hymenocallis pygmaea Traub, Pygmy Spiderlily, Waccamaw Spiderlily. Cp (NC, SC): banks of blackwater rivers; rare. 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, misapplied]

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).

* ***Leucojum aestivum*** Linnaeus, Snowflake. Cp (NC, SC, VA), Pd (VA): persistent after cultivation; rare, introduced from Europe. March-April. Reported naturalized in NC by Leonard (1971b). [= RAB, C, F, FNA, G; > *L. aestivum* ssp. *aestivum* – K]

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. Pd, Cp (NC, SC), Mt (NC): frequently cultivated, sometimes persistent for long periods of time, especially in lawns around older homes; rare, introduced from 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]

Narcissus Linnaeus 1753 (Daffodil, Jonquil, Narcissus, Buttercup)

A genus of about 40-60 species, of Europe, n. Africa, and w. Asia. References: Stace (1997)=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.

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.
    3 Corona of a single color, all white or yellow; umbel (or spathe, or stem) with (1-) 2 (-3) flowers ..... ***N. ×medioluteus***
    3 Corona rim red, contrasting with the white or yellow corona; umbel (or spathe, or stem) with 1 flower ..... ***N. poeticus***
  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.
    4 Tepals linear to lanceolate, < 5 mm wide ..... ***N. bulbocodium***
    4 Tepals ovate, triangular-ovate, or suborbicular, > 10 mm wide.
      5 Corona 10-25 mm long, distinctly shorter than the perianth lobes ..... ***N. ×incomparabilis***
      5 Corona 30-50 mm long, about as long as the perianth lobes ..... ***N. pseudonarcissus***

* ***Narcissus bulbocodium*** Linnaeus, Hoop-petticoat Daffodil. Cp (NC): grassy roadsides, established; rare (introduced from Eurasia). March. [= Y, Z]
* ***Narcissus ×incomparabilis*** P. Miller (pro sp.) [*poeticus* × *pseudonarcissus*], Nonesuch Daffodil. Cp, Pd (GA, NC, SC, VA): cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; common, introduced from Europe. March-April. [= C, K, Z; = *N. incomparabilis* – RAB, F, G]
* ***Narcissus jonquilla*** Linnaeus, Jonquil. Cp (GA, NC, SC): cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; uncommon, introduced from Europe. March-April. [= RAB, C, F, FNA, G, K, Z]
* ***Narcissus ×medioluteus*** P. Miller (pro sp.) [*poeticus* × *tazetta*], Primrose-peerless. Cp, Pd, Mt (NC, SC, VA): cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; common, introduced from Europe. March-May. [= K, Z; = *N. tazetta* × *poeticus* – RAB]
* ***Narcissus poeticus*** Linnaeus, Poet's Narcissus, Pheasant's-eye Daffodil. Cp, Pd, Mt (GA, NC, SC, VA): cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; common, introduced from Europe. March-May. [= RAB, C, F, FNA, G, K, Z]
* ***Narcissus pseudonarcissus*** Linnaeus, Daffodil, Buttercup. Cp, Pd, Mt (GA, NC, SC, VA): cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; common, introduced from Europe. February-April. [= RAB, C, FNA, K, Z; = *N. pseudo-narcissus* – F, G, orthographic variant]

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.

Sternbergia Waldst. & Kit. 1805 (Winter Daffodil)

A genus of about 8 species, of Meditteranean Europe, n. Africa, and w. Asia. References: Meerow & Snijman in Kubitzki (1998a).

* ***Sternbergia lutea*** (Linnaeus) Ker-Gawler ex Sprengel, Winter Daffodil. Cp (VA): cultivated as an ornamental, persistent and naturalized in lawns, roadsides, woodland borders, and disturbed areas; rare, introduced from Europe. This species has yellow, *Crocus*-like flowers, in the autumn. [= K]

Zephyranthes Herbert 1821 (Atamasco-lily, Zephyr-lily, Rain-lily)

A genus of about 50 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).

1 Flowers (from base of ovary to apex of perianth) 3-5 cm long; stamens 1.5-2.5 cm long; stigma 1, 3-lobed; [introduced species, escaped from cultivation] ..... ***Z. candida***
1 Flowers 6-10 cm long; stamens 4.5-8 cm long; stigmas 3; [native species, sometimes also cultivated].
  2 Style and stigma as long as or shorter than the anthers; perianth segments erect-ascending at full anthesis, mostly 3-6 cm long ..... ***Z. simpsonii***
  2 Style and stigmas extending beyond the anthers; perianth segments spreading at full anthesis, mostly 5-8 cm long.

3 Mature leaves concave, 3-8 mm wide; perianth tube usually <2.3 cm long; filaments > 1.5× as long as the perianth tube ..... ***Z. atamasca***
3 Mature leaves grooved, 1-4 mm wide; perianth tube usually >2.3 cm long; filaments < 1.5× as long as the perianth tube ..... ***Z. treatiae***

Zephyranthes atamasca (Linnaeus) Herbert, Common Atamasco-lily. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC): bottomland forests and adjacent road shoulders, wet meadows; common (rare in VA Piedmont, rare in Mountains). 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; = *Atamosco atamasco* (Linnaeus) Greene – S, orthographic variant]

* ***Zephyranthes candida*** (Lindley) Herbert. Cp (GA, NC, SC): cultivated, persistent or spreading from cultivation; rare, introduced from South America. Late September-October. [= RAB, FNA, K; = *Atamosco candida* (Lindley) Small – S]

Zephyranthes simpsonii Chapman, Florida Atamasco-lily. Cp (GA, NC, SC): 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 (GA); rare (GA Special Concern, NC Rare). 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; = *Atamosco simpsonii* (Chapman) Greene – S]

Zephyranthes treatiae S. Watson. Cp (GA): wet savannas; uncommon. January-April. S. GA (Jones & Coile 1998) south into FL. [= FNA, GW; = *Z. atamasca* (Linnaeus) Herbert var. *treatiae* (S. Watson) Meerow – K; = *Atamasco treatiae* (S. Watson) Greene – S]

ARACEAE A.L de Jussieu 1789 (Arum Family)

(also see *ACORACEAE*)

A family of about 100-110 genera and about 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); 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 ..... ***Wolffia***
3 Fronds flat, elongate and curved, 4-14 mm long ..... ***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 ..... ***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 ..... ***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) ..... ***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*] ..... ***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] ..... ***Arisaema***
8 Bulblets present at base and summit of the petiole; spadix fused to the spadix; [alien, rare] ..... ***[Pinellia]***
7 Leaves simple.
9 Leaves peltate and cordate-hastate; [subfamily *Aroideae*, tribe *Colocasieae*] ..... ***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*] ..... ***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; [subfamily *Calloideae*] ..... ***[Calla]***
11 Spathe green or white; leaves hastate or rounded at base; plants from fibrous roots, a short thick rhizome, tuber, or a corm.
12 Leaves ovate, rounded or subcordate at the base; spathe purple, or purple flecked with white; [subfamily *Orontioideae*, tribe *Symplocarpeae*] ..... ***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*] ..... ***[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*] ..... ***Arum***
14 Plant from fibrous roots; leaves not variegated; [native, of wetlands]; [subfamily *Aroideae*, tribe *Peltandreae*]..... ***Peltandra***

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. Pd, Mt, Cp (GA, NC, SC, VA): bottomlands and floodplains; uncommon (rare in Mountains and Coastal Plain). May; July. S. Québec, MI, and WI, south to FL and e. TX. [= RAB, C, F, FNA, G, GW, K, Q, W; = *Muricauda dracontium* (Linnaeus) Small – S]

Arisaema triphyllum (Linnaeus) Schott *ssp.* ***pusillum*** (Peck) Huttleston, Small Jack-in-the-pulpit. Cp, Pd, Mt (GA, NC, SC, VA): swamps and moist forests; common. March-May. CT, NY, and IN, south to FL and LA. Widespread in e. North America. This taxon is diploid (2n=28). [= K, X, Z; < *A. triphyllum* – RAB, F, FNA, GW, W; = *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*)]

Arisaema triphyllum (Linnaeus) Schott *ssp.* ***quinatum*** (Nuttall) Huttleston, Southern Jack-in-the-pulpit. Mt, Pd (GA, NC, SC), Cp (GA): mesic forests; uncommon. 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 ssp. (Huttleston (1981). This taxon is diploid (2n=28). [= K, Z; < *A. triphyllum* – RAB, FNA, W; = *A. quinatum* (Nuttall) Schott – GW, S, X; < *A. triphyllum* ssp. *pusillum* – Q, Y; ? *A. polymorphum* Buckley]

Arisaema triphyllum (Linnaeus) Schott *ssp.* ***stewardsonii*** (Britton) Huttleston, Bog Jack-in-the-pulpit. Mt (NC, VA): bogs and peaty swamps; rare (NC Rare). April-May. Nova Scotia 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. Cp, Pd, Mt (GA, NC, SC, VA): mesic forests; common. March-April. New Brunswick west to se. Manitoba, 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; = *A. triphyllum* var. *triphyllum* – C; > *A. triphyllum* – F; > *A. atrorubens* (Aiton) Blume – F; = *A. triphyllum* – S]

Arum Linnaeus 1753 (Arum)

A genus of about 26 species, of temperate Eurasia. References: Thompson in FNA (2000); Boyce (1993)= Z; Mayo, Bogner, & Boyce in Kubitzki (1998b).

* ***Arum italicum*** Linnaeus *ssp.* ***italicum***, Arum. Pd (NC): suburban woodlands; rare, introduced from Europe and n. Africa, weakly naturalizing from horticultural use. It has a large (> 10 cm long) white spathe. [= Z; < *A. italicum* – FNA]

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, is a circumpolar species of seepage swamps, ranging south in North America to sw. PA, w. MD, n. IL, c. MN, and British Columbia. [= C, F, FNA, G, K]

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. Cp (GA, NC, SC): naturalized in ditches or shores; rare, 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; > *C. antiquorum* Schott – S; > *C. esculenta* var. *antiquorum* (Schott) Hubb. & Rehder – Z; > *C. esculenta* var. *esculenta* – Z]

Landoltia D.H. Les & D.J. Crawford

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. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; uncommon, introduced from 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; = *Lemna punctata* G.F.W. Meyer]

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. Cp (GA, NC, SC, VA): still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; common, rare in VA. Widespread worldwide, except in n. North America and n. Eurasia. [= FNA, K, Y, Z]

Lemna minor Linnaeus. Cp (GA, NC, VA), Pd (NC): still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; common. Widespread in the Northern Hemisphere; scattered in the Southern Hemisphere, where perhaps in part introduced. [= FNA, K, Y, Z; < *L. minor* – RAB, C, F, G, W (also see *L. obscura*)]

Lemna minuta Kunth. Cp, Mt (GA): quiet waters; rare. Widespread in North America, Central America, and South America; more local in Europe and Japan. [= C, FNA, K; = *L. valdiviana* Philippi var. *abbreviata* Hegelmann – F; = *L. minuscula* Herter – Y, Z]

Lemna obscura (Austin) Daubs. Cp (GA, NC, SC, VA): still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; common. NY west to MN and NE, south to FL, TX, Mexico, and the Bahamas. [= FNA, K, Y, Z; < *L. minor* – RAB, C, F]

Lemna perpusilla Torrey. Cp (NC), Pd (NC, VA): still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; uncommon, rare in NC. Québec west to MN, south to NC, TN, and TX. [= RAB, C, F, FNA, G, K, W, Y, Z]

Lemna trisulca Linnaeus. Mt (VA): still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; rare. Widespread in the Northern Hemisphere; scattered in the Southern Hemisphere. [= C, F, FNA, G, K, W, Y, Z]

Lemna valdiviana Philippi. Cp (GA, NC, SC, VA), Mt (GA, VA): still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; common. Widespread in North America, Central America, and South America. [= RAB, C, FNA, G, K, W, Y, Z; = *L. valdiviana* var. *valdiviana* – F]

Lemna turionifera Landolt, south and east to c. PA (Rhoads & Klein 1993), WV, and n. AL (FNA). [= FNA, K; < *L. minor* Linnaeus -- C]

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. Cp, Mt, Pd (GA, NC, SC, VA): 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; common (rare in Piedmont and Mountains). March-April. MA and c. NY south to 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]

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. Cp (GA, NC, SC): pocosins of the outer Coastal Plain, sphagnous swamps; rare (GA Special Concern, NC Rare, SC Rare). 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; = *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. Cp, Pd, Mt (GA, NC, SC, VA): marshes, bogs, beaver ponds, pocosins, other stagnant, aquatic situations; common (rare in Mountains). May-June. ME, s. Québec, and n. MI south to s. FL and e. TX. [= RAB, C, FNA, G, GW, K, S, W; > *P. virginica* – F; > *P. luteospadix* Fernald – F; > *P. virginica* ssp. *virginica* – Z]

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, is introduced from Japan and rarely naturalized, at least in the northern portion of our area, as in DC, se. PA, NJ, and s. NY. It is likely naturalized in our primary area, at least in n. VA. [= C, F, FNA, G, K]

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. Cp (GA?, SC), Pd (NC): stagnant or slow-moving waters of rivers, sometimes cultivated in ponds, where it persists for a while (presumably eventually eliminated by cold winters); rare, introduced from farther south. 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 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 presumable escapes. The orginal distribution is unclear. [= FNA, GW, K, S]

Spirodela Schleiden 1839
(also see *Landoltia*)

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.

1 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)..... ***S. polyrrhiza***

1 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 ..... ***[Landoltia punctata]***

Spirodela polyrrhiza (Linnaeus) Schleiden, Greater Duckweed, Minnow-fole. Cp (GA, NC, SC, VA), Pd (GA, VA), Mt (VA): still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; common. Widespread worldwide. [= RAB, FNA, K, X, Y, Z; = *S. polyrhiza* – C, F, G, GW, S, W, orthographic variant]

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. Mt, Pd, Cp (NC, VA): seepage-fed bogs and nonalluvial swamps; common in VA across the state, uncommon in NC (rare in Piedmont and Coastal Plain of NC). January-March; July-September. Nova Scotia and s. Québec west to MN, south to n. NC, ne. TN, s. OH, and IL. [= RAB, C, F, FNA, G, GW, K, W; = *Spathyema foetida* (Linnaeus) Rafinesque – S; = *Dracontium foetidum* Linnaeus]

Wolffia Horkel ex Schleiden 1844 (Watermeal, Mud-mary)

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 ..... ***W. columbiana***
1 Fronds nutshell-like, 0.5-1.0× as deep as wide; thallus punctate above with brownish pigment cells (most visible on dead fronds).
  2 Frond 1.3-2× as long as wide, the upper side slightly convex, with an upward point apically ..... ***[W. borealis]***
  2 Frond 1-1.5× as long as wide, the upper side with a prominent papilla centrally ..... ***W. brasiliensis***

Wolffia brasiliensis Weddell. Cp (VA), Pd (VA), Mt (VA): still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; uncommon, rare in Piedmont and Mountains. Widespread in e. North America, Central America, and South America. [= FNA, K, W, Y, Z; = *W. papulifera* C. Thompson – RAB, C, F, G, GW; < *Bruneria punctata* (Grisebach) Nieuwland – S]

Wolffia columbiana Karsten. Cp (NC, VA) Mt (VA), {also GA and SC according to FNA}: still to slowly moving waters of ponds, lakes, beaver ponds, and swamps; uncommon. Widespread in North America, Central America, and South America. [= RAB, C, F, FNA, G, GW, K, Y, Z; = *Bruneria columbiana* (Karsten) Nieuwland – S]

Wolffia borealis (Engelmann) Landolt. Still to slowly moving waters of ponds, lakes, beaver ponds, and swamps. Québec west to British Columbia, south to PA, KY, TN, MO, and CA. [= FNA, K, Y, Z; = *W. punctata* Grisebach – C, F, G, GW, misapplied; < *Bruneria punctata* (Grisebach) Nieuwland – S, misapplied]

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 degrees ..... ***W. gladiata***
1 Fronds 1.5-8× as long as wide; angle of pouch 45-90 degrees ..... ***[W. oblonga]***

Wolffiella gladiata (Hegelmaier) Hegelmaier, Mud-midgets. Cp (GA, NC, SC, VA): ponds, ditches, beaver-ponds millponds; common. April-June. MA and n. IL (s. WI?) south to FL and TX; Mexico. [= FNA, K, Y, Z; > *Wolffiella floridana* (Donnell-Smith) C. Thompson – RAB, C, F, G, GW, S; > *W. gladiata* – GW]

Wolfiella oblonga (Philippi) Hegelmaier. FL, MS, LA, TX south to Mexico, Central America, South America; West Indies. [= FNA, GW, K]

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. Cultivated in the Southeast, more frequently to the south, but sometimes in our area. It can be seen in ditches adjacent to ornamental plantings; it is uncertain whether it can be considered naturalized in our area. It is superficially similar to *Colocasia*, differing in its non-peltate leaves. [= K, Z; = *Xanthosma sagittifolium* – GW, orthographic error]

ARECACEAE Schultz 1832 *or* ***PALMAE*** de Jussieu 1789 (Palm Family)

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 coastal GA, SC, and NC, 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 shortcentral axis, the leaf blade about as long as wide; [native species]; [subfamily *Coryphoideae*, tribe *Corypheae*].
  3 Petioles armed with sharp recurved teeth; [subtribe *Livistoninae*].....***Serenoa***
  3 Petioles smooth, unarmed (leaf sheaths with long needle-like spines in *Rhapidophyllum*).
    4 Petioles and lower leaf surfaces green and glabrous; leaf sheaths without spines; [subtribe *Sabalinae*].....***Sabal***
    4 Petioles and lower leaf surfaces more or less silvery pubescent; leaf sheaths bearing long (10-50 cm) needle-like spines; [subtribe *Thrinacinae*].....***Rhapidophyllum***

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, and e. GA; native of s. Brazil and Uruguay. It persists and can appear naturalized in apparently semi-natural situations.

Cocos Linnaeus (Coconut Palm)

A monotypic genus, the single species now pantropical. References: Zona in FNA (2000).

* *Cocos nucifera* Linnaeus, Coconut Palm. Rarely reaches our shores as propagules (coconuts), but is not established; native region unknown, but probably tropical islands of thye western Pacific (now pantropical). Photographic evidence has been supplied from Bear Island, Onslow County, NC, 11 June 1996 (Dave Owen, pers. comm. and photograph). [= FNA, K, S]

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. Cp (GA, SC): moist to wet soils of small blackwater stream swamps, especially where underlain with coquina limestone ("marl"), hydric hammocks and rich, wetland-upland transitions; rare (SC Rare). 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, north of its natural range. [= FNA, GW, K, S, Z]

Sabal Adanson 1763 (Palmetto)

Sabal has 16 species, primarily distributed around the Caribbean Sea. The other species of se. United States are *S. etonia* Swingle ex Nash, of scrub habitats in peninsular FL, *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; Dransfield & Uhl in Kubitzki (1998b).

1 Shrub, with subterranean, rhizomatous "trunk" (very rarely emerging as much as 1 meter from the ground); blade with midrib not decurved, typically appearing 1-2 cm long and oblique on the upper surface, 4-7 (-12) cm long on the lower surface; leaf with the deepest partition generally the terminal one, thus parting the leaf into 2 halves; segments with margins lacking filamentose fibrils..... ***S. minor***
1 Tree, with erect trunk (though young plants appear as trunkless shrubs, similar in habit to *S. minor*); blade with midrib 5-50 cm long, decurved; leaf lacking a deep terminal partition dividing the leaf into 2 halves; margins of leaf segments with filamentose fibrils ..... ***S. palmetto***

Sabal minor (Jacquin) Persoon, Dwarf Palmetto. Cp (GA, NC, SC), Pd (GA): swamps, maritime forests, low moist woods, especially in calcareous soils developed from shell limestone (marl); common. May-July; September-November. Ne. NC south to c. peninsular FL, west to e. TX, c. TX 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, S, Z]

Sabal palmetto (Walter) Loddiges ex J.A. & J.H. Schultes, Cabbage Palmetto. Cp (GA, NC, SC): maritime forests, marsh edges, and other near-coastal communities; common, rare in NC (NC Rare). July; October-November. 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, 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. Cp (GA, SC): pine flatwoods and maritime forests; common (rare though locally dominant in SC). 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 and other Gulf Coast states, for instance in pine flatwoods or coastal scrub. [= RAB, FNA, GW, K, S]

ASPARAGACEAE A.L. de Jussieu 1789 (Asparagus Family)

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). The "Asparagus Fern" grown as a house plant is another species of *Asparagus*, *A. setaceus* (Kunth) Jessop, native to S. Africa. References: Kubitzki & Rudall in Kubitzki (1998a); Straley & Utech in FNA (2002a).

* ***Asparagus officinalis*** Linnaeus, Asparagus, Sparrowgrass, Garden Asparagus. Mt, Pd, Cp (GA, NC, SC, VA): commonly cultivated, commonly escaped to fencerows, roadsides, disturbed areas; common, native of Eurasia. April-May (or later); July-October. [= RAB, C, F, FNA, G, K, S, W]

BROMELIACEAE A.L. de Jussieu 1789 (Bromeliad or Pineapple Family)

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. Cp (GA): on tree branches in bayswamps, tidal swamp forests, and mesic hardwood bluffs; rare (GA Rare). E. GA south through Florida; 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; *? T. myriophylla* Small – S]

Tillandsia fasciculata Sw. *var*. ***densispica*** Mez, Quill-leaf Airplant. Cp (GA): branches of trees, especially evergreen oaks; rare (GA Rare). Se. GA south through FL, and in the West Indies, Mexico, and Central America. [= FNA, K; < *T. fasciculata* – S]

Tillandsia recurvata (Linnaeus) Linnaeus, Ball-moss, Bunch-moss. Cp (GA, SC*): on tree branches in maritime forests; rare (GA Threatened). 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 (P. McMillan, pers. comm. 2005). Outside of our area, this species also occurs on rock cliffs and is frequent on powerlines. [= FNA, K; = *Diaphoranthema recurvata* (Linnaeus) Beer – S]

Tillandsia setacea Sw., Wild-pine, Pine-needle Airplant. Cp (GA): in tree branches, especially on hardwoods, in mesic bluff forests; rare (GA Rare). 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. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): 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); common, very rare in lower Piedmont (VA Rare). April-June. S. MD (historically), se. VA south to s. FL, west to TX and Mexico, extending south to South America. *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; = *Dendropogon usneoides* (Linnaeus) Rafinesque – S]

Tillandsia utriculata Linnaeus, Giant Wild-pine, is reported for GA by Kartesz (1999), but not by Luther & Brown in FNA (2000). FL (and GA?); West Indies, Mexico, Central America, South America. [= FNA, K, S]

BURMANNIACEAE Blume 1827 (Burmannia Family)

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. Cp (GA): acid swamps; rare. E. GA (Glynn County) west to e. TX, south to c. South America, and in the West Indies. [= FNA, GW, K, S]

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. Cp (GA, NC, SC, VA), Pd (SC): savannas, bogs, shores of Coastal Plain depression ponds; uncommon (SC Rare, VA Rare). August-November. Se. VA south to FL, west to e. TX. [= RAB, C, F, FNA, G, GW, K, S]

Burmannia capitata (J.F. Gmelin) von Martius, White Burmannia. Cp (GA, NC, SC), Pd (GA, SC): savannas, bogs, shores of Coastal Plain depression ponds; uncommon. July-November. E. NC south to FL, west to TX and se. OK; West Indies, Central America, and South America. [= RAB, FNA, GW, K, S]

CALOCHORTACEAE
(see *LILIACEAE*)

CANNACEAE A.L. de Jussieu 1789 (Canna Family)

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. Cp (GA, SC): wet pine savannas, marshes, ditches; uncommon. 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. Cp, Pd (GA, NC, SC): cultivated and persisting; rare. June-September; August-October. [= RAB, FNA, K]
* ***Canna indica*** Linnaeus, Indian-shot, Platanillo. Cp, Pd (GA, NC, SC): cultivated and persisting; rare. June-September; August-October. [= FNA, GW, K, S]

COLCHICACEAE Augustin de Candolle 1805 (Meadow Saffron Family)

As here circumscribed, a family of 19 genera and about 225 species, nearly cosmopolitan. The circumscription is uncertain and likely to change. References: Dahlgren, Clifford, & Yeo (1985); Nordenstam in Kubitzki (1998a).

1 Plant acaulescent, from a tunicated bulb.....***Colchicum***
1 Plant with leafy stem, from a rhizome .....***Uvularia***

Colchicum Linnaeus 1753 (Meadow Saffron)

A genus of about 90 species, of s. Europe, n. Africa, and w. and c. Asia. References: Nordenstam in Kubitzki (1998a).

* ***Colchicum autumnale*** Linnaeus, Meadow Saffron, Autumn-crocus. Pd (NC): planted as an ornamental, at least long-persistent; rare, introduced from s. Europe. September-October. [= C, F, G, K]

Uvularia Linnaeus 1753 (Bellwort, Merrybells)

A genus of about 5 species, of temperate eastern North America. References: Wilbur (1963)=Z; Uttal (1991)=Y; Utech & Kawano in FNA (2002a); Nordenstam in Kubitzki (1998a).

1 Leaves perfoliate, the margins scarious but smooth; [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; [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] ..... ***U. 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 ..... ***U. floridana***
    5 Pedicel bractless; capsule on a stalk 2-4 (-6) mm long, not beaked ..... ***U. sessilifolia***

Uvularia floridana Chapman, Florida Bellwort. Cp (GA, SC): alluvial forests, moist ravines; uncommon. Mid March-early April. C. SC south to ne. and panhandle FL, west to c. MS, apparently rare and local throughout its range. [= RAB, FNA, GW, K, Z; = *Oakesiella floridana* (Chapman) Small – S]

Uvularia grandiflora J.E. Smith, Large-flowered Bellwort. Mt (GA, NC, VA), Pd (NC, VA): cove forests and other moist, rich, forested sites; common. Mid April-mid May; July-August. S. Québec 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, Z]

Uvularia perfoliata Linnaeus, Perfoliate Bellwort. Mt, Pd, Cp (GA, NC, SC, VA): moist to fairly dry hardwood forests; common. April-early May; June-August. S. NH, s. Ontario, and c. OH, south to panhandle FL and LA. [= RAB, C, F, FNA, G, K, S, W, Z]

Uvularia puberula Michaux ***var. nitida*** (Britton) Fernald, Coastal Bellwort. Cp (GA, NC, SC, VA): dry to moist upland, acidic forests; uncommon. Late March-late April; August-October. Var. *nitida* ranges from Long Island NY south to GA in the Coastal Plain and Sandhills. Var. *nitida* is reported to intergrade with var. *puberula* in c. NC; elsewhere, the 2 varieties appear to be geographically allopatric and more-or-less morphologically distinguishable. While Wilbur (1963) chose not to recognize varieties, Uttal (1991) supports varietal recognition. [= C, Y; < *U. pudica* (Walter) Fernald – RAB, nomen dubium; = *U. pudica* var. *nitida* (Britton) Fernald – F, G; < *U. puberula* – FNA, K, W, Z; < *Oakesiella puberula* (Michaux) Small – S]

Uvularia puberula Michaux ***var. puberula***, Appalachian Bellwort. Mt, Pd (GA, NC, SC, VA): dry to moist upland, acidic forests, up to at least 1500m; common. Early April-Early May; August-October. Var. *puberula* ranges from s. PA to GA in the Mountains and (more rarely) Piedmont. [= C, Y; < *U. pudica* (Walter) Fernald – RAB, nomen dubium; = *U. pudica* var. *pudica* – F, G; < *U. puberula* – FNA, K, W, Z; < *Oakesiella puberula* (Michaux) Small – S]

Uvularia sessilifolia Linnaeus, Straw-lily, Wild-oats. Pd, Mt (GA, NC, SC, VA), Cp (NC, SC, VA): moist hardwood forests, on slopes and mainly in bottomlands; common. Late March-early May; August-October. Nova Scotia west to ND, south to panhandle FL and n. LA. [= RAB, C, F, FNA, K, W, Z; = *Oakesiella sessilifolia* (Linnaeus) S. Watson – S]

COMMELINACEAE R. Brown 1810 (Spiderwort Family)

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 paired, terminating the stem, resembling foliage leaves in size, shape, texture, and coloration; [tribe *Tradescantieae*] ..... ***Tradescantia***

1 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*).
  2 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***
  2 Spathe scale-like, scarious, and inconspicuous, not closely subtending and surrounding the flower pedicels; petals equal, in size and coloration.
    3 Leaves linear, > 20× as long as wide; petals bright pink (rarely white); [tribe *Tradescantieae*] ..... ***Cuthbertia***
    3 Leaves lanceolate, < 20× as long as wide; petals white, pink, purplish, or bluish.
      4 Fertile stamens 3, alternating with 3 staminodia; petals pink to purplish or bluish; [tribe *Commelineae*] ..... ***Murdannia***
      4 Fertile stamens 0-6, all fertile; petals white; [tribe *Tradescantieae*] ..... ***Callisia***

Callisia Loefling
(also see *Cuthbertia*)

A genus of ca. 15-18 species, of tropical America. References: Faden in FNA (2000); Tucker (1989)=Z.

1 Inflorescences pedunculate; flowers on pedicels; capsule with 3 locules ..... ***C. cordifolia***
1 Inflorescences sessile; flowers sessile or nearly so; capsule with 2 locules ..... ***[C. repens]***

* ***Callisia cordifolia*** (Swartz) E.S. Anderson & Woodson. Mt (GA): disturbed area?; rare, presumably introduced from the native range in peninsular 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 repens* (Jacquin) Linnaeus. Disturbed areas. Native of tropical America. [= FNA, K]

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.
    3 Larger petals light blue; sterile anthers entirely yellow..... ***C. communis*** *var.* ***communis***
    3 Larger petals intense violet blue; sterile anthers with brownish-purple spot..... ***C. communis*** *var.* ***ludens***
  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.
    4 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***
    4 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].
  5 Flowers peach-colored ..... ***[C. gambiae]***
  5 Flowers white and/or bluish.
    6 Leaf sheaths ciliate with coarse reddish-brown hairs, the sheath not auriculate; middle petal blue, lilac, or lavender; [mostly of moist soils].
      7 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***
      7 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***
    6 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].
      8 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***
      8 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. Cp (GA, NC, SC): fields; common, introduced from 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) and SC (Edgefield County) 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. Cp (GA, NC, SC): moist disturbed areas; rare, apparently introduced from 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, in part; > *C. hasskarlii* C. B. Clarke (the earliest name applied to the species in India)]

* ***Commelina communis*** Linnaeus *var.* ***communis***, Common Dayflower. Cp, Pd, Mt (GA, NC, SC, VA): gardens, bottomlands, disturbed ground; common, introduced from the Old World. May-October. [= F, G, K, Z; < *C. communis* – RAB, C, FNA, GW, S, W, X, Y]

* ***Commelina communis*** Linnaeus *var.* ***ludens*** (Miquel) C.B. Clarke, Bright-blue Dayflower. {NC, VA} introduced. The distribution of this taxon in our area is poorly known. May-October? Not recognized by many recent authors (see synonymy). [= F, G, K, Z; < *C. communis* – RAB, C, FNA, GW, S, W, X, Y]

* ***Commelina diffusa*** Burmann f., Creeping Dayflower. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, fields, disturbed ground; uncommon, introduced from the Old World. June-October. [= RAB, C, F, G, W; < *C. diffusa* – GW, X, Z, in part only (also see *C. caroliniana*); *C. longicaulis* Jacquin – S; *C. diffusa* var. *diffusa* – FNA, K, Y]

Commelina erecta Linnaeus *var.* ***angustifolia*** (Michaux) Fernald, Sand Dayflower. Cp (GA, NC, SC), Pd (GA, VA), Mt (VA): dunes and dry sand flats on barrier islands, sandhills, other dry sandy sites, shale barrens, other dry rocky sites; common. 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, X; < *C. erecta* – RAB, W, Y, Z; > *C. angustifolia* Michaux – S; > *C. crispa* Wooton – S]

Commelina erecta Linnaeus *var.* ***erecta***, Erect Dayflower. Cp, Pd, Mt (GA, NC, SC, VA): dry openings and woodlands, especially in thin soil around rock outcrops; common (uncommon in Mountains). 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 virginica Linnaeus, Virginia Dayflower. Cp, Pd, Mt (GA, NC, SC, VA): bottomlands, swamp forests, other moist to wet forests and forest edges; common (rare in the upper Piedmont and Mountains). July-October. Our most robust species of *Commelina.* NJ west to KS and OK, south to FL and TX. [= RAB, C, F, FNA, G, GW, K, S, W, X, Y, Z]

* *Commelina gambiae* C.B. Clarke, 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 northward from peninsular FL is questionable. [= FNA; = *Commelina nigritana* Bentham var. *gambiae* (C.B. Clarke) Brenan – K, Y]

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 sheaths) ..... ***C. rosea***
1 Leaves erect or ascending, the leaf blades 1-5 mm wide (narrower than the 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. Cp (GA, NC, SC, VA): sandhills; common (VA Rare). 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 barbulata* var. *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, Z]

Cuthbertia rosea (Ventenat) Small. Cp (GA, SC), Pd (GA, NC, SC): sandhills, other dry woodlands; common (NC Watch List). May-July. [= S; = *Tradescantia rosea* Ventenat var. *rosea* – RAB; = *Callisia rosea* (Ventenat) D.R. Hunt – FNA, K, 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, Z; = *Tradescantia rosea* Ventenat var. *ornata* (Small) E.S. Anderson & Woodson]

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. Cp, Pd, Mt (GA, NC, SC, VA): stream banks, canals, ditches, marshes, swamp forests, wet disturbed places; common (primarily in the Coastal Plain, uncommon in the Piedmont, rare in the Mountains), introduced from 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. Cp (GA, NC, SC), Pd? (GA?): moist sands, ditches, wet disturbed places; rare, introduced from 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)
(also see *Callisia* and *Cuthbertia*)

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).

1 Plant sprawling, rooting at the nodes; leaves 2.5-5 cm long, < 4× as long as wide; [exotic] ..... ***T. fluminensis***
1 Plant erect or ascending, not rooting at the nodes; leaves > 4 cm long, > 5× as long as wide; [native].
  2 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.
    3 Pedicels 2.0-3.2 cm long; sepals 9-16 mm long ..... ***T. ernestiana***
    3 Pedicels 1.0-1.7 cm long; sepals 4-10 mm long ..... ***T. subaspera***
  2 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.
    4 Sepals, pedicels, and ovary pubescent with glandular hairs or a mixture of glandular and eglandular hairs; leaves slightly to densely puberulent or pubescent.
      5 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***
      5 Leaves glaucous to subglaucous, puberulent; sepals, pedicels, and ovary puberulent with glandular hairs only; pedicels 1.2-2.5 cm long ..... ***T. roseolens***
    4 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*).
      6 Pedicels pubescent; sepals eglandular-villous; leaves green; sepals green, inflated-turgid (*T. virginiana*) or not (*T. hirsutiflora*).
        7 Stems usually hirsute or pilose throughout; roots 1.0-1.5 (-2.0) mm thick; sepals not inflated ..... ***T. hirsutiflora***
        7 Stems glabrous, or sparsely puberulent on the upper stem only; roots (1.5-) 2.0-4.0 mm thick; sepals usually inflated ..... ***T. virginiana***
      6 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.
        8 Plants distinctly glaucous; leaves 5-45 cm long, arcing, at an acute angle to the stem..... ***T. ohiensis***
        8 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. Mt (GA): {habitat}; rare. 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*** Vellozo, Wandering Jew. Cp (GA): disturbed areas; rare, introduced and naturalized from GA south and west. [= FNA, K, Z]

Tradescantia hirsuticaulis Small, Hairy Spiderwort. Mt (NC, SC), Pd (GA, SC), Cp (GA): dry rocky woodlands, and rock outcrops (especially granitic flatrocks and domes); rare (NC Watch List). April-June. W. NC and w. SC southwest to n. GA and n. AL; disjunct in AR and e. OK (its core range). There is some question about the validity of this species. [= RAB, FNA, K, W, Y, Z]

Tradescantia hirsutiflora Bush. Cp (GA, SC): sandhills; rare. C. SC (Richlands County), s. and e. GA and FL panhandle, west to TX. Reported for SC (Richland Co.) (P. McMillan 2003). [= FNA, K, Y, Z; >< *T. hirsuticaulis* – S, misapplied]

Tradescantia ohiensis Rafinesque, Smooth Spiderwort. Mt, Pd, Cp (GA, NC, SC, VA): woodlands and forests, alluvial bottoms, disturbed areas; common. April-July. MA west to MN, south to FL and TX, some of that range the result of naturalization from cultivation. [= RAB, C, F, FNA, G, K, W, Z; *? T. reflexa* Rafinesque – S; *? T. canaliculata* Rafinesque – Y]

Tradescantia roseolens Small, Sandhill Spiderwort. Cp, Pd (GA, SC): dry sandy woodlands; rare (GA Rare). May-June. SC south through GA to c. peninsular FL. [= RAB, FNA, K, Y, Z; = *T. longifolia* Small – S]

Tradescantia subaspera Ker-Gawler, Wide-leaved Spiderwort. Mt (GA, NC, SC, VA), Pd (GA, NC, SC), Cp (GA): dry to mesic woodlands and forests; common (VA Watch List). 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; > *Tradescantia subaspera* Ker-Gawler var. *montana* (Shuttleworth ex Britton) E.S. Anderson & Woodson – C, F, G, K, Y, Z; > *T. subaspera* var. *subaspera* – C, F, G, K, Y, Z; < *T. pilosa* J.G.C. Lemaire – S]

Tradescantia virginiana Linnaeus, Virginia Spiderwort. Pd (GA, NC, SC, VA), Mt (GA, VA), Cp (VA): nutrient-rich forests and woodlands; common (rare south of VA) (NC Rare, SC Rare). April-July. ME west to MI and WI, south to n. GA, MO, and AR. [= RAB, C, F, FNA, G, K, S, W, Y, Z; *? T. brevicaulis* Rafinesque – S]

Tradescantia paludosa E.S. Anderson & Woodson. Swamps and bottomlands. Coastal Plain of AL and FL (?) west to TX and AR. March-May. [= FNA, K, Y, Z; = *T. ohiensis* Rafinesque var. *paludosa* (E.S. Anderson & Woodson) D.T. MacRoberts]

CONVALLARIACEAE

[see *RUSCACEAE*]

CYMODOCEACEAE N. Taylor 1909 (Manatee-grass Family)

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. Cp (NC, SC?): submerged in estuarine waters up to about 2 m deep, especially in Core and Pamlico sounds (North Carolina); common. 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 *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, 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, occurs in FL, westward along the Gulf Coast, and in the West Indies; it is occasionally cast ashore in Georgia and the Carolinas following hurricanes, but there is no evidence that

it grows in our area. It is the only other member of the family in e. North America. [= FNA, Z; = *Cymodocea filiformis* (F.T. Kützing in R.F. Hohenacker) Correll – GW, K; = *Cymodocea manatorum* Ascherson – S]

CYPERACEAE (Sedge Family)

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*].
  2 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)..... ***Carex***
  2 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) ..... ***Cymophyllus***
1 Achene not enclosed in a perigynium.
  3 Scales distichously imbricate; spikelets aggregated into spikes or heads; [subfamily *Cyperoideae*].
    4 Inflorescence axillary; leaves predominantly cauline, conspicuously 3-ranked; perianth bristles subtending the achene 6-9; [tribe *Dulichieae*]..... ***Dulichium***
    4 Inflorescence terminal, more-or-less scapose (though immediately subtended by leafy bracts); leaves predominantly basal, not 3-ranked; perianth bristles absent; [tribe *Cypereae*].
      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***
  3 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 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 minutely pitted in longitudinal lines; [tribe *Cypereae*]..... ***Isolepis***
              13 Achenes transversely rugose; [tribe *Fuireneae*] ..... ***Schoenoplectus erectus***
          11 Involucral bracts 2-several, spreading, the inflorescence therefore appearing terminal.
            13 Plants diminutive, to 5 dm tall; leaves 3-15 cm long, to 1 mm wide; [tribe *Abildgaardieae*]..... ***Bulbostylis***
            13 Plants moderate to very robust, 7-30 dm tall; leaves 30-150 cm long, 1.5-15 mm wide.
              14 Flowers 1-2 per spikelet; [tribe *Schoeneae*]..... ***Cladium***
              14 Flowers several-many per spikelet.
                15 Style fimbriate; leaves 0.5-5 mm wide; [tribe *Abildgaardieae*]..... ***Fimbristylis***
                15 Style smooth; leaves (2-) 5-18 mm wide; [tribe *Scirpeae*]..... ***Scirpus georgianus***
        10 Achene subtended by either bristles, 3 stalked paddle-like scales, or 1-2 broad-based scales (in addition to the scales of the spikelets).
          16 Achene subtended by stalked paddle-like scales or broad-based scales.
            17 Achene subtended by a perianth of 3 stalked paddle-like scales; plants 2-7 dm tall; [tribe *Fuireneae*] ..... ***Fuirena***

17 Achene lacking a perianth, but subtended by 1-2 broad-based scales; plants 0.5-3 dm tall; [tribe *Cypereae*]..... ***Lipocarpha***

16 Achene subtended by bristles.

18 Bristles 10-many, > 5× as long as the achene, white to tawny, straight; [tribe *Scirpeae*]..... ***Eriophorum***

18 Bristles 1-6, usually < 4× as long as the achene, brown, straight or conspicuously twisted (twisted if > 3× as long as the achene).

19 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***

19 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].

20 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***

20 Main involucral bracts 2-8, spreading and foliaceous (the inflorescence thus appearing terminal).

21 Spikelets 10-40 mm long, 6-12 mm in diameter, 3-50 per culm; [tribe *Fuireneae*] ..... ***Bolboschoenus***

21 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); 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 equalling to surpassing the distinctly trigonous achene..... ***B. fluviatilis***

2 Bristles shorter than to equalling 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) J. Soják, River Bulrush. Cp, Mt (VA): tidal and river marshes; rare (VA Rare). June-early July; July-August. New Brunswick west to Saskatchewan, British Columbia (Vancouver Island) and WA, south to VA, OH, IN, KS, AZ, and CA; disjunct in s. AL. [= 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. Cp (VA): marshes; rare (VA Watch List). 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]

Bolboschoenus novae-angliae (Britton) S.G. Smith, Salt-marsh Bulrush. Cp (NC, VA): fresh to brackish tidal marshes, ditches; rare (VA Watch List). Late June-July; July-September. ME to GA. Proabbaly 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) J. Soják, Salt-marsh Bulrush. Cp (GA, NC, SC, VA), Mt (VA): brackish marshes; common (rare in Mountains). Late May-June (-September); late June-September. Along the coasts, from Nova Scotia to FL, west to TX, and into tropical America; also in CA. [= FNA; = *Scirpus robustus* Pursh – RAB, C, F, GW, S, W; = *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. Cp (GA, NC, SC), Pd (GA, NC, SC, VA): sandy fields; common, introduced from the Old World tropics (rare and apparently not established in VA). July-October. [= RAB, FNA, GW, K, W, Z; = *Stenophyllus barbatus* (Rottbøll) Britton – S]

Bulbostylis capillaris (Linnaeus) Kunth ex C.B. Clarke, Common Hairsedge. Mt, Pd, Cp (GA, NC, SC, VA): thin soils on rock outcrops, especially granite domes and granite flatrocks (but also on mafic rocks, such as diabase), sandy soils, fields; common. July-October. ME to MN, south to 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, Z; > *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. Cp (GA, NC, SC, VA): moist to wet sands of savannas, roadsides, disturbed areas; common (VA Watch List). 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 (also see *B. coarctata*); = *Stenophyllus ciliatifolius* (Elliott) C. Mohr – S]

Bulbostylis coarctata (Elliott) Fernald, Elliott's Hairsedge. Cp (GA, NC, SC, VA): sandhills, usually associated with longleaf pine and wiregrass; uncommon (VA Watch List). July-October. Se. VA south to s. FL and west to e. TX, north in the interior to sw. TN. [= F, G; = *Bulbostylis ciliatifolia* (Elliott) Fernald *var. coarctata* (Elliott) Kral – C, FNA, GW, K, W, Z; < *B. ciliatifolia* – RAB; = *Stenophyllus coarctatus* (Elliott) Britton – S]

Bulbostylis stenophylla (Elliott) C.B. Clarke. Cp (GA, NC, SC): sandhills, dry savannas, and disturbed sandy areas; uncommon. July-October. Se. NC south to s. FL, west to w. FL, and in Cuba. [= RAB, FNA, GW, K, Z; = *Stenophyllus stenophyllus* (Elliott) Britton – S]

Bulbostylis warei (Torrey) C.B. Clarke, Ware's Hairsedge. Cp (GA, NC, SC): sandhills; rare (NC Rare). 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 and Thomas F. Wieboldt)

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 Spike entirely staminate
  2 Culms distinctly red or purple at the base ..... ***C. picta*** in **Section 41: *Pictae***
  2 Culms yellow to brown or black, without red or purple coloration.
    3 Culms shorter than the leaves; widest leaf blades > 2 mm wide ..... **Section 44: *Phyllostachyae***
    3 Culms longer than the leaves; widest leaf blades < 2 mm wide ..... ***C. exilis*** in **Section 11: *Stellulatae***
1 Spike pistillate or with both pistillate and stamainate flowers.
  4 Stigmas 2; achenes lenticular ..... ***C. exilis*** in **Section 11: *Stellulatae***
  4 Stigmas 3; achenes trigonous.
    5 Perigynia pubescent near the tip ..... ***C. picta*** in **Section 41: *Pictae***
    5 Perigynia glabrous.
      6 Spikes gynecandrous; beak of perigynium with apical teeth > 0.3 mm long ..... ***C. squarrosa*** in **Section 34: *Squarrosae***
      6 Spikes androgynous or entirely pistillate; beak of perigynium with apex entire, emarginate, or with teeth < 0.2 mm long.
        7 Lower pistillate scales > 10 mm long ..... **Section 44: *Phyllostachyae***
        7 Lower pistillate scales < 10 mm long.
          8 Perigynium beak > 2 mm long, as long as or longer than the perigynium body ..... **Section 44: *Phyllostachyae***
          8 Perigynium beak < 2 mm long, or if more, thentapering to the perigynium body and shorter than the body.
            9 Perigynia > 4× as long as wide ..... ***C. pauciflora*** of **Section 38: *Leucoglochin***
            9 Perigynia < 4× as long as wide.
              10 Perigynia with veins on the faces, distinct at least over the achene ..... **Section 46: *Leptocephalae***
              10 Perigynia with 2 marginal veins, otherwise veinless or with faint veins at the base only ..... ***C. geyeri*** in **Section 45: *Firmiculmes***

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 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***

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***

11 Sheath fronts of lower cauline leaves smooth (or very weakly and indistinctly 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 *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 longl 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 bladeless or with blades < 1 cm long and also shorther than the sheaths ..... **Section 40: *Clandestinae***
25 Upper leaves with blades > 2 cm long, longer than the sheaths ..... **Section 39: *Acrocystis***

[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***

Carex conjuncta Boott, Soft Fox Sedge. Cp, Pd, Mt (VA): mesic forests; rare (VA Rare). May-July. NY, NJ, MN, and SD, south to VA, sc. TN, and AR. [= C, F, FNA, G, K, M, W]

Carex crus-corvi Shuttleworth ex Kunze, Crowfoot Sedge, Ravenfoot Sedge. Cp (GA, NC, SC, VA): swamp forests, especially over calcareous substrates; rare (VA Rare). May-June. Se. VA south to FL, west to TX, north in the interior to IN, s.

Ontario, 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 laevivaginata (Kükenthal) Mackenzie. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): marshes, swamp forests, alluvial forests; common. May-June. MA, MI, and MN, south to n. FL, AL, and MO. [= RAB, C, F, FNA, G, GW, K, M, W; = *C. laevi-vaginata* – S, orthographic variant]

*? ***Carex oklahomensis*** Mackenzie, Oklahoma Sedge. Mt (NC, VA): seepage; rare (probably adventive from farther west) (NC Watch List, VA Rare). Se. MO west to KS, south to MS, AR, and ne. TX; disjunct (and probably adventive) in w. NC (Graham County) and w. VA (Giles County). First reported for VA by Wieboldt et al. (1998). [= F, FNA, K, M; < *C. stipata* – S; = *C. stipata* Muhlenberg ex Willdenow var. *oklahomensis* (Mackenzie) Gleason]

Carex stipata Muhlenberg ex Willdenow *var.* ***maxima*** Chapman. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): marshes, ditches, alluvial forests; common. May-June. NJ south to 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; = *C. uberior* (C. Mohr) Mackenzie – M, S]

Carex stipata Muhlenberg ex Willdenow *var.* ***stipata***. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): marshes, ditches, alluvial forests; common. May-June. 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 alopecoidea Tuckerman. Seasonally saturated situations, typically over calcareous substrates. Nova Scotia west to Saskatchewan, south to DC, MD, WV, KY, TN, and IA (Standley in FNA 2002b). [= FNA, K] {synonymy incomplete; not keyed at this time}

[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***

Carex decomposita Muhlenberg, Cypress-knee Sedge, Epiphytic Sedge. Cp (GA, NC, SC, VA), Pd (VA): blackwater swamp forests, often growing on cypress knees, cypress bases, or fallen logs (often at or near water level); rare (GA Special Concern, NC Rare, VA Rare). NY west to MI, south to sw. GA (Jones & Coile 1988), FL, and TX. See Gaddy & Rayner (1980). [= RAB, C, F, FNA, G, GW, K, M, S]

Carex prairea Dewey ex Wood, Prairie Sedge. Mt (VA): calcareous wetlands; rare (VA Rare). Québec west to Yukon, south to NJ, w. VA, OH, NE, MT, and British Columbia. [= C, F, FNA, G, K, M]

Carex diandra Schrank. Swamps, bogs, especially over limestone. Circumboreal, south in North America to w. MD, PA, TN, OH, IL, CO, CA; reported from TN on the basis of a destroyed specimen. [= C, F, FNA, G, K, M]

[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***

Carex annectens (Bicknell) Bicknell, Yellowfruit Sedge. Cp (GA, NC, SC, VA), Pd, Mt (NC, SC, VA): marshes, bottomland forests; common. 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; > *C. annectens* – M; > *C. brachyglossa* Mackenzie – M]

Carex fissa Mackenzie ***var. aristata*** Hermann. Cp (GA, SC): wet savannas; rare (GA Special Concern). Extreme se. SC (Jasper Co.), se. GA (Clinch County) (Sorrie 1998b) and s. MS (Bryson et al. 1996) south into n. and c. peninsular FL. The SC distribution is documented by a voucher (Crins 9848 & D. Brunton) at MICH. Probably a species distinct from *C. fissa*. [= FNA, GW, K; < *C. fissa* – M]

* ***Carex fissa*** Mackenzie ***var. fissa***. Cp (VA): introduced at old railroad stockyard, well-established; rare, introduced from sc. United States (MO and KS south to TX). [= FNA, K; < *C. fissa* – M]

Carex triangularis Böckler. Cp (SC), {GA}: moist forests, ditches, other wet sites; rare. 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 vulpinoidea Michaux. Mt, Pd, Cp (GA, NC, SC, VA): wet sites; common. Labrador west to British Columbia, 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*)]

[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***

Carex aggregata Mackenzie. Mt (NC, VA), Pd (VA): rich forests and woodlands; uncommon. May-June. NY, Ontario, MN, and SD, south to NC, AL, 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 appalachica J. Webber & P.W. Ball, Appalachian Sedge. Mt (GA, NC, SC, VA): dry to mesic forests, rock outcrops; uncommon (GA Special Concern). May-June. ME and Ontario 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 austrina*** Mackenzie. Pd (NC), Cp (VA): roadsides, apparently introduced with hay used for erosion control; rare, introduced from sc. United States. May. Native from KY, IA, and NE south to AL and TX. First reported for our area 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 cephalophora Muhlenberg ex Willdenow. Cp, Pd, Mt (GA), {NC, SC, VA}: ME west to MN, south to FL and TX. [= F, FNA, K, M, S; < *C. cephalophora* – RAB, W (also see *C. mesochorea*); = *C. cephalophora* var. *cephalophora* – C, G]

* ***Carex divulsa*** Stokes. Reported for Washington, DC; its occurrence in our area is uncertain. [= C, F; *? C. divulsa* ssp. *divulsa* – FNA, K; *? C. virens* – G, M, misapplied]

* ***Carex gravida*** Bailey *var. **gravida***. Pd (VA): fields; uncommon. Ontario west to Saskatchewan, south to TN, MS, AR, OK, and CO, rarely introduced eastward. [= C, F, G, K; < *C. gravida* – FNA; = *C. gravida* – M]

* ***Carex gravida*** Bailey *var. **lunelliana*** (Mackenzie) F.J. Hermann. Pd (GA, NC), {SC, VA}: disturbed areas; rare (VA Watch List). IN, SD, and CO south to AR, TX, and NM; introduced eastward in MD south to GA. Reported as new to MD (Calvert County) (Steury 1999). [= RAB, C, F, G, K; < *C. gravida* – FNA; = *C. lunelliana* Mackenzie – M]

Carex leavenworthii Dewey. Cp (VA), Pd (GA, NC, SC, VA), Mt (GA, NC, VA): dry forests; uncommon. May-June. NY, Ontario, and NE south to FL and TX. [= RAB, C, F, FNA, G, K, M, S, W]

Carex mesochorea Mackenzie. Pd, Cp (SC, VA), {GA, NC}: dry forests and woodlands; rare (VA Watch List). MA, Ontario, 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 muehlenbergii Schkuhr ex Willdenow *var.* ***enervis*** W. Boott. {GA, NC, SC, VA}. (VA Watch List). NH west to MN and NE, south to GA, AL, MS, and TX. [= 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***. {GA, NC, SC, VA}. ME, Ontario, and MN south to FL and TX. [= K; < *C. muhlenbergii* – RAB, W; < *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 radiata (Wahlenberg) Small. Cp, Pd, Mt (NC, SC, VA), {GA}: mesic to wet-mesic forests; common. May-June. Nova Scotia west to Manitoba, south to SC, AL, LA, and OK. [= C, FNA, K; < *C. rosea* – RAB, G, W; = *C. rosea* – F, M, S, misapplied]

Carex retroflexa Muhlenberg ex Willdenow. {GA, NC, SC, VA}: dry to mesic forests; uncommon. ME, MI and IA, south to 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 rosea Schkuhr ex Willdenow, Rosy Sedge. Pd (GA), {GA, NC, SC, VA}: dry to dry-mesic hardwood forests; uncommon (GA Special Concern). May-June. Nova Scotia west to Manitoba, south to FL and TX. [= C, FNA, K; < *C. rosea* – RAB, G, W (also see *C. appalachica* and *C. radiata*); = *C. convoluta* Mackenzie – F, M, S; *? C. flaccidula* Steudel]

Carex socialis Mohlenbrock & Schwegman. Cp (GA, NC, SC): blackwater and brownwater swamp forests and bottomlands; rare (GA Special Concern). 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. Pd (GA), {NC, SC, VA}: rich forests; uncommon. May-June. ME, Ontario, 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 texensis (Torrey) Bailey. {GA, NC, SC, VA}: dry to mesic forests;uncommon. 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 cephaloidea (Dewey) Dewey. Basic forests. New Brunswick, Ontario, and MN south to MD, OH, IN, IL, and IA. [= F, FNA, K, M; *C. sparganioides* Muhlenbergia ex Willdenow var. *cephaloidea* (Dewey) Carey – C, G]

* *Carex muricata* Linnaeus ssp. *lamprocarpa* Čelakovský. A European alien, with known occurrences south to e. PA (Rhoads & Klein 1993). [= FNA; < *C. muricata* – C, K]

* *Carex spicata* Hudson. (VA?). VA reports said to erroneous in FNA. [= C, F, FNA, G, K, M]

[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]***

Carex sartwellii Dewey. Wetlands. Québec west to British Columbia, MD, PA, OH, IN, IL, MO, CO, and ID. [= FNA, C, F, G, M; > *C. sartwellii* var. *sartwellii* – K]

[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***

* ***Carex divisa*** Hudson, Divided Sedge. Cp (NC, VA): brackish marshes; rare, introduced from the Old World. May-June. [= RAB, C, F, FNA, G, K]

* ***Carex praegracilis*** W. Boott, Freeway Sedge. Mt (VA): median of interstate highway; rare, introduced from 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]

[26j] Section 7 – section *Ammoglochin (Arenariae)*

A section of 14 species, of temperate Northern Hemishere. References: Reznicek in FNA (2002b).

One species ..... ***C. arenaria***

* ***Carex arenaria*** Linnaeus, Sand Sedge. Cp (NC, VA): moist to dry sandy hammocks; rare, 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 MD south to se. NC; also on ballast in OR (Mackenzie 1931-1935). [= RAB, C, F, FNA, G, K, M]

Carex siccata Dewey, Bronze Sedge. Dry upland habitats. ME and Mackenzie south to NJ, OH, IL, MN, and AZ. [= C, FNA, G, M; < *C. siccata* – K (also see *C. foenea*); = *C. foenea* Willdenow – F, misapplied] {not keyed at this time}

[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***

* ***Carex kobomugi*** Ohwi, Sea Isle Sedge, Japanese Sedge. Cp (NC, VA): sand dunes; uncommon, introduced from 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]

[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 0.2-0.5 mm wide; spikes 1-2; perigynia 1-3 per spike; perigynia 2.5-3.3 mm long; [south to PA and NJ]..... ***[C. trisperma** var**. billingsii]***
  2 Leaves 1-2 mm wide; spikes 1-3; perigynia 1-6 per spike; perigynia 3.3-4.0 mm long; [south to w. NC] ..... ***C. trisperma** var**. 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***

Carex brunnescens (Persoon) Poiret *var***. *sphaerostachya*** (Tuckerman) Kükenthal, Brown Sedge. Mt (GA, NC, SC, VA): grassy balds, bogs, moist forests at moderate to high elevations; common (GA Special Concern, VA Watch List). 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 canescens Linnaeus *var***. *canescens***, Silvery Sedge. Mt (VA): {habitat}; rare. 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. Cp (NC, SC, VA), Mt (VA): bogs, swamps, often in disturbed areas; rare (NC Rare, VA Watch List). June. 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 trisperma Dewey *var***. *trisperma***, Three-seeded Sedge. Mt (NC, VA): bogs and swamps at high elevations, usually growing in living *Sphagnum*, in shaded situations under shrubs or trees in montane wetlands; rare (NC Rare, VA Watch List). June. Labrador west to Saskatchewan, south to NJ, MD, OH, n. IN, IL, and MN; and in the mountains to w. NC and WV. [= C, F, FNA, G, K, M; < *C. trisperma* – RAB, W]

Carex brunnescens (Persoon) Poiret *var***. *brunnescens***. Reported for our area by FNA. {Resolve.} [= F; < *C. brunnescens* – RAB, C, G, M, S, W; = *C. brunnescens* ssp. *brunnescens* – FNA, K] {not keyed at this time}

Carex trisperma Dewey var. *billingsii* O.W. Knight. Wet, boggy areas. Newfoundland and Ontario south to NJ, PA, and MI. The validity and distinction of this variety from var. *trisperma* need additional study. [= C, F, FNA, G, K, M]

[26n] Section 10 – section *Deweyanae*

A section of 8 species, of North America and e. Asia. References: Naczi (1990); Naczi in FNA (2002b).

1 Perigynia 1.3-1.6 mm wide, 3-4× as long as wide ..... ***[C. deweyana** var. **deweyana]***
1 Perigynia 0.8-1.2 mm wide, 4-5× as long as wide.
2 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***
2 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***

Carex bromoides Willdenow *ssp.* ***bromoides***, Common Brome Sedge. Cp (GA, NC, SC, VA), Mt, Pd (NC, SC, VA): swamp forests, bogs, seeps, other wetlands; uncommon. May-July. Ssp. *bromoides* ranges from New Brunswick west to e. MN, south to n. 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]

Carex bromoides Willdenow *ssp.* ***montana*** Naczi, Blue Ridge Brome Sedge. Mt (NC, SC, VA): mountain bogs in the Blue Ridge, seepages in the Blue Ridge Escarpment; rare (NC Watch List). 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 deweyana Schweinitz var. *deweyana*. Rich forests and openings. Newfoundland and Labrador west to AK, south to ec. PA, OH, IL, CO, and WA. Naczi (1999b) reports a chromosome number of n = 27. [= C, F, G, FNA, K, M]

[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***

Carex atlantica Bailey. Cp, Pd, Mt (GA, NC, SC, VA): bogs and seepages; uncommon. May-June. Nova Scotia west to MI and nw. IN, south to n. 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]

Carex echinata Murray *ssp. **echinata***, Star Sedge. Mt (NC, VA): bogs; uncommon (NC Watch List). May-June. Ssp. *echinata* is circumboreal, ranging in North America from Newfoundland west to Saskatchewan, 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 British Columbia south to CO, UT, and s. CA. Ssp. *phyllomanica* (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* (Bailey) Wiegand & Eames – G; = *C. angustior* Mackenzie – M, S; > *C. angustior* – F; > *C. cephalantha* (Bailey) Bicknell – F; < *C. muricata* – W]

Carex exilis Dewey, Coastal Sedge. Cp (NC): peaty seepage bogs; rare (NC Threatened). May-June. Newfoundland and Labrador west to Ontario and n. MN, south to NJ, DE, MD, NY, and n. MI; disjunct southward in sc. NC, se. MS, and 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 howei Mackenzie, Howe's Sedge. Cp (GA, NC, SC, VA), Pd, Mt (NC, VA): bogs and seepages; uncommon. May-June. Nova Scotia 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* (Bailey) Cronquist – C; = *C. atlantica* Bailey ssp. *capillacea* (Bailey) Reznicek – FNA, K]

Carex interior Bailey, Inland Sedge. Mt (VA): calcareous seepage areas; rare (VA Rare). May-June. Newfoundland and 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 ruthii Mackenzie, Ruth's Sedge. Mt (GA, NC, SC, VA): seepage areas, in forest or open areas; uncommon (NC Watch List, VA Watch List). 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 seorsa Howe. Cp (GA, NC, SC, VA), Pd (NC, SC, VA), Mt (VA): acidic swamp forests; common (GA Special Concern). May-June. MA south to GA 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 sterilis Willdenow, Sterile Sedge. Mt (VA): mafic fens; rare (VA Rare). Newfoundland west to Saskatchewan, 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 wiegandii Mackenzie, south to c. PA (Rhoads & Klein 1993). [= C, F, FNA, G, K, M] {not keyed at this time}

[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, & 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***

Carex alata Torrey. Cp (GA, NC, SC, VA), Pd (NC, VA): bottomland forests, marshes; common, rare in lower Piedmont only. May-June. NH, MI, and MO south to FL and TX. [= RAB, C, F, FNA, G, GW, K, W; < *C. alata* – S (also *C. vexans*)]

Carex albolutescens Schweinitz. Cp, Pd, Mt (GA, VA), {NC, SC}: low fields, bottomlands. May-June. MA, NY, WI, and MO, south to FL and TX. [= C, F, FNA, K; < *C. albolutescens* – RAB, G, GW, W (also see *C. longii*); *C. straminea* misapplied]

Carex argyrantha Tuckerman, Silvery-flowered Sedge, Hay Sedge. Mt (NC, VA), Pd? (VA?): wet meadows or dry soils; common (NC Rare). New Brunswick west to Ontario, south to w. NC, e. TN (Unicoi County), and OH. June-August. [= RAB, C, F, G, K, W; *C. aenea*, misapplied]

Carex bebbii Olney ex Fernald. Mt (VA): calcareous wetlands; rare. Newfoundland, 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. Pd (SC): prairie-like openings and barrens over gabbro; rare. ME west to Saskatchewan, 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 brevior (Dewey) Mackenzie ex Lunell. Mt, Pd? (VA): dry forests and margins; uncommon. May-June. MW west to British Columbia, 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 cristatella Britton, Crested Sedge. Mt (NC, VA), Pd (VA): grassy balds, bogs, wet meadows; rare (NC Rare, VA Rare). May-June. VT west to Saskatchewan, 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 festucacea Schkuhr ex Willdenow, Fescue Sedge. Cp (GA, NC, SC, VA), Pd, Mt (NC, SC, VA): bottomland forests; uncommon (NC Watch LIst). May-June. VT west to MN, south to GA, AL, MS, LA, and TX. [= C, F, FNA, K; < *C. festucacea* – RAB, GW, W; < *C. festucacea* – G (also see *C. straminea*)]

Carex hormathodes Fernald. Cp (NC, VA): freshwater and slightly brackish tidal marshes; rare (NC Rare). Newfoundland south to ne. NC, along the coast. [= F, FNA, K, M; = *C. straminea* Willdenow ex Schkuhr var. *invisa* W. Boott – C, G]

Carex longii Mackenzie, Long's Sedge. Cp (GA), {NC, SC, VA}: low fields, bottomlands. May-June. Nova Scotia west to WI, south to FL and TX. [= C, F, FNA, K; < *C. albolutescens* – RAB, G, GW, W]

Carex molesta Mackenzie ex Bright, Troublesome Sedge. Mt (VA): calcareous soils; rare (VA Watch List). NH west to ND, south to VA, AL, MS, and OK. [= F, FNA, G, K; < *C. brevior* (Dewey) Mackenzie ex Lunell – C]

Carex normalis Mackenzie. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): mesic forests; May-June. ME, Québec, and Ontario south to GA and AR. [= RAB, C, F, FNA, G, GW, K, W]

* ***Carex opaca*** (F.J. Hermann) P.E. Rothrock & Reznicek. Cp (VA): introduced at old railroad livestock yard, well-established; rare, introduced from 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 ovalis*** Goodenough. Mt (NC): grassy balds, disturbed areas; rare, introduced from Eurasia. Known to range in North America from 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 projecta Mackenzie. Mt, Pd, Cp (NC, SC, VA), {GA?}: moist forests; rare (NC Rare). May-June. Newfoundland, Labrador, and Saskatchewan south to NC, IN, IL, and IA. [= RAB, C, F, FNA, G, K, M]

Carex reniformis (Bailey) Small, Kidney Sedge. Cp (GA, NC, SC, VA), Pd (NC): floodplain forests, marshes, ditches, other wet areas; rare (GA Special Concern, NC Rare). VA, IL, and OK south to FL and TX. [= RAB, C, F, FNA, G, GW, K, S]

Carex scoparia Sckuhr ex Willdenow *var. **scoparia***. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (NC, VA): bogs, swamp forests, marshes, seepy ledges, ditches; common (GA Special Concern). May-June. Newfoundland west to British Columbia, south to GA, MS, and CA. [= F, FNA, K; < *C. scoparia* – RAB, C, G, GW, W]

Carex silicea Olney, Seabeach Sedge. Cp (VA): beaches and shores; rare (VA Rare). Newfoundland south to VA, along the coast. [= C, F, FNA, G, K]

Carex straminea Willdenow ex Schkuhr, Straw Sedge. Pd (VA), {NC}: wetlands; rare (VA Rare). 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 suberecta (Olney) Britton, Prairie Straw Sedge. Mt (VA): calcareous wetlands; uncommon (VA Watch List). Ontario and MN south to VA, WV, OH, IN, IL, AR, and TX. [= C, F, FNA, G, K]

Carex tenera Dewey *var. **tenera***, Slender Sedge. Pd (NC, VA), Mt (GA, VA), Cp (VA), {SC}: low forests; rare (NC Watch List, VA Rare). Nova Scotia west to British Columbia, south to VA, NC, n. GA, ne. TN, MO, KS, WY, and OR. [= F, FNA; < *C. tenera* – RAB, C, G, K]

Carex tribuloides Wahlenberg *var. **sangamonensis*** Clokey. {GA, NC, SC, VA}: 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***. {GA, NC, SC, VA}. bottomland forests. May-June. New Brunswick west to MN and NE, south to FL, GA, TN, MO, and KS. [= FNA, G, K; < *C. tribuloides* – RAB, C, F, GW, W]

Carex foenea Willdenow, Hay Sedge. Labrador and Newfoundland west to Yukon, south to CT, NY, PA, MI, and ID. [= C, FNA; > *C. aenea* Fernald – F, M; < *C. siccata* – G, K, misapplied; > *C. foenea* – M]

Carex hyalina Boott. Bottomland forests. TN, AR, and OK, south to MS, LA, and TX. [= FNA, K, M] {not keyed at this time; synonymy incomplete}

Carex molestiformis Reznicek & P.E. Rothrock. Mt (VA): {habitat}. Known distribution is w. VA, KY, TN, MO, AR, and OK. [= FNA, K; < *C. brevior* (Dewey) Mackenzie ex Lunell – C] {not keyed at this time; synonymy incomplete}

Carex muskingumensis Schweinitz. Floodplain forests. Ontario and MN south to KY, TN, AR, and OK. [= C, F, FNA, G, K, M]

Carex vexans F.J. Hermann, Florida Hammock Sedge. Peninsular FL and eastern Panhandle FL. [= FNA, K; < *C. alata* – S]

[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***

Carex aquatilis Wahlenberg, Aquatic Sedge. Mt (NC, VA): mountaintop pond, with *Dulichium arundinaceum, Vaccinium macrocarpon, Juncus canadensis*, and *Utricularia sp*., mafic fen at high elevation; rare (VA Rare). 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). 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 crinita Lamarck *var.* ***brevicrinis*** Fernald. Cp, Pd (NC, SC, VA), {GA}: swamps, wet forests; common (VA Watch List). 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***. Pd, Cp (NC, SC, VA), Mt (NC), {GA}: swamps, wet forests, bogs; common (rare in Mountains) May-June. Newfoundland west to MN and Alberta, 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 emoryi Dewey in Torrey. Mt (VA): {habitat}; rare. 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 gynandra Schweinitz. Mt (GA, NC, SC, VA), Pd (NC, VA): mountain bogs, swamp forests, seepages; common. May-June. 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 mitchelliana M.A. Curtis, Mitchell's Sedge. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC, SC): swampy woodlands and forests; rare. 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; = *C. crinita* Lamarck var. *mitchelliana* (M.A. Curtis) Gleason – RAB, G, GW; < *C. crinita* – W]

Carex stricta Lamarck. Mt (GA, NC, VA), Pd, Cp (NC, VA), {SC?}: bogs, sedge meadows, depression ponds, old beaver ponds; common. May-June. Québec and Nova Scotia west to Manitoba, 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 torta F. Boott, Streambed Sedge, Twisted Sedge. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): rocky streambeds, often dominant in patches in mountain streams; common (GA Special Concern). April-May. Nova Scotia west to Ontario, 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 haydenii Dewey. Wet meadows, wet prairies. Newfoundland and Québec west to SD, south to s. PA, MD (C. Frye, pers. Comm. 2000), IL, and IA. [= C, F, FNA, G, K, M]

[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***

Carex buxbaumii Wahlenberg, Brown Bog Sedge, Buxbaum's Sedge. Mt (GA, NC, SC, VA), Cp (VA), Pd (VA): bogs, fens, and seepages (especially over calcareous or mafic rocks); rare (GA Special Concern, NC Rare, VA Rare). June-July. Circumboreal, in North America ranging from 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]

[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 2.0-3.8 mm wide, wider than the perigynia ..... ***[C. limosa]***

1 Pistillate scales 1.2-2.0 mm wide, narrower than the perigynia.

2 Terminal spikes 20-50 mm long; pistillate scales usually shorter than the perigynia, obtuse to acute at the tip .....

..... ***C. barrattii***

2 Terminal spikes 7-20 mm long; pistillate scales usually longer than the perigynia, acute to acuminate and often short-awned (up to 3 mm long) ..... ***[C. magellanica** ssp. **irrigua]***

Carex barrattii Schweinitz & Torrey, Barratt's Sedge. Cp (NC, VA), Mt (GA, NC, SC, VA): peaty bogs and marshes; rare (NC Endangered, VA Rare). 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 limosa Linnaeus. Bogs, wet meadows. Circumboreal, south in North America to se. PA (Rhoads & Klein 1993), NJ, DE, OH, IN, NE, UT, and CA. [= C, FNA, K, M]

Carex paupercula Michaux. Bogs, fens, marshes. Circumboreal, south in North America to NJ, PA, OH, MN, CO, UT, and OR. Closely related to and sometimes teated as a subspecies of the s. South American *C. magellanica*. [= C, G, M; > *C. paupercula* var. *irrigua* (Wahlenberg) Fernald – F; > *C. paupercula* var. *pallens* Fernald – F; = *C. magellanica* Lamarck ssp. *irrigua* (Wahlenberg) Hultén – FNA, K]

[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***

* ***Carex pendula*** Hudson, Pendulous Sedge. Cp (VA): disturbed areas; rare, native of Europe. Introduced in VA (FNA, Kartesz 1999). [= FNA, K]

[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***

Carex glaucescens Elliott, Blue Sedge, Southern Sedge. Cp (GA, NC, SC, VA), Mt (GA): blackwater swamps, pocosins, wet pine savannas, seepage bogs, other acid and peaty situations; common. 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]

Carex joorii Bailey, Joor's Sedge, Hummock Sedge, Cypress-swamp Sedge. Cp (GA, NC, SC, VA), Pd (GA, NC, VA): swamps, upland depression swamps in the Piedmont, sphagnous wetlands; common, rare in the Piedmont. June-October. E. MD south to panhandle FL, west to e. TX, north in the interior to TN, MO, and OK. [= RAB, C, F, FNA, G, GW, K, M, S]

Carex verrucosa Muhlenberg. Cp (GA, NC, SC): pocosins, wet pinelands, pond cypress wetlands; uncommon. July-September. Se. NC south to s. to FL, west to w. LA. [= RAB, FNA, GW, K, M, S; = *C. glaucescens* Elliott var. *androgyna* M.A. Curtis]

[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***

Carex biltmoreana Mackenzie, Biltmore Sedge. Mt (GA, NC, SC): 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*; rare (GA Threatened, NC Rare, SC Rare). 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 millefolia*. An excellent illustration appears in Massey et al. (1983). [= RAB, FNA, K, M, S, W]

Carex chapmanii Steudel, Chapman's Sedge. Cp (GA, NC, SC, VA?): edges of calcareous pine savannas, calcareous slopes and bottomlands; rare (US Species of Concern, NC Rare, SC Rare). April-May. Se. NC south to 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, orthographic variant; = *C. styloflexa* Buckley var. *fusiformis* (Chapman ex Dewey) Wiegand]

Carex meadii Dewey, Mead's Sedge. Pd (NC, VA), Mt (VA): on low, moist clayey soils over mafic rocks (such as diabase) or calcareous rocks; rare (NC Rare, VA Watch List). May-June. NJ west to MI and Saskatchewan, 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 polymorpha Muhlenberg, Variable Sedge. Mt (VA): dry, acidic ridgetop forests; rare (US Species of Concern, VA Endangered). 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 tetanica Schkuhr, Rigid Sedge. Mt, Cp (NC, VA), Pd (NC): moist forests; rare (NC Rare, VA Watch List). May-June. MA west to MN, NE, and Alberta, south to NJ, VA, and NC. [= RAB, C, F, FNA, K, M; = *C. tetanica* var. *tetanica* – G]

Carex woodii Dewey, Wood's Sedge. Mt (GA, NC, SC, VA): moist slopes and cove forests over mafic rocks (such as amphibolite), ultramafic rocks (such as olivine), or felsic rocks; uncommon (GA Special Concern, NC Rare, SC Rare). May-June. NY west to Manitoba, 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]

[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 Perigynium with 1 distinct and 5-6 much less distinct nerves per face, narrowly cuneate basally; perigynium beak short and usually abruptly bent; foliage dark green; bracts surpassing the staminate spike..... ***C. leptonervia***
1 Perigynium with 6-many distinct nerves per face (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 brown; uppermost bract overtopping the staminate spike; staminate spike sessile or short-stalked ..... ***C. blanda***
5 Basal sheaths purple when fresh, weathering to brown; uppermost bract rarely overtopping the staminate spike; staminate spike usually long-stalked..... ***C. gracilescens***

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).
6 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***
6 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].
7 Basal sheaths purple or wine-red (may weather to brown in *C. gracilescens*).
8 Spikes densely flowered, the perigynia overlapping ..... ***C. gracilescens***
8 Spikes loosely flowered, the spikelets not overlapping.
9 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***
9 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***
7 Basal sheaths brown, not purple or wine-red.
10 Mature perigynia obovoid.
11 Spikes overlapping, densely flowered; staminate spike more-or-less obscured; plant green..... ***C. crebriflora***
11 Spikes scattered, loosely flowered; staminate spike prominently exserted; plant usually glaucescent ..... ***C. laxiflora***
10 Mature perigynia fusiform.
12 Spikes overlapping, the staminate more-or-less obscured and overtopped by the uppermost bract .... ***C. crebriflora***
12 Spikes scattered, the staminate prominent and exceeding the uppermost bract.
13 Spikes densely flowered; perigynium beaks curved; lowest spike exserted on a long, arching, peduncle ..... ***C. styloflexa***
13 Spikes loosely flowered; perigynium beaks straight; lowest spike on a short, erect or ascending, peduncle..... ***C. striatula***

Carex albursina Sheldon, White Bear Sedge. Mt (GA, NC, SC, VA), Pd (VA): nutrient-rich cove forests, over mafic or calcareous rocks; rare (GA Special Concern, NC Watch List). April-June. VT and s. Québec 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* Boott – G]

Carex blanda Dewey. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): cove forests, bottomlands, and other mesic, nutrient-rich forests; common. April-June. ME and s. Québec west to ND, south to c. GA (Jones & Coile 1988), panhandle FL, and TX. Naczi (1999b) reports chromosome numbers of n = 15-18. [= RAB, C, F, FNA, K, M, S, W; = *C. laxiflora* var. *blanda* (Dewey) Boott – G]

Carex crebriflora Wiegand. Mt, Pd, Cp (GA, NC, SC, VA): bottomland and other nutrient-rich forests: uncommon. April-June. VA south to FL, west to TX. [= RAB, C, F, FNA, G, K, M, S, W]

Carex gracilescens Steudel. Pd, Mt (NC, SC, VA), Cp (GA?, VA): nutrient-rich forests; rare (SC Rare). May-June. VT and s. Québec west to WI, south to SC, AL, LA, and e. TX. The report for sw. GA in Jones & Coile (1988) needs verification. Naczi (1999b) reports a chromosome number of n = 17, 19, 20. [= RAB, F, FNA, K, M, S, W; < *C. gracilescens* – C (also see *C. ormostachya*); = *C. laxiflora* var. *gracillima* (Boott) Boott ex B.L. Robinson & Fernald – G]

Carex laxiflora Lamarck. Mt, Pd, Cp (GA, NC, SC, VA): bottomland and other nutrient-rich forests; common. May-June. Varieties have been recognized; their appropriate disposition is uncertain. Var. *laxiflora* ranges from ME and s. Québec 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 leptonervia (Fernald) Fernald. Mt (NC, VA): nutrient-rich forests, such as rich, seepy northern hardwoods forests; rare (NC Rare, VA Watch List). May-June. Newfoundland west to MN, south to NJ, PA, IN, and WI, and in the Appalachians south to NC. [= RAB, C, F, FNA, G, K, M, S, W]

Carex manhartii Bryson, Blue Ridge Purple Sedge, Manhart's Sedge. Mt (GA, NC, SC, VA): 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; uncommon (GA Threatened, NC Rare, SC Rare). 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 ormostachya Wiegand, Necklace Spike Sedge. Mt (VA): northern hardwood forest; rare (VA Rare). 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 purpurifera Mackenzie, Limestone Purple Sedge. Mt (GA, NC, VA): moist, rich cove forests, at low elevations, over calcareous or mafic rocks; rare (GA Threatened, VA Rare). 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. Mt (GA, NC, SC): very nutrient-rich, moist cove forests in the Blue Ridge Escarpment region, over calcareous or mafic rocks; rare (GA Special Concern, NC Rare). 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 striatula Michaux. Mt, Pd (NC, SC, VA), Cp (GA, NC, SC, VA): bottomland and other nutrient-rich forests; common. May-June. Se. NY and PA west to TN, south to 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; = *C. laxiflora* var. *angustifolia* Dewey – G; *? C. laxiflora* – S, misapplied]

Carex styloflexa Buckley. Mt, Pd, Cp (GA, NC, SC, VA): bogs, wet forests; common. May-June. CT west to s. OH, south to FL and se. TX. [= RAB, C, F, FNA, G, K, M, S, W]

Carex kraliana Naczi & Bryson, Kral's Sedge. Pd (NC, SC, VA), Mt, Cp (SC, VA), {GA}: mesic forests, slightly acidic to circumneutral: common. MD, OH, and IN south to FL and TX. See Naczi, Bryson, & Cochrane (2002). [= FNA] {not keyed at this time; synonymy incomplete}

[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).

1 Staminate peduncle elongate, overtopping the uppermost pistillate spike ..... ***C. crawei***
1 Staminate peduncle none, or shorter than the uppermost pistillate spike ..... ***C. granularis***

Carex crawei Dewey, Crawe's Sedge. Mt (VA): dry calcareous barrens; rare (VA Rare). Québec west to British Columbia, 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 gholsonii Naczi & Cochrane, Gholson's Sedge. Cp (GA, NC, SC): moist calcareous forests, especially marl flats and bottomlands over coquina; rare. E. NC south to FL, west to AL. See Naczi, Bryson, & Cochrane (2002). [= FNA] {not keyed at this time}

Carex granularis Muhlenberg ex Willdenow. Mt (VA), Cp (GA, NC, SC, VA), Pd (NC, VA): moist, nutrient-rich forests, especially bottomlands, mostly over calcareous rocks (limestone, dolostone, coquina limestone) or mafic rocks (diabase); common, rare south of VA (NC Watch List). May-June. ME and Québec west to Saskatchewan, south to FL, OK, and ne. TX. 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. *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 more information; further study is needed. [= 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 microdonta Torrey & Hooker. Calcareous prairies, limestone glades. AL and FL west to MO, KS, OK, TX, NM, and AZ. [= FNA, K] {not keyed at this time}

[26dd] Section 21 – section *Careyanae*

A section of 8 species, of tempearte 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***

Carex abscondita Mackenzie. Cp (GA, NC, SC, VA): rich bottomlands and other forests; common. April-June. MA south to n. FL, west to LA. 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 (also see *C. magnifolia*); >< *C. abscondita* var. *abscondita* – F; > *C. abscondita* var. *rostellata* Fernald – F]

Carex austrocaroliniana Bailey, South Carolina Sedge. Mt (GA, NC, SC): nutrient-rich, moist coves in the sw. mountains of NC and adjacent SC, often with some seepage; uncommon (SC Rare). 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 careyana Torrey ex Dewey, Carey's Sedge. Mt (GA, NC, VA), Pd (VA): nutrient-rich moist forests, mostly over calcareous rocks; rare (GA Special Concern, NC Rare, VA Watch List). 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 cumberlandensis Naczi, Kral, & Bryson, Cumberland Sedge. Mt, Pd (GA, NC, SC, VA), Cp (GA): rich, mesic, deciduous or mixed forests; common. 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 digitalis Willdenow *var. **digitalis***. Infraspecific taxa need separating: {Mt, Pd, Cp (GA, NC, SC, VA): rich forests; common.} 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]

Carex digitalis Willdenow *var. **floridana*** (L.H. Bailey) Naczi & Bryson. Cp (GA, NC, SC, VA): rich forests; common. 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]

Carex digitalis Willdenow *var. **macropoda*** Fernald. Infraspecific taxa need separating: {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]

Carex laxiculmis Schweinitz *var. **copulata*** (Bailey) Fernald. Mt, Pd (VA), {NC}: mesic forests; uncommon. April-June. VA, Ontario, and WI south to NC, AL, and AR. Var. *copulata* (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* (Bailey) Mackenzie – F, M]

Carex laxiculmis Schweinitz *var. **laxiculmis***. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): rich slope or alluvial forests; common. 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 magnifolia Mackenzie. Cp (GA, NC, SC), Mt (NC): bogs, acid swamps; uncommon? (rare in Mountains). 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 plantaginea Lamarck, Plantainleaf Sedge. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): rich cove forests, mostly over mafic or calcareous rocks, montane alluvial forests; uncommon (SC Rare, VA Watch List). April-May. New Brunswick 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. Mt (GA, NC, VA), Pd (NC, VA), Cp (VA): rich cove forests, mostly over mafic or calcareous rock; uncommon (GA Special Concern). April-June. ME and s. Québec 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]

[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.

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-) 4.0-7.3 cm up from the base; widest leaves 2.4-4.0 (-5.3) mm wide; achene stipe 0.6-0.8 (-0.9) mm long..... ***C. godfreyi***

10 Plants densely cespitose; culm purple-red coloration extending 0-3.6 (-3.9) cm up from the base; widest leaves 3.3-6.8 (-9.1) mm wide; achene stipe (0.2-) 0.3-0.6 mm long.
11 Perigynia 1.5-1.9 (-2.2) mm wide, (2.2-) 2.5-3.1× as long as wide ..... ***C. amphibola***
11 Perigynia (1.7-) 1.8-2.6 mm wide, 1.8-2.4 (-2.6)× as long as wide.
12 Widest leaves 3.3-5.6 (-8.0) mm wide; achene stipe (0.3-) 0.4-0.6 mm long ..... ***C. corrugata***
12 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***

Carex amphibola Steudel. {GA, NC, SC, VA}. {distribution and abundance in our area needing additional herbarium investigation} May-June. MA, s. Ontario, 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 conoidea Schkuhr ex Willdenow, Field Sedge. Mt (NC, VA): seepage and fen over mafic rocks (amphibolite); rare (NC Threatened, VA Rare). May-June. Newfoundland west to MN, south to nw. NC (Ashe Co.) and MO. The only known location in NC was found by a party led by Asa Gray in 1841. [= RAB, C, F, FNA, G, K, M, S]

Carex corrugata Fernald. Cp (NC, SC, VA), {GA}: wet calcareous forests (NC Rare). {distribution and abundance needing additional herbarium investigation}. May-June. Se. VA and KY south to TN and AL. See Hill (1992). [= F, FNA, K; < *C. grisea* – RAB, G, M, S; < *C. amphibola* – GW; *? C. amphibola* Steudel var. *turgida* Fernald]

Carex flaccosperma Dewey. Cp, Pd, Mt (GA), {NC, SC, VA} {distribution and abundance needing additional herbarium investigation} May-June. Se. VA south to FL, west to TX, north in the interior to s. MO. [= FNA, G, K, M, S; < *C. flaccosperma* – RAB, C, GW (also see *C. glaucodea* and/or *C. pigra*); = *C. flaccosperma* var. *flaccosperma* – F]

Carex glaucodea Tuckerman ex Olney. (NC, VA): {distribution and abundance needing additional herbarium investigation} May-June. MA and Ontario 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. Cp (GA, NC, SC): calcareous swamps and bottomlands; rare. May-June. Se. NC south to c. peninsular FL and west to Panhandle FL and sw. GA and s. AL. See Naczi (1993) for additional information. [= FNA, K; < *C. grisea* – RAB, M, S; < *C. amphibola* – GW]

Carex grisea Wahlenberg. (VA). {distribution and abundance in our area needing additional herbarium investigation} May-June. New Brunswick 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 hitchcockiana Dewey. Mt (NC, VA): rich moist forests, especially over limestone, other calcareous, or mafic rocks; uncommon (NC Rare, VA Watch List). June-July. MA west to MN, south to NC, sc. TN, and AR. [= C, F, FNA, G, K, M, W]

Carex impressinervia Bryson, Kral, & Manhart. Pd (NC): moist forests; rare (US Species of Concern, NC Rare). 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 oligocarpa Schkuhr ex Willdenow, Few-fruited Sedge. Mt (GA, NC, SC, VA), Pd (VA), Cp (GA, VA): rich forests, over calcareous or mafic rocks; common (rare in GA, NC, and SC) (GA Special Concern). May-June. MA west to MN, south to FL and TX. *C. oligocarpa* sensu stricto in SC (McMillan pers. comm., specimen at CLEMS). [= RAB, C, F, FNA, G, K, M, S, W]

Carex pigra Naczi, Lazy Sedge. Cp (NC, SC, VA), Pd (NC, SC), {GA}: moist forests; uncommon. 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; < *C. flaccosperma* Dewey var. *glaucodea* (Tuckerman ex Olney) Kükenthal – F; < *C. glaucodea* – S]

Carex planispicata Naczi. Pd, Cp (GA, NC, SC, VA): rich to fairly acid mesic forests, on slopes and floodplains; common. 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 acidicola Naczi (section *Griseae*). Mesic forests. GA and AL (Naczi, Bryson, & Cochrane 2002). [= FNA] {not keyed at this time}

Carex brysonii (section *Griseae)*. Mesic forests. Endemic to the Cumberland Plateau of n. AL. See Naczi (1993) for additional information. [= FNA, K]

Carex bulbostylis Mackenzie. MS west to TX and OK; disjunct in TN. Reports for GA in Jones & Coile (1988) are probably based on misidentifications. [= FNA, K; = *Carex amphibola* Steudel var. *globosa* (Bailey) Bailey]

Carex calcifugens Naczi. Cp (GA, NC, SC): rich bluff forests, evergreen maritime forests; rare. Se. NC south to FL. See Naczi, Bryson, & Cochrane (2002). [= FNA] {not keyed at this time; synonymy incomplete}

Carex ouachitana Kral, Manhart, & Bryson. Dry to dry-mesic slope and ridge forests. Disjunct in nc. TN and KY from the Ouachita Mountain of AR and OK. [= FNA, K] {not keyed at this time; synonymy incomplete}

Carex thornei Naczi (section *Griseae*). Cp (GA): 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 nw. FL. See Naczi, Bryson, & Cochrane (2002). [= FNA]

[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]***

Carex cherokeensis Schweinitz, Cherokee Sedge. Cp (GA, NC, SC), Pd (GA, SC), Mt (GA, NC, SC, VA*?): moist, rich, calcareous forests; rare (NC Rare). May-June. Se. NC, nw. SC, sw. NC, nc. TN, se. MO, and OK, south to Panhandle FL and west to e. TX and se. OK; disjunct in the Mountains of VA, where perhaps introduced (Belden et al. 2004). This species is much more common in the sc. United States than in our area. [= RAB, FNA, G, K, M, S, W]

Carex sprengelii Dewey ex Sprengel, Sprengel's Sedge, Long-beaked Sedge, south to NJ, e. PA (Rhoads & Klein 1993), and DE (FNA). [= C, FNA, K, M]

[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***

Carex aestivaliformis Mackenzie. Mt (GA, VA): wet meadows (VA), upland submesic forests (GA); rare (GA Special Concern). 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. Mt (GA, NC, SC, VA): dry-mesic to mesic forests; common. May-June. VT south to GA and AL, in or near the Appalachians. [= RAB, C, F, FNA, G, K, M, S, W]

Carex davisii Schweinitz & Torrey, Davis's Sedge. Pd (VA): rich forests; rare. VT, Ontario, 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 gracillima Schweinitz, Graceful Sedge. Mt (GA, NC, SC, VA): moist forests; common. April-June. Newfoundland west to Manitoba, south to GA, AL, and AR. [= RAB, C, FNA, G, K, M, W; > *C. gracillima* var. *gracillima* – F]

Carex misera Buckley, Wretched Sedge. Mt (GA, NC): moderate to high elevation cliffs and rock outcrops; rare (GA Threatened). 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 oxylepis Torrey & Hooker. Cp, Pd (GA, NC, SC, VA): bottomlands, calcareous forests; common. May-June. VA, KY, IL, MO, and OK south to FL and TX. Var. *oxylepis* widespread in TN; var. *pubescens* restricted in TN to c. TN. [= RAB, C, F, FNA, G, GW, M, S, W; > *C. oxylepis* var. *oxylepis* – K; > *C. oxylepis* var. *pubescens* J.K. Underwood – K]

Carex prasina Wahlenberg. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): rich forests, especially in seepage; common. May-June. ME, Ontario, 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 roanensis F.J. Hermann, Roan Mountain Sedge. Mt (GA, NC, VA): cove forests, moderate toi high elevation oak forests, northern hardwood forests; rare (GA Special Concern, VA Watch List). May-June. Sw. PA, w. VA, and e. WV south through e. KY, e. TN, w. NC to se. TN and nw. GA (Smith et al. 2006). See 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]

[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***

Carex allegheniensis Mackenzie. Mt (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): swamps, bogs, streamhead pocosins, other moist to wet habitats, boggy pools in floodplains; uncommon. 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 arctata W. Boott, Black Sedge, Drooping Woodland Sedge. Mt (NC, VA): northern hardwood and spruce forests, bog edges; rare (VA Rare). Newfoundland west to MN, south to PA, w. VA, nw. NC, and OH. First reported for our area (in Highland County, VA) by Fleming & Ludwig (1996). [= C, F, FNA, G, K, M]

Carex debilis Michaux. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): swamps, bogs, other moist to wet habitats; common. May-August. MA west to s. IN, south to 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 (also see *C. allegheniensis* and *C. flexuosa*)]

Carex flexuosa Muhlenberg ex Willdenow. Mt (NC, SC, VA): dry to moist upland forests, openings, granitic domes, rock outcrops; common. May-July. 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* Bailey – RAB, C, F, G, K; < *C. debilis* var. *rudgei* L.H. Bailey – FNA; < *C. debilis* – GW, W]

Carex oblita Steudel. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC, SC): swamps and other wet habitats; common? (GA Special Concern, VA Watch List). NJ south to sc. GA, west to e. 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 sylvatica*** Hudson. Mt, Pd (NC): pastures, lawns; rare, native of Europe. [= C, F, FNA, G, K, M]

Carex venusta Dewey. Cp (GA, NC, SC, VA): swamps, peat bogs, mossy wetlands, and other wet habitats; common? (GA Special Concern, VA Watch List). 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 (also see *C. oblita*)]

Carex castanea Wahlenberg, Chestnut Sedge. Calcareous sites. Newfoundland west to Manitoba, 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] {not keyed}

[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, minutely papillose, or with few scattered hairs; larger lateral spikes (3.5-) 4-8 mm wide; ligules as wide as long.

4 Perigynia pubescent, minutely papillose, 2.5-4.0 mm long; pistillate scales attenuate, at least some with awns 0.5-2.0 mm long ..... ***C. bushii***
4 Perigynia glabrous or sparsely pilose, non-papillose, 2.0-3.5 mm long; pistillate scales awnless, or awn to 0.5 (-1.0) mm long.
5 Mature perigynia with a minute beak about 0.1-0.2 mm long, the body terete, subterete, or subtriangular in cross-section, spreading at > 45 degrees from the rachis..... ***C. caroliniana***
5 Mature perigynia beakless, triangular in cross-section, appressed-ascending at < 45 degrees from the rachis.
6 Leaf blades glabrous or nearly so, especially on the lower surface; sheaths glabrous to sparsely pubescent, sometimes densely pubescent at the summit; [primarily of the Coastal Plain and Piedmont] ... . ***C. complanata***
6 Leaf blades soft-pubescent; sheaths soft-pubescent; [primarily of the Mountains and Piedmont] .... ***C. hirsutella***

Carex bushii Mackenzie. Pd (GA, NC, VA), Mt (NC, VA): meadows; uncommon (VA Watch List). 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 caroliniana Schweinitz, Carolina Sedge. Cp, Pd, Mt (GA, NC, SC, VA): forests; common. 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]

Carex complanata Torrey & Hooker. Cp, Pd (GA, NC, SC, VA), Mt (GA): forests; common. May-June. NJ and s. PA south to 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 (also see *C. hirsutella*)]

Carex hirsutella Mackenzie. Mt, Pd, Cp? (NC, SC, VA) {GA}: forests; common. May-June. ME, s. Ontario, and IA, south to GA and ne. TX. [= F, FNA, K, M, S; = *C. complanata* Torrey & Hooker var. *hirsuta* (Bailey) Gleason – C, G; < *C. complanata* – RAB, GW, W]

Carex pallescens Linnaeus, Pale Sedge. Mt (NC, VA): grassy balds at high elevations, other grassy openings; rare (VA Rare). June-July. Circumboreal (in ne. North America and n. Eurasia); in North America ranging from Newfoundland, Québec, 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 swanii (Fernald) Mackenzie. Mt (GA, NC, SC, VA), Cp (NC, VA), Pd (VA): nutrient-rich forests, woodlands, and openings; common. May-June. Nova Scotia, 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 virescens Muhlenberg ex Willdenow. Mt (GA, NC, SC, VA), Pd, Cp (VA): nutrient-rich forests, woodlands, and openings; common. 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]

[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***

Carex scabrata Schweinitz. Mt (GA, NC, SC, VA), Pd (VA): seepage slopes, brook-banks, often in shade; common (GA Special Concern). May-July. Nova Scotia west to MI, south to NJ, n. GA, OH, and MO. [= RAB, C, F, FNA, G, GW, K, M, S, W]

[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***

Carex dasycarpa Muhlenberg, Velvet Sedge. Cp (GA, SC): maritime forests, other sandy forests; rare (GA Rare). May-June. E. SC south to 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]

Carex tenax Chapman. Cp (GA, NC, SC), Pd (GA): sandhills; rare. May-June. Sc. NC south to FL, west to MS; also in sw. LA and se. TX. [= RAB, FNA, K, M; *? C. validior* Mackenzie – S]

[26nn] Section 27 – section *Hirtifoliae*

A monotypic section, of e. North America. References: Ball in FNA (2002b); Jones & Jones (1993).

One species ..... ***C. hirtifolia***

Carex hirtifolia Mackenzie. Mt (VA): nutrient-rich, though often rather dry, forests and woodlands; uncommon (VA Watch List). May-June. New Brunswick west to MN, south to MD, sw. VA, c. TN, KY, MO, and e. KS. [= C, F, FNA, G, K, M, W]

[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***

Carex hyalinolepis Steudel. Cp (GA, NC, SC, VA): marshes, swamp forests; uncommon (NC Watch List). May-June. NJ south to FL, west to TX, north in the interior to KS; disjunct around the Great Lakes in MI, IN, and s. Ontario. [= RAB, C, F, FNA, K, M, S; = *C. lacustris* Willdenow var. *laxiflora* Dewey – G; = *C. hyalinolepsis* – GW, misspelling]

Carex lacustris Willdenow, Lakeshore Sedge. Cp, Mt (VA): marshes, swamp forests; rare (VA Rare). Québec west to Saskatchewan, south to e. VA, w. VA, and NE. [= C, F, FNA, K, M; = *C. lacustris* var. *lacustris* – G]

Carex lasiocarpa Ehrhart *var.* ***americana*** Fernald, Slender Sedge. Mt (NC, VA): in shallow water of alkaline spring seep, on hummocks in acidic basin marsh, and in high elevation fen over amphibolite; rare (VA Rare). A circumboreal species, ranging south in North America to NJ, WV, MD (C. Frye, pers. comm. 2000), VA, nw. NC, IA, and WA. 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 pellita Muhlenberg. Mt (VA): wet meadows; uncommon. New Brunswick west to British Columbia, 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 pumila*** Thunberg. Cp (NC): open disturbed sand flats; rare, introduced from Asia. May. See Reznicek (1993) for additional information. [= FNA, K; >< *C. hirta* – RAB, misidentification]

Carex striata Michaux *var.* ***brevis*** Bailey. Cp (NC, SC, VA): pocosins, limesink ponds, small depression ponds, clay-based Carolina bays, acid peaty swamps, wet savannas (dominated by *Pinus serotina* and/or *Taxodium ascendens*); common, rare in

VA (VA Watch List). May-June. E. MA south to SC. See Reznicek & Catling (1986) for discussion of the nomenclatural change. [= C, FNA, K; < *C. walteriana* – RAB, GW, M, S; = *C. walteriana* Bailey var. *brevis* (Bailey) Bailey – F, G]

Carex striata Michaux *var. **striata***, Pocosin Sedge. Cp (GA, SC): pocosins, limesink ponds, small depression ponds, clay-based Carolina bays, acid peaty swamps, wet savannas (dominated by *Pinus serotina* and/or *Taxodium ascendens*); uncommon. May-June. SC south to n. FL and e. panhandle FL. [= C, FNA, K; < *C. walteriana* Bailey – RAB, GW, M, S; = *C. walteriana* var. *walteriana* – F, G]

Carex vestita Willdenow. Pd (NC, VA), Cp (VA): low forests; rare (NC Watch List, VA Rare). April-May. S. ME south to se. VA and nc. NC. [= RAB, C, F, FNA, G, K, M]

Carex acutiformis Ehrhart. Introduced in MD, native of Eurasia (FNA, Kartesz 1999). [= FNA, K]

[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***

Carex atherodes Sprengel, Awned Sedge. Mt (VA): marl fens; rare (VA Rare). Circumboreal, south in North America to NY, n. VA, WV, MO, CO, UT, and OR. [= C, F, FNA, G, K, M]

* ***Carex hirta*** Linnaeus. Cp (VA): dry sandy areas; rare, introduced from Europe. 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 trichocarpa Muhlenberg ex Willdenow. Mt (NC, VA), Pd (VA): wet meadows, marshes; uncommon (NC Watch List). May-July. Québec west to MN, south to DE, nw. NC, WV, IN, and MO. [= RAB, C, F, FNA, G, K, M, W]

[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) witha 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 0.7-2.3 mm long, divergent to straight.
        6 Spikes 12-18 mm in diameter; teeth of the pergynium beak strongly outcurved, the longest 1.3-2.1 (-2.8) mm long ..... ***C. comosa***
        6 Spikes 9-12 mm in diameter; teeth of the perigynium beak straight or slightly outcurved, the longest 0.7-1.2 (-1.4) mm long ..... ***[C. pseudocyperus]***
1 Pistillate scales smooth-margined, obtuse to acuminate, awnless (rarely the lowermost scales awned in *C. utriculata*).
  7 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***
  7 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].
    8 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]***

8 Achenes symmetrical; widest perigynia (2-) 2.5-3.5 (-4.5) mm wide; beaks 1-4.2 (-4.8) mm long, scabrous or smooth.
9 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) November 5, 2004mm wide ..... ***C. bullata***
9 Perigynium beaks smooth, 1-4.5 mm long; widest leaves 1.5-15 mm wide.
10 Pistillate spikes globose or short ovoid, ca. 3-20-flowered; [plants of the Coastal Plain from e. NC southward]..... ***C. elliottii***
10 Pistillate spikes cylindric, ca. 20-150-flowered; [plants collectively of the Mountains, from nw. NC northward].
11 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]***
11 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.
12 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***
12 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***

Carex baileyi Britton, Bailey's Sedge. Mt (NC, VA): bogs; uncommon (NC Watch List). June-July. NH south to KY, NC, and TN, primarily Appalachian. [= RAB, C, F, FNA, G, K, M, S; *C. lurida* Wahlenberg var. *gracilis* (Boott) Bailey]

Carex bullata Schkuhr ex Willdenow. Cp (GA, NC, SC, VA), Mt (GA, NC, VA), Pd (NC): bogs; uncommon. May-June. Nova Scotia 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 comosa Boott, Bottlebrush Sedge, Bristly Sedge. Cp (GA, NC, SC, VA), Pd (NC, VA), Mt (GA, VA): swamps, marshes; common. April-June. Québec west to MN, south to FL and LA; also in w. North America. [= RAB, C, F, FNA, G, GW, K, M, S, W]

Carex elliottii Schweinitz & Torrey, Elliott's Sedge. Cp (GA, NC, SC): bogs; uncommon (NC Watch List). May-June. NC south to c. pen. FL and west to s. AL. [= RAB, FNA, GW, K, M, S]

Carex hystericina Muhlenberg ex Willdenow, Porcupine Sedge. Mt (GA, VA), Pd (GA): calcareous marshes and wet meadows; common (GA Special Concern). June-July. New Brunswick west to British Columbia, south to w. VA, sc. TN, w. TX, and n. CA. [= C, FNA, G, K; = *C. hystricina* – F, M, W, orthographic variant]

Carex lurida Wahlenberg. Mt, Pd, Cp (GA, NC, SC, VA): bogs, marshes, ditches; common. June-September. Nova Scotia west to MN, south to FL and Mexico. [= RAB, C, F, FNA, G, GW, K, M, S]

Carex oligosperma Michaux. Mt (NC): bogs and seeps at high elevations; rare (NC Endangered). Newfoundland west to Mackenzie, 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 schweinitzii Dewey ex Schweinitz, Schweinitz's Sedge. Mt (VA): bogs; rare (VA Rare). June. VT west to n. MI, south to NJ (and MO?); disjunct in 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 utriculata Boott, Beaked Sedge. Mt (NC, VA): wet meadows; rare (VA Rare). 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* (Boott) Bailey – F, G; < *C. rostrata* – M, misapplied as to our material; = *C. schweinitzii* – RAB, by misidentification]

Carex vesicaria Linnaeus, Inflated Sedge. Mt (NC, VA): bogs, rare (VA Rare). 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 pseudocyperus Linnaeus. Swamps, bogs, wet meadows. Newfoundland to Saskatchewan, south to NJ, PA, OH, and MN. [= C, FNA, K; = *Carex pseudo-cyperus* – F, G, M, orthographic variant]

Carex retrorsa Schweinitz. Swampy forests and wet meadows. New Brunswick and British Columbia, south to DE, MD, sc. PA, IL, UT. [= C, F, FNA, G, K, M]

Carex tuckermanii F. Boott. Calcareous swampy forests and wet meadows. New Brunswick and MN south to WV, sc. PA, NJ, MD, and IL. [= C, F, FNA, K; = *C. tuckermani* – G, M, orthographic variant]

[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***

Carex gigantea Rudge, Giant Sedge. Cp (GA, NC, SC, VA), Pd (GA, NC), Mt (GA): swamps, bottomland forests, cypress depressions; common (rare in Piedmont). 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]

Carex grayi Carey, Asa Gray's Sedge. Cp, Pd (NC, SC, VA), Mt (GA, VA): bottomland forests; common (rare in Mountains) (GA Special Concern). May-June. Sw. Québec west to WI and IA, south to nw. GA and OK; apparently 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* Bailey – S]

Carex intumescens Rudge *var. **fernaldii*** Bailey. Mt (NC, VA): spruce-fir forests, northern hardwood forests, grassy balds; common. June-July. Newfoundland west to Manitoba, 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***. Cp, Pd, Mt (GA, NC, SC, VA): bogs, wet forests; common. May-July. Nova Scotia west to WI, south to c. peninsular FL and e. TX. [= F; < *C. intumescens* – RAB, C, FNA, G, GW, K, M, S, W]

Carex louisianica Bailey. Cp (GA, NC, SC, VA), Pd (GA, NC): calcareous forests; common (rare in Piedmont). May-July. S. NJ south to c. peninsular FL, w. 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]

Carex lupuliformis Sartwell ex Dewey, False Hop Sedge. Cp, Pd (NC, SC, VA), {GA}: wet forests, especially around ponds; rare (NC Rare, VA Rare). June-July. VT and Québec west to se. WI, south to c. peninsular FL and e. TX. [= RAB, C, F, FNA, G, K, M; < *C. lupulina* – GW]

Carex lupulina Muhlenberg ex Willdenow, Hop Sedge. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, VA): bottomland forests; common (rare in Mountains). June-September. Nova Scotia west to MN, south to c. peninsular FL and e. TX. [= RAB, C, FNA, G, K, M, S, W; < *C. lupulina* – GW (also see *C. lupuliformis*); > *C. lupulina* var. *lupulina* – F; > *C. lupulina* var. *pedunculata* A. Gray – F]

[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***

Carex folliculata Linnaeus. Mt (GA, NC, SC, VA), Pd, Cp? (NC): bogs, boggy forests, high elevation forests (spruce-fir); uncommon (GA Special Concern). May-July. Newfoundland west to WI, south to NC, e. TN, and sc. TN. [= FNA, K, M, S, W; = *C. folliculata* var. *folliculata* – RAB, C, F, G; < *C. folliculata* – GW (also see *C. lonchocarpa*)]

Carex lonchocarpa Willdenow. Cp (GA, NC, SC, VA): pocosin margins, small blackwater stream swamps; common. May-July. S. MD south to FL, west to LA. Recognition of *C. lonchocarpa* at the species level is supported by its distinctive achene micromorphology (Wujek & Menapace 1986). [= FNA, K, M; = *C. folliculata* Linnaeus var. *australis* Bailey – RAB, C, F, G; < *C. folliculata* – GW; = *C. smalliana* Mackenzie – S]

Carex turgescens Torrey, Pinebarren Sedge. Cp (GA, NC, SC): sandhill seepage bogs, streamhead pocosins, pocosin-sandhill ecotones, canebrakes, in highly acidic, sandy-peaty soils; rare (NC Watch List). May-June. Sc. NC south to Panhandle FL, west to se. LA, a Southeastern Coastal Plain endemic. [= RAB, FNA, GW, K, M, S]

Carex michauxiana Böckeler, Michaux's Sedge. Bogs, seeps, usually in *Sphagnum*. Labrador and Manitoba south to MD, MI, and MN. Closely related to an e. Asian species. [= C, F, FNA, G, K, M] {not keyed at this time; add to synonymy}

[26tt] Section 33 – section *Collinsiae*

A monotypic section, of e. North America. References: Standley in FNA (2002b).

One species ..... ***C. collinsii***

Carex collinsii Nuttall, Collins's Sedge. Cp (GA, NC, SC, VA), Mt (NC): white cedar (*Chamaecyparis*) bogs and pocosins in the Coastal Plain, bogs in the southwest mountains of NC (where associated with other Coastal Plain disjuncts); uncommon (GA Special Concern, NC Watch List, SC Rare, VA Watch List). 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]

[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***

Carex aureolensis Steudel. {separate from *C. frankii*} {Pd, Mt, Cp (NC, SC, VA): bottomland forests; common. May-July.} VA, KY, IL, and NE south to FL, TX, NM, Coahuila, and Nuevo León; South America. [= FNA; < *C. frankii* – RAB, C, F, G, GW, K, M, S, W]

Carex frankii Kunth. {Pd, Mt, Cp (GA, NC, SC, VA)}: bottomland forests; common. May-July. } W. NY and s. Ontario 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*)]

Carex squarrosa Linnaeus. Pd (GA, NC, SC, VA), Cp (NC, VA), Mt (VA): bottomland forests; common. 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 typhina Michaux. Cp (GA, NC, SC, VA), Pd, Mt (NC, SC, VA): bottomland forests; common (uncommon in Mountains). June-July. ME and Québec west to WI and se. MN, south to GA and LA. [= RAB, C, F, FNA, G, GW, K, M, S, W]

[26vv] Section 35 – section *Shortianae*

A monotypic section, of e. North America. References: Cochrane in FNA (2002b).

One species ..... ***C. shortiana***

Carex shortiana Dewey, Short's Sedge. Mt (VA): calcareous bottomlands and meadows; rare (VA Watch List). May-June. PA, s. Ontario, IL, and IA, south to w. VA, e. TN, AR, and OK. [= C, F, FNA, G, K, M, W]

[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***

* ***Carex extensa*** Goodenough, Long-bracted Sedge. Cp (VA): salt marshes, introduced around seaports; rare, introduced from Europe. [= C, F, FNA, G, K, M]

* *Carex distans* Linnaeus. Disturbed areas. Introduced in MD and PA; native of Eurasia. [= FNA, K]

[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 (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***

Carex flava Linnaeus, Yellow Sedge. Mt (VA): calcareous seeps; rare (VA Rare). June. Circumboreal, ranging south in North America to NJ, PA, IN, ID, and British Columbia; 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 lutea LeBlond, Golden Sedge. Cp (NC): wet savannas shallowly underlain by coquina limestone, with open camopy of *Taxodium ascendens, Pinus palustris*, and *Liriodendron tulipifera*; rare (US Species of Concern, NC Rare). 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]

[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]***

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]

[26bbb] Section 39 – section *Acrocystis (Montanae)*

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). Key based in part on Rettig (1988), C, and M.

NOTE TO USERS: This key does not accomodate two to four new species in our area; they are under study, and will likely be added in the near future. Most will key toward *C. deflexa*.

1 Spikes borne above the middle of the culm, but also with some of the pistillate spikes borne on short or elongate peduncles from the base of the culm.
  2 Terminal staminate spike 2-5 mm long, closely associated with one or more pistillate spikes, the lowest of these subtended by a foliaceous bract mostly surpassing the staminate spike ..... ***C. deflexa***
  2 Terminal staminate spike 5-15 mm long, alone or associated with a pistillate spike, the subtending bract not surpassing the staminate spike.

3 Perigynia subcoriaceous, 3.5-4.5 mm long, the body glabrous or very sparsely short-pubescent; leaf blades thick, stiff, deep green, spreading at maturity, 2-4.5 mm wide; plants loosely cespitose with short-ascending stolons; achenes brownish at maturity, shining, pitted ..... ***C. tonsa***

3 Perigynia membranaceous, 2.5-4.25 mm long, the body short-pubescent; leaf blades thinnish, not stiff, light green, erect or ascending at maturity, 1.5-3 mm wide; plants densely cespitose; achenes, brownish-black or black, at maturity, either minutely pitted or obscurely and irregularly pitted.

4 Perigynia (3.0-) 3.2-4.2 mm long, 1.2-1.5 mm wide, the beak 1.2-1.6 (-2.0) mm long, from about a half to nearly as long as the body; achenes oblong-obovoid, the outer covering dull grayish-black, appearing minutely roughened, the achenes at maturity black, very obscurely and irregularly pitted ..... ***C. rugosperma***

4 Perigynia 2.2-2.9 (-3.2) mm long, 1-1.3 mm wide, the beak 0.4-0.9 mm long, < ½ the length of the body; achenes orbicular-obovoid, the outer covering pitted, the achenes at complete maturity brownish-black, very closely and minutely pitted ..... ***C. umbellata***

1 Spikes all borne close together above the middle of the culm, the terminal one staminate, the lateral ones pistillate (rarely a few spikes borne near the base).

5 Body of the perigynium (excluding the beak and the contracted base) subglobose or spherical, about as wide as long.

6 Plants cespitose; leaves 1.8-4.7 mm wide.

7 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***

7 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***

6 Plants with long rhizomes, forming clonal patches; leaves 1.0-3.0 mm wide.

8 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; culm smooth; [widely distributed in our area] ..... ***C. pensylvanica***

8 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; culm scabrous, at least near the summit; [(in our area) of the Mountains of sw. VA, w. NC, and nw. SC].

9 Beak of the perigynium averaging 1.5 mm long, the orifice oblique; leaves mostly 1.1-1.3 mm wide; perigynium pubescent only on the summit, at the base of the beak; male spikes <15 mm long; culms scabrous throughout; leaves more-or-less smooth on the lower surface.... ***C. lucorum*** *var.* ***austrolucorum***

9 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; male spikes > 15 mm long; culms scabrous only near the summit; leaves scabrous on the lower surface ..... ***[C. lucorum*** *var.* ***lucorum]***

5 Body of the perigynium (excluding the beak and the contracted base) ellipsoid to obovoid, distinctly longer than wide or thick, often also wider than thick, and slightly trigonous.

10 Plants with long rhizomes, forming clonal patches; [collectively of the Coastal Plain and, less commonly, Piedmont).

11 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***

11 Achene body (1.1-) 1.2-1.3 (-1.4) mm long, trigonous; fertile culms 20-43 cm tall, equalling or exceeding the leaves; basal sheaths usually not fibrillose; pistillate scales (2.3-) 2.6-3.0 (-3.4) mm long ..... ***C. physorhyncha***

10 Plants cespitose; [collectively widespread in our area].

12 Lowermost 2 pistillate spikes separated by > 7 mm ..... ***[C. novae-angliae]***

12 Lowermost 2 pistillate spikes overlapping, separated by < 5 mm.

13 Achene body (1.3-) 1.4-1.6 (-1.7) mm long; fertile culms mostly 10-20 cm tall; pistillate scales (2.9-) 3.1-3.4 mm long ..... ***C. nigromarginata***

13 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.

14 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, equalling 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***

14 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***

Carex albicans Willdenow ex Sprengel. Mt, Pd, Cp (NC, SC, VA), {GA}: dry woodlands and forests; common. 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 communis Bailey *var.* ***amplisquama*** (F.J. Hermann) J. Rettig. Mt (GA, NC, SC): dry, open woodlands; rare (NC Rare, SC Rare). 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 Bailey *var.* ***communis***. Mt (GA, NC, SC, VA), Pd (GA): dry woodlands and forests; common. May-June. Prince Edward Island 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 deflexa Hornemann. Mt (NC): seepage at high elevations; rare (NC Rare). Greenland west to AK, south to MA, n. NY, n. MI, and n. MN; apparently disjunct in the high mountains of w. NC. [= C, F, G, K, M; > *C. deflexa* var. *deflexa* – FNA]

Carex emmonsii Dewey ex Torrey, Emmons's Sedge. Cp (NC, SC, VA), Pd (GA, NC, SC, VA): dry, sandy woodlands; rare (NC Watch List). April-May. Nova Scotia 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* (Boott) Gleason – G; < *C. varia* Muhlenberg ex Willdenow – S; = *C. albicans* – M, misapplied]

Carex floridana Schweinitz, Florida Sedge. Cp (GA, NC, SC, VA), Pd (NC): dry, sandy woodlands; rare (GA Special Concern, NC Watch List, VA Watch List). March-May. E. NC south to FL, west to TX. [= FNA, K, M, S; = *C. nigromarginata* Schweinitz var. *floridana* (Schweinitz) Kükenthal – RAB, F]

Carex lucorum Willdenow ex Link *var.* ***austrolucorum*** J. Rettig, Appalachian Woodland Sedge. Mt (GA, NC, SC, VA): xeric to mesic wooded slopes, usually in oak forests and northern hardwood forests; uncommon (GA Special Concern, NC Watch List, VA Rare). *C. lucorum* var. *austrolucorum* is endemic to the Southern Appalachians, ranging from sw. VA 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]

Carex nigromarginata Schweinitz. Pd, Mt, Cp (GA, NC, SC, VA): dry woodlands and forests; common. 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, orthographic variant; = *C. nigro-marginata* – S, orthographic variant]

Carex pensylvanica Lamarck. Mt (GA, NC, SC, VA), Pd (NC, SC, VA), Cp (VA): dry to moist woodlands and forests, grassy balds, shale barrens, rock outcrops; common. April-June. ME west to s, Manitoba 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. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA): dry woodlands; rare (NC Watch List). Se. VA south to FL, west to AR, OK, TX, and Mexico. [= RAB, F, M, S, W; = *C. albicans* Willdenow ex Sprengel var. *australis* (Bailey) J. Rettig – FNA, K]

Carex rugosperma Mackenzie. Mt (SC, VA): distribution and habitats in our area obscure. Prince Edward Island 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 tonsa (Fernald) Bicknell. Mt (GA), {SC, VA} {Distribution and habitats in our area obscure}; common. Québec west to Alberta, 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 umbellata Schkuhr ex Willdenow. Pd, Mt (GA), {NC, SC, VA}. Distribution and habitats in our area obscure. Newfoundland west to Saskatchewan, south to VA, TN, IL, and MN. It seems very possible that southern members of the *C. umbellata* complex may not correspond to any of 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 lucorum Willdenow ex Link var. *lucorum*, Northern Woodland Sedge. New Brunswick 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]

Carex novae-angliae Schweinitz. South to e. PA and WV (Kartesz 1999), occurring in moist forests. It will key most closely to *C. nigromarginata*, from which it differs in having the lowest pistillate spike remote from the next lowest and not overlapping it. [= C, F, G, K, M; < *C. novae-angliae* – FNA]

Carex species 1, Canebrake Sedge. Cp (GA, NC, SC, VA): canebrakes and acid swamps; uncommon. [< *C. novae-angliae* Schweinitz – FNA] {not keyed at this time}

Carex species 2. Mt (NC, VA): ultramafic seepages; rare. {not keyed at this time}

[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]***

Carex pedunculata Muhlenberg ex Willdenow *var. **pedunculata***, Longstalk Sedge. Mt (GA, NC, SC, VA): nutrient-rich dry to mesic forests, usually over calcareous or mafic rocks; rare (GA Special Concern, NC Rare, VA Watch List). April. Var. *pedunculata* ranges from Newfoundland, Saskatchewan, 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]

Carex richardsonii R. Brown. Pd? (VA?): dry, rocky forests; rare if present. VT west to Alberta, south to DC, OH, IN, IA, and SD. This species ranges south to DC (according to C); it is likely to be present in our area, in n. VA. [= C, F, FNA, G, K, M]

[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***

Carex baltzellii Chapman, Baltzell's Sedge. Cp (GA): steepheads, beech-magnolia slopes, and mesic to dry-mesic hammocks; rare (GA Endangered). Sw. GA west to Panhandle FL. [= FNA, K, M, S]

Carex picta Steudel, Painted Sedge. Mt (GA): mesic forests; uncommon. 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]

[26fff] Section 42 – section *Mitratae (Praecoces)*

A section of ca. 20 species, of Europe, e. Asia, and Australia. References: Standley in FNA (2002b).

One species ..... ***C. caryophyllea***

* ***Carex caryophyllea*** Latourette, Spring Sedge. Cp? (VA?): disturbed areas; rare, introduced from Eurasia. This species may not actually be known to occur in our area; it has been reported as naturalized south to DC and is likely to be in VA. [= C, F, FNA, G, K, M]

[26ggg] Section 43 – section *Albae*

A section of 4 species, north temperate. References: Ball in FNA (2002b).

One species ..... ***C. eburnea***

Carex eburnea Boott, Bristle-leaf Sedge. Mt (GA, NC, SC, VA): calcareous cliffs, bluffs, and outcrops; common, rare south of VA (GA Special Concern, NC Rare). May. Newfoundland west to AK, south to w. VA, w. NC, nw. SC, c. AL, n. AR, NE, s. Alberta, and s. British Columbia; 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]

[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 Lowest pistillate scales 2.4-4.5 mm wide, much wider than the the perigynia, appressed against and essentially concealing them; staminate flowers 2-4 per spike; [northern species, south to PA] ..... ***[C. backii]***
1 Lowest pistillate scales 1.2-2.5 (-3) mm wide, < 1.5× as wide as the perigynia, spreading and not concealing them; staminate flowers 5-25 per spike.
2 Achenes subglobose, 1-1.5× as long as wide; staminate scales more or less truncate.
3 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***
3 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].
4 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***
4 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]***
2 Achenes ellipsoid, 1.5-2.0× as long as wide; staminate scales obtuse to acute.
5 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***
5 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.
6 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***
6 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***

Carex basiantha Steudel, Southern Willdenow's Sedge. Cp (NC, SC): mesic forests, bottomlands, and lower slopes, over calcareous or mafic rocks; rare. April-June. Se. NC south to n. FL, west to e. TX, and north to nw. GA, c. TN, and c. AR. [= FNA, K; < *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 jamesii Schweinitz, James's Sedge. Pd (NC, SC, VA), Mt, Cp (VA), {GA}: nutrient-rich bottomlands and mesic slopes over calcareous or mafic rocks; uncommon. 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 juniperorum Catling, Reznicek, & Crins. Mt (VA): calcareous glades and barrens; rare. This species was recently described, and is so far known only from alvars in s. Ontario, calcareous glades and barrens in s. OH and ne. KY, and has recently been found in Montgomery Co., VA (Belden et al. 2004). [= FNA, K]

Carex superata Naczi, Reznicek, & B.A. Ford. Mt (VA), Pd (SC), {GA}: rich forests; uncommon. April-June. 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; < *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 willdenowii Schkuhr ex Willdenow. Pd (NC, SC, VA), Mt, Cp (NC, VA): dry-mesic upland oak forests; common. May-June. MA, VT, NY, s. Ontario, 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 backii Boott. Dry forests and woodlands. South to ne. PA and NJ. [= C, F, FNA, G, K, M]

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]

[26lll] Section 45 – section *Firmiculmes*

A section of 3 species, of western North America. References: Crins in FNA (2002b).

One species ..... ***[C. geyeri]***

*? *Carex geyeri* Boott, Elk Sedge (section *Firmiculmes*), occurs as a disjunct (introduced?) from w. North America in Centre County, PA (Rhoads & Klein 1993). [= C, FNA, K, M]

[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***

Carex leptalea Wahlenberg ***var. harperi*** (Fernald) Weatherby & Griscom. Cp, Pd (GA, NC, SC, VA), Mt? (NC, SC, VA): bogs, seeps, blackwater bottomlands, usually in saturated conditions with *Sphagnum spp*.; common. May-June. NJ south to 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; *C. leptalea* ssp. *harperi* (Fernald) W. Stone – FNA, K; = *C. harperi* Fernald]

Carex leptalea Wahlenberg ***var. leptalea***. Mt, Pd (NC, VA): bogs, seeps, usually in saturated conditions with *Sphagnum spp*.; common. May-June. 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]

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. Cp (GA, NC, SC, VA): in circumneutral to alkaline situations, including brackish marshes, and rarely somewhat inland in savannas underlain by coquina limestone; common (VA Rare). 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; = *C. mariscus* (Linnaeus) Pohl ssp. *jamaicense* (Crantz) Kükenthal – K; = *Mariscus jamaicensis* (Crantz) Britton – S]

Cladium mariscoides (Muhlenberg) Torrey, Twig-rush, Fen-sedge, Smooth Sawgrass. Cp (GA, NC, SC, VA), Mt (NC, VA): 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); uncommon (NC Rare, SC Rare). July-September. Newfoundland west to Saskatchewan 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; = *Mariscus mariscoides* (Muhlenberg) Kuntze – S]

Cymophyllus Mackenzie ex Britton (Fraser's Sedge)

A monotypic genus, endemic to the Appalachians. *Cymophyllus* is a peculiar plant, often considered a relict species most closely (but not very) related to *Carex*, but recent molecular evidence suggests that it may be best re-merged into *Carex*. References: Reznicek in FNA (2002b); Goetghebeur in Kubitzki (1998b).

Identification notes: 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.

Cymophyllus fraserianus (Ker-Gawler) Kartesz & Gandhi, Fraser's Sedge, Lily-leaf Sedge. Mt (GA, NC, SC, VA): cove forests, mostly rather acidic and associated with *Rhododendron maximum*, at moderate elevations; uncommon (GA Threatened,

NC Watch List, VA Watch List). May-June. 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). Kartesz & Gandhi (1991) have shown that the Ker-Gawler's epithet *fraserianus* has priority over Andrews's *fraseri*. [= FNA, K; = *Cymophyllus fraseri* (Andrews) Mackenzie – RAB, C, F, G, S, W; = *Carex fraseriana* Ker-Gawler; = *Carex fraseri* Andrews]

Cyperus Linnaeus 1753 (Umbrella Sedge)
(also see *Kyllinga*)

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).

This treatment is 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 spikelets 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 Perennial.
    3 Achenes with a granular or papillose surface; leaves often bladeless; bracts 2 (-3) ..... ***C. haspan***
    3 Achenes with a smooth surface; leaves with blades; bracts 3-5.
      4 Plants with tubers and stolons; spikelets commonly proliferous ..... ***C. dentatus***
      4 Plants with stolons only; spikelets not proliferous ..... ***C. lecontei***
  2 Annual.
    5 Scales cuspidate, with a cusp 0.6-1.2 mm long ..... ***C. cuspidatus***
    5 Scales blunt or slightly mucronate.
      6 Spikelets 30-20 per head; styles ca. 0.1 mm long..... ***C. difformis***
      6 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).
  7 Leaves bladeless; inflorescence bracts ca. 20, borne horizontally; stamens 3..... ***[C. involucratus]***
  7 Leaves with leaf blades; inflorescence bracts 2-10, borne variously; stamens 1 (-2).
    8 Stems sharply 3-angled, the faces concave, the angles harshly scabrous; leaf blades and inflorescence bracts with conspicuous cross-veins ..... ***C. virens***
    8 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.
      9 Stems slightly scabrous, the prickles pointing downward (retrorse) ..... ***C. surinamensis***
      9 Stems smooth or if rough, the prickles pointing upward (antrorse) or outward (extrorse).
        10 Achene bases swollen, spongey ..... ***C. distinctus***
        10 Achene bases not swollen and spongey.
          11 Achenes narrowly ellipsoid to linear, about 3-6× as long as wide.
            12 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***
            12 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***
          11 Achenes broadly ellipsoid, about 2-2.5× as long as wide (the stipe or cuneate base typically conspicuous).
            13 Annual; longest inflorescence bract erect or strongly ascending; anther ca. 0.5 mm long..... ***C. acuminatus***
            13 Perennial; longest inflorescence bract horizontal or slightly ascending (< 30 degrees); anther 0.8-1.2 mm long.
              14 Scales declined 3-45 degrees from the rachilla; achenes with a stipe..... ***C. eragrostis***
              14 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)

One species in our area ..... ***C. 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 Plant a rhizomatous perennial, culms single ..... ***[C. schweinitzii]***
  2 Plant an annual, culms several, cespitose.
    3 Achenes 0.2-0.6 mm wide; stamen 1; culms 2-16 cm tall.
      4 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***
      4 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***
    3 Achenes 0.5-1.1 mm wide; stamens 3; culms (2-) 6-50 cm tall.
      5 Achenes obovoid, truncate at the apex; leaves flat to V-shaped; live plants not viscous to the touch..... ***C. compressus***

5 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.
6 Spikelets linear, 1.2-1.6 mm wide; scales not overlapping, the tip of each scale just reaching or falling short of the base of the next scale on the same side of the rachilla ..... ***C. distans***
6 Spikelets oblong-ovate to linear-oblong, (1.5-) 1.0-3.0 (-4.0) mm wide; scales overlapping, the tip of each scale reaching to at least the base of the next scale on the same side of the rachilla.
7 Spikelets strongly compressed, >2×as wide as thick (in cross-section); scales spreading or appressed.
8 Scales obovate-orbiculate, notched at the tip; styles < 0.1 mm long.
9 Rachilla wingless; scales scarcely mucronate ..... ***C. iria***
9 Rachilla narrowly winged; scales distinctly mucronate..... ***[C. amuricus]***
8 Scales elliptic to oblong or ovate, acute to obtuse, not notched at the tip; styles 0.3-1.3 mm long.
10 Rachilla with hyaline, whitish, or straw-colored wings 0.2-0.5 mm wide.
11 Culms terete (at least toward the base), nodose-septate; inflorescence bracts 2 (-4), all erect; leaf blades generally absent..... ***C. articulatus***
11 Culms trigonous, not nodose-septate; inflorescence bracts 3-7, horizontal, ascending, or reflexed; leaf blades present.
12 Scales persistent; rachilla persistent; elongate stolons up to 15 cm long present, bearing tubers.
13 Scales purplish red to reddish brown, with green midveins; base of culm indurate; stolons wiry, springy when dried ..... ***C. rotundus***
13 Scales yellowish brown to brown; base of culm soft; stolons spongy, flexible when dried.
14 Style and stigma combined < 4.2 mm long..... ***C. esculentus*** *var.* ***leptostachyus***
14 Style and stigma combined > 4.2 mm long..... ***[C. esculentus*** *var.* ***macrostachyus]***
12 Scales deciduous; rachilla deciduous; rhizomes up to 5 cm long present, not bearing tubers.
15 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***
15 Scales 1.5-2.5 (-3.1) mm long; anthers 0.7-1.8 mm long; stigmas 1-2 (-3) mm long.
16 Achenes coarsely punctate..... ***C. planifolius***
16 Achenes smooth..... ***C. grayi***
10 Rachilla wingless, or with wings 0-0.2 mm wide.
17 Longest inflorescence bract erect or strongly ascending ..... ***[C. schweinitzii]***
17 Longest inflorescence bract horizontal, weakly ascending, or reflexed.
18 Longest inflorescence bract weakly ascending.
19 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***
19 Rachis hispidulous; achenes 1.0-1.2 mm long; spikes loosely oblong-ovoid; [of wetland sites, of SC southward]..... ***C. pilosus***
18 Longest inflorescence bract horizontal to reflexed.
20 Anthers 0.8-1.0 mm long ..... ***C. filiculmis***
20 Anthers 0.3-0.6 mm long.
21 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***
21 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***
7 Spikelets subterete or quadrangular, 1-1.5×as wide as thick (in cross-section); scales appressed.
22 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***
22 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.
23 Spikelets reflexed (some of the uppermost spreading to ascending).
24 Culms glabrous; leaves and inflorescence bracts nearly glabrous ..... ***C. hystricinus***
24 Culms (at least the upper portion) scaberulous or puberulent; leaves and inflorescence bracts puberulent on the upper surface.
25 Inflorescence rays scaberulous; leaves and inflorescence bracts pubescent on the upper and lower surfaces; culm obtusely trigonous to nearly terete..... ***C. plukenetii***
25 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***
23 Spikelets ascending to spreading (some of the lowermost reflexed).
26 Spikes cylindrical, 2-5× as long as wide.
27 Spikelets ellipsoid, 2-3×as long as wide; spikelets with 1-2 (-3) fertile scales ..... ***[C. aggregatus]***
27 Spikelets lanceolate to linear, 4-10×as long as wide; spikelets with 3-8 fertile scales.

28 Scales greenish to light brown, the tips overlapping the lower 1/4 to 1/3 of the next scale. ..... ***C. strigosus***
28 Scales reddish brown or tawny, the tips barely reaching the base of the next scale..... ..... ***C. thyrsiflorus***
26 Spikes ovoid, globose, or obovoid, 1-2× as long as wide.
29 Scales >4 mm long; achenes >2 mm long.
30 Spikes tightly globose..... ***C. echinatus***
30 Spikes ellipsoid to obovoid.
31 Spikelets subquadrangular, the terminal scale elongate, forming a subulate tip to the spikelet; leaves and inflorescence bracts 3-6 mm wide, smooth..... ***C. hystricinus***
31 Spikelets subterete, the terminal scale not elongate, the spikelet therefore acute; leaves and inflorescence bracts mostly >10 mm wide, scabrous on the upper surfaces.
32 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***
32 Spikes loose, of 13-75 spikelets, each with 4-8 (-11) fertile scales; achenes straight, 5-6× as long as wide ..... ***C. refractus***
29 Scales <4 mm long; achenes <2 mm long.
33 Spikes with parallel sides, mostly > 25 mm long; spikelets quadrate.
34 Spikelets narrowly ellipsoid, 1.5-2.0 mm wide..... ***C. tetragonus***
34 Spikelets linear, 0.5-1.0 mm wide ..... ***C. thyrsiflorus***
33 Spikes with curved (convex) sides, mostly < 20 mm long; spikelets somewhat compressed.
35 Scales ascending; achenes oblong-fusiform, gradually narrowed to both ends..... ..... ***C. ovatus***
35 Scales appressed; achenes elongate, abruptly constricted at the tip.
36 Spikes loose, globose to hemispheric; spikelets angular in cross-section, with 3-8 fertile scales; scales yellow-greenish ..... ***C. croceus***
36 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.
37 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***
37 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. Mt (NC, VA), {GA}: wetlands, especially over limestone; rare (VA Rare). 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, TN, KY, and OH (where probably native , and NY and NH (where probably introduced). [= C, F, FNA, G, GW, K, W]

Cyperus articulatus Linnaeus. Cp (GA, SC): marshes, especially tidal; rare. July-September. Se. SC south to s. FL west to e. TX, and south into tropical America. [= RAB, FNA, GW, K, S]

Cyperus bipartitus Torrey. Cp, Pd (NC, VA), Mt (GA, NC, VA), {SC}: low fields, ditches, marshes; uncommon. July-September. ME and Québec west to MN and WA, south to GA, LA, TX, NM, AZ, and CA. [= C, FNA, GW, K, W; *? C. rivularis* Kunth – RAB, F, G, S]

Cyperus compressus Linnaeus. Cp, Pd (GA, NC, SC, VA): sandy fields, disturbed areas; common (uncommon in Piedmont). 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]

Cyperus croceus Vahl. Cp (GA, NC, SC, VA), Pd (GA), Mt (VA): savannas, pine flatwoods, disturbed areas; common. July-October. NJ and MO south through the New World tropics. {problems in circumscription; check specimens} [= C, FNA; = *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. Cp (GA, SC): sandy fields, disturbed areas; rare. July. S. SC south to FL, west to AL; and in New World tropics. [= RAB, FNA, GW, K, S]

Cyperus dentatus Torrey, Toothed Flatsedge. Cp (NC, SC), Mt (VA): low sandy areas; rare (NC Rare, VA Rare). July-October. Nova Scotia and Québec 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. Cp, Pd (VA), Mt (GA, VA): {habitat}; rare (VA Rare). 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. Cp (GA, NC, SC, VA): disturbed areas; rare, introduced from Old World tropics. See Bryson et al. (1996). [= C, F, FNA, G, GW, K]

* ***Cyperus distans*** Linnaeus f. Cp (NC): marshes; rare, probably introduced from tropical America (NC Watch List). July-September. [= RAB, FNA, K, S]

Cyperus distinctus Steudel. Cp (GA, SC): marshes; rare (SC Rare). July-September. E. SC south to s. FL, west to e. LA. [= RAB, FNA, GW, K]

Cyperus echinatus (Linnaeus) Wood. Pd, Cp (GA, NC, SC, VA), Mt (GA, VA): sandy woodlands, forests, and fields; common. July-September. CT and NY west to s. OH, IL, and se. KS, south to n. FL, TX, and ne. Mexico. [= C, FNA, K; = *C. ovularis* (Michaux) Torrey – RAB, G, GW, S, W; > *C. ovularis* var. *ovularis* – F; > *C. ovularis* var. *sphaericus* Böckler – F]

Cyperus entrerianus Böckler. Cp (GA): {habitat}; rare. E. GA south to FL and west to e. TX. [= FNA, K]

* ***Cyperus eragrostis*** Lamarck. Cp (SC): disturbed wetlands; rare, introduced from tropical America. See Bryson et al. (1996), Brown & Marcus (1998). [= FNA, K]

Cyperus erythrorhizos Muhlenberg, Redroot Flatsedge. Cp, Pd (GA, NC, SC, VA), Mt (VA): marshes, ditches; uncommon. 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; > *C. erythrorhizos* – S; > *C. halei* Torrey ex Britton – S]

Cyperus esculentus Linnaeus *var. **leptostachyus*** Böckler, Yellow Nutsedge, Yellow Nutgrass, Wild Chufa, Earth-almond. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common. 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; > *C. esculentus* – S; > *C. lutescens* Torrey & Hooker – S]

Cyperus esculentus Linnaeus *var. **macrostachyus*** Böckler, Yellow Nutsedge, Yellow Nutgrass, Wild Chufa, Earth-almond. {GA, NC, SC} July-October. The species is pantropical and warm temperate. [= FNA; < *C. esculentus* var. *esculentus* – K; < *C. esculentus* – RAB, C, F, G, GW, S, W; < *C. lutescens* Torrey & Hooker – S]

Cyperus filicinus Vahl. Cp (GA, NC, SC, VA): brackish marshes; common. July-September. ME to s. FL, west to LA; West Indies. [= RAB, C, F, FNA, G, K, S; = *C. polystachyos* Rottböll var. *filicinus* (Vahl) C.B. Clarke; < *C. polystachyos* – GW]

Cyperus filiculmis Vahl. Cp (GA, NC, SC, VA), Pd? (NC, SC, VA): sandy or rocky woodlands, forests, and fields; common. July-October. Se. MD south to s. peninsular FL, west to e. TX. [= FNA, RAB; < *C. lupulinus* ssp. *lupulinus* – K (also see *C. lupulinus*]

Cyperus flavescens Linnaeus. Mt, Pd, Cp (GA, NC, SC, VA): low fields, ditches, marshes; common. July-September. Pantropical and warm temperate, north in North America to MA, MI, MO, and KS. [= RAB, C, FNA, G, GW, K, S, W; > *C. flavescens* var. *poiformis* (Pursh) Fernald – F]

Cyperus flavicomus Michaux. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): ditches, marshes; common (GA Special Concern). July-October. Se. VA and KY south through the New World tropics. [= C, FNA, K, W; = *C. albomarginatus* (Martius & Schrader ex Nees) Steudel – RAB, F, G, GW; *? C. sabulosus* (Martius & Schrader ex Nees) Steudel – S]

* ***Cyperus fuscus*** Linnaeus, Black Galingale, Brown Galingale. Cp (VA): {habitat}; rare, introduced from Eurasia. See McKenzie et al. (1998). [= C, F, FNA, G, K]

Cyperus granitophilus McVaugh, Granite Flatsedge. Pd (GA, NC, SC, VA), Cp, Mt (GA): granitic flatrocks, rarely on diabase flatrocks and Altamaha Grit glades; rare (NC Rare, VA Rare). 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; included in concept of *C. squarrosus* by some earlier authors]

Cyperus grayi Torrey. Cp (GA, NC, SC, VA), Pd (NC, VA): dry soils; uncommon. July-September. NH south to GA. [= RAB, C, FNA, K, W; *C. grayii* – G, orthographic variant; > *C. grayii* – F; > *C. filiculmis* var. *oblitus* Fernald & Griscom – F?]

Cyperus haspan Linnaeus. Cp (GA, NC, SC, VA), Pd (GA): marshes, low fields, ditches; common (VA Watch List). July-September. Pantropical in distribution, north in North America to se. VA. [= RAB, C, FNA, G, GW, K, S; > *C. haspan* var. *americanus* Böckler – F]

Cyperus houghtonii Torrey, Houghton's Flatsedge. Pd (NC), Mt (VA): dry upland sites; rare (NC Rare, VA Rare). July. MA, VT, and Québec west to MN, south to w. VA, WV, nc. NC, and nw. IN. [= RAB, C, F, FNA, G, K, W]

Cyperus hystricinus Fernald. Cp, Pd (GA, NC, SC, VA), Mt? (GA, NC, SC): dry woodlands and forests; rare. 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; < *C. retrofractus* – RAB, W, misapplied; = *C. retrofractus* (Linnaeus) Torrey var. *hystricinus* (Fernald) Kükenthal – F, G]

* ***Cyperus iria*** Linnaeus. Cp, Pd (GA, NC, SC, VA): marshes, ditches, disturbed wet areas; common, introduced from Old World. July-October. [= RAB, C, F, FNA, G, GW, K, S]

* ***Cyperus laevigatus*** Linnaeus. Cp (NC): brackish marshes; rare, introduced from sw. North America nad New World tropics. [= RAB, FNA, K, S; *? C. careyi* Britton – S]

Cyperus lancastriensis Porter ex A. Gray. Pd (GA, NC, SC, VA), Cp, Mt (NC, SC, VA): dry woodlands, forests, and fields; common. July-September. NJ west to WV, OH, and MO, south to GA and AR. [= RAB, C, F, FNA, G, K, S, W]

Cyperus lanceolatus Poiret. Cp (GA): wet places; rare. Se. GA and ne. FL west to LA and c. TX (?). [= FNA, GW, K; *? C. densus* Link – S]

Cyperus lecontei Torrey ex Steudel. Cp (GA, NC, SC?): limesink ponds, low pinelands; rare (NC Rare). July-September. Se. NC south to s. FL, west to LA. Sorrie (1998b) reports it for e. GA (Glynn County). [= RAB, FNA, GW, K, S]

Cyperus lupulinus (Sprengel) Marcks *ssp. **lupulinus***. Cp (GA, NC, SC, VA), Mt, Pd (NC, SC, VA): {additional herbarium check} MA and VT west to MN, south to NC, n. SC, TX; disjunct in ID, WA, and OR. [= FNA, K; < *C. filiculmis* Vahl – RAB, W; < *C. lupulinus* – C; = *C. filiculmis* Vahl var. *filiculmis* – F, G; >< *C. filiculmis* – S; > *C. martindalei* Britton – S]

Cyperus lupulinus (Sprengel) Marcks *ssp. **macilentus*** (Fernald) Marcks. Mt (GA, NC, VA), Cp (VA), {SC}: rare (GA Special Concern). {additional herbarium check} ME, Québec, and MN south to w. VA, w. NC, nw. GA, and MO. [= FNA, K; < *C. filiculmis* Vahl – RAB, S, W; = *C. filiculmis* Vahl var. *macilentus* Fernald – F, G; < *C. lupulinus* – C]

Cyperus ochraceus Vahl. Cp (GA): wet areas; rare. Se. GA (Jones & Coile 1988), FL, LA, TX, West Indies, Central America. [= FNA, GW, K, S]

Cyperus odoratus Linnaeus. Cp (GA, NC, SC, VA), Pd (GA, NC, VA), Mt (VA): low fields, marshes, ditches; uncommon. July-September. Pantropical, north in North America to MA, se. ME, Ontario, MN, KS, NM, AZ, and CA. [= C, FNA, K, W; > *C. odoratus* – RAB, F, G, GW; > *C. engelmannii* Steudel – RAB, F, G, GW, S; > *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. Cp (GA, NC, SC): sandy beaches, maritime forests, and pinelands; rare. 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. Cp (GA, SC) {habitat}; rare, introduced from South America. See Bryson et al. (1996). [= FNA, GW, K]

* ***Cyperus pilosus*** Vahl. Cp (SC): rice fields; rare, introduced from e. Asia. [= FNA, K]

Cyperus planifolius L.C. Richard. Cp (GA): brackish marshes; rare. Se. GA (Jones & Coile 1988) south to s. FL; West Indies; Central and South America. [= FNA, GW, K; *? C. brunneus* Swartz – S]

Cyperus plukenetii Fernald. Cp (GA, NC, SC, VA), Pd (NC, SC): sandhills, sandy woodlands, and dry, disturbed areas; common (rare in Piedmont) (VA Rare). July-October. NJ, KY, MO, and se. OK, south to c. peninsular FL and e. TX. [= RAB, C, F, FNA, K, W; = *C. retrofractus* var. *retrofractus* – G, misapplied; = *C. retrofractus* – S, misapplied]

Cyperus polystachyos Rottböll. Cp, Pd (GA, NC, SC, VA): low fields, ditches, and marshes; common. July-October. Pantropical and warm temperate, north in North America to ME, MA, KY, MO, and OK. [= FNA, GW; > *C. polystachyos* Rottböll var. *texensis* (Torrey) Fernald – RAB, C, F, G, K, W; *C. polystachyos* var. *paniculatus* (Rottböll) C.B. Clarke; > *C. microdontus* Torrey – S; > *C. odoratus* – S, misapplied; > *C. paniculatus* Rottböll – S]

Cyperus pseudovegetus Steudel. Cp, Pd (GA, NC, SC, VA), Mt (GA, VA): marshes, ditches, depressions; common. 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; = *C. virens* – F, misapplied]

* ***Cyperus pumilus*** Linnaeus. Cp (GA): disturbed wet areas; rare, iIntroduced from the Old World, occurring in n. FL and se. GA. [= FNA, GW, K]

Cyperus refractus Engelmann ex Böckler. Pd (GA, NC, SC, VA), Mt, Cp (NC, SC, VA): dry sandy or rocky woodlands and forests; rare (VA Watch List). July-September. NJ west to OH and MO, south to SC, GA, AL, and AR. [= RAB, C, F, FNA, G, K, S, W]

Cyperus retrofractus (Linnaeus) Torrey. Pd, Cp, Mt (GA, NC, SC, VA): dry sandy or rocky woodlands and fields; common. July-September. NJ west to s. OH, and se. MO, south to GA. AL, and AR. [= C, FNA, K; = *C. dipsaciformis* Fernald – RAB, F, S, W; = *C. retrofractus* (Linnaeus) Torrey var. *dipsaciformis* (Fernald) Kükenthal – G]

Cyperus retrorsus Chapman. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC): dry woodlands, forests, and rock outcrops; common. 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, G, GW, W; = *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. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (SC): gardens, fields, disturbed areas; common. June-October. Pantropical and warm temperate in distribution (though extending less far north than *C. esculentus*). [= RAB, C, F, FNA, G, GW, K, S]

* ***Cyperus sanguinolentus*** Vahl. Cp (GA): ditches, disturbed wet areas; rare, introduced from Asia, known in North America from e. GA west to LA. See Carter & Bryson (2000) for detailed information. [= FNA; > *Cyperus louisianensis* Thieret – K]

Cyperus squarrosus Linnaeus. Pd (GA, NC, SC, VA), Mt (VA), Cp (GA): moist depressions and seepages on granitic and other rocks, drawdown riverbanks, moist disturbed sites; rare (NC Watch List). July-September. Nearly cosmopolitan in distribution, in Old World and New World. Similar to the closely related *C. granitophilus*. [= C, FNA, K; > *C. aristatus* Rottböll – RAB, G, GW, W; > *C. inflexus* Muhlenberg – F, S]

Cyperus strigosus Linnaeus, False Nutsedge. Mt, Pd, Cp (GA, NC, SC, VA): marshes, ditches, wet disturbed areas; common. July-October. Québec west to SD, south to FL and TX; also in w. North America. [= RAB, C, FNA, GW, K, W; > *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 Rottböll. Cp (GA, SC): "disturbed clay-sand beds" (RAB); rare. 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]

Cyperus tetragonus Elliott, Four-angled Flatsedge. Cp (GA, NC, SC): maritime forests and dunes; rare (NC Rare, SC Rare). July-September. E. NC south to FL; also reported for AZ and NM. [= RAB, FNA, K, S]

Cyperus thyrsiflorus Junghuhn. Cp (GA): swamps and streambanks; rare (GA Special Concern). Se. GA and FL peninsula west to se. TX. [= FNA, K; = *C. hermaphroditus* (Jacquin) Standley – S, misapplied]

Cyperus virens Michaux. Cp (GA, NC), Pd (GA, NC?): marshes and ditches; rare. July-September. Se. NC south to c. peninsular FL, west to TX; West Indies, Mexico to Argentina. [= RAB, FNA, GW, K, S]

* *Cyperus aggregatus* (Willdenow) Endlicher, native of tropical America, has been collected as a waif in NJ, PA, AL, and FL. [= FNA, K; *? C. cayennensis* (Lamarck) Britton – S; *? C. flavus* (Vahl) Nees]

* *Cyperus amuricus* Maximowicz, native of e. Asia, is naturalized in DE, PA, NJ, and NY. [= FNA, G, K; *? C. microiria* Steudel – F]

* *Cyperus involucratus* Rottböll, introduced from Africa, naturalized north at least to FL. [= FNA, K; *? C. alternifolius* Linnaeus, misapplied]

Cyperus retroflexus Buckley. AL west to NM, south to Mexico. [= FNA, K] {not keyed at this time}

Cyperus schweinitzii Torrey occurs in sandy soils from VT, MA, MN, and Albert, south to NJ, e. PA, n. KY, OH, MO, TX, NM, UT, and Mexico. It occurs in se. PA (Rhoads & Klein 1993) and NJ. [= FNA, K]

* *Cyperus serotinus* Rottböll, naturalized in s. NJ, DE, and PA (Kartesz 1999). [= FNA, K]

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, cauline leaves makes *Dulichium* distinctive.

Dulichium arundinaceum (Linnaeus) Britton *var.* ***arundinaceum***, Threeway Sedge. Cp, Pd, Mt (GA, NC, SC, VA): streambanks, marshes, bogs, ditches; common. July-September. Var. *arundinaceum* ranges from Newfoundland west to MN, south to FL and TX; also from MT and British Columbia south to CA. A second variety, var. *boreale* Lepage, is endemic in Québec. [= FNA; < *D. arundinaceum* – RAB, C, F, G, GW, K, S, W]

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.

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 ..... **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].....***[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

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 Achenes reddish to purplish-black to black, (0.3-) 0.5-0.6 mm wide; bristles shorter than to equaling the tubercle .....***E. flavescens*** *var.* ***flavescens***
  2 Achenes olive-green to brown to black, (0.4-) 0.7 (-0.8) mm wide; bristles exceeding the tubercle .....***E. olivacea*** *var.* ***olivacea***
1 Apex of sheath firm, somewhat thickened, opaque, with a definite edge.
  3 Rhizomatous perennials growing from thick horizontal rhizomes.
    4 Basal (sterile) scales 2-3, the lowest not encircling the base of the spike; [of the Mountains, rarely the Piedmont].....***E. palustris***
    4 Basal (sterile) scale solitary and spathiform, encircling the base of the spike; [of either the Mountains, upper Piedmont, or outer Coastal Plain].
      5 Achenes prominently reticulate-pitted; [of the outer Coastal Plain]..... ***E. fallax {ambigens* phase*}***
      5 Achenes smooth to faintly reticulate; [of the Mountains, rarely Piedmont, or outer Coastal Plain].
        6 Culms slender to filiform; scales obtuse, 30-40 per spike; [of basic soils, of the Mountains and rarely Piedmont] .....***E. erythropoda***
        6 Culms thicker, somewhat inflated; scales acute, 5-30 per spike; [of brackish habitats of the outer Coastal Plain] .....***E. halophila***
  3 Tufted or cespitose annuals without thick horizontal rhizomes.
    7 Tubercle nearly or actually as broad as the achene, and appearing confluent with it, broader than high.
      8 Tubercle flat-deltoid, 1/4 as high as the the achene; bristles shorter than the achene body; [plants of clay soils only].....***E. engelmannii***
      8 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***
    7 Tubercle < 2/3 as broad as the achene, conic, taller than broad.
      9 Achene body pale brown, about 1 mm long.....***[E. ovata]***
      9 Achene body black, 0.5-1.0 mm long.
        10 Spikes lance-ovoid to subcylindric; achene body -.5-0.6 mm long .....***E. atropurpurea***
        10 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 prominenet 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. Cp, Pd (GA, NC, SC, VA), Mt (NC, VA): marshes, ditches; uncommon. July-September. Greenland, Newfoundland, Nunavut, 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 albida Torrey, White Spikerush. Cp (GA, NC, SC, VA): brackish pools; uncommon (GA Special Concern, VA Watch List). July-September. MD south to FL, west to TX and Mexico. [= RAB, C, F, FNA, G, GW, K, S]

Eleocharis atropurpurea (Retz.) J. & K. Presl. Cp (GA, NC, SC, VA*): clay-based Carolina bays, other pineland ponds, disturbed wetlands; rare (GA Special Concern, NC Watch List). 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. Cp (GA, NC, SC, VA), Pd (GA): bogs, pools, acid shores; uncommon (VA Rare). 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 brittonii Svenson ex Small. Cp (GA, NC, SC): bogs, pine savannas; common. NC south to FL, west to TX, north in the interior to TN and MO. [= 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. [= RAB, FNA, GW, K, S]

Eleocharis compressa Sullivant *var. **compressa***, Flattened Spikerush. Mt (GA, VA), Pd (VA): limestone glades and barrens; rare (GA Special Concern, VA Rare). Québec, 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; *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 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 (NC, SC, VA), Pd (GA, NC, VA), Mt (VA): freshwater shores, marshes, disturbed wet places; (NC Watch List). July-September. MA, Ontario, and British Clumbia south to GA, TX, and CA. [= RAB, F, FNA, G, K, S]

Eleocharis equisetoides (Elliott) Torrey, Horsetail Spikerush. Cp (GA, NC, SC, VA): quiet waters of limesink (doline) ponds, natural lakes, borrow pits, ditches, artificial millponds; uncommon (NC Watch List, VA Rare). 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), Cp (NC, VA), Pd (VA): streambanks, marshes; rare (GA Special Concern, NC Watch List). July-September. Nova Scotia and AK south to NC, MS, TX, AZ, and OR. [= RAB, FNA, GW, K; < *E. palustris* – C; > *E. calva* Torrey – F, G, S, invalid name]

Eleocharis fallax Weatherby. Cp (GA, NC, SC, VA): fresh to brackish tidal marshes; rare (GA Special Concern). 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 *var. **flavescens***. Cp (GA, NC?, SC?, VA): Coastal Plain ponds, pools; rare. June-September. VA (?) south to FL, west to 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. [= FNA, F, G, GW, K; > *E. caribaea* (Rottböll) S.F.Blake – RAB, C, S]

Eleocharis halophila (Fernald & Brackett) Fernald. Cp (NC, VA): brackish marshes; rare (NC Threatened, VA Rare). July. 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): muddy calcareous seepage areas; rare (VA Rare). Nova Scotia 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]

Eleocharis melanocarpa Torrey, Black-fruited Spikerush. Cp (GA, NC, SC, VA), Mt (VA): Coastal Plain ponds, cypress meadows, sinkhole ponds in the Shenandoah Valley; uncommon (NC Watch List, VA Rare). July-September. MA south to 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 (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 S]

Eleocharis montevidensis Kunth, Sand Spikerush. Cp (GA, NC, SC): maritime wet grasslands; 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). [= 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, Pd, Mt (GA, NC, SC, VA): ditches, marshes, disturbed wet areas; common. June-October. Nova Scotia west to British Columbia, south to FL, TX, and CA. [= FNA, G, GW, K, S; < *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 (GA, NC, SC, VA): Coastal Plain ponds, pools; uncommon. June-September. Nova Scotia 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 palustris (Linnaeus) Roemer & J.A. Schultes, Small's Spikerush. Mt (NC), Pd, Cp (VA), {SC}: marshes; rare (NC Watch List, VA Watch List). July. 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; > *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 (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (VA): tidal brackish and freshwater marshes, shallow waters of managed impoundments; rare (NC Watch List). July-September. Nova Scotia, Newfoundland, and MI south to FL and LA; British Columbia 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, Mt, Pd (GA, NC, SC, VA): pools, marshes; uncommon. June-September. MA west to Ontario and MI, south to n. FL and TX. [= RAB, C, FNA, GW, K, S; > *E. quadrangulata* var. *quadrangulata* – F, G; > *E. quadrangulata* var. *crassior* Fernald – F, G]

Eleocharis radicans (A. Dietrich) Kunth, Rooting Spikerush. Cp (VA): {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 (GA, NC, SC, VA), Mt (VA): quiet waters of limesink (doline) ponds, natural lakes; rare (NC Rare, VA Rare). July-August. Nova Scotia and New Brunswick west to Ontario, 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 (NC, VA), {GA?, SC}: brackish and freshwater tidal marshes; rare (NC Rare, VA Watch List). July-September. ME, Ontario, and British Columbia south to FL, TX, CA and Mexico; West Indies. [= RAB, C, F, FNA, G, GW, K]

Eleocharis tenuis (Willdenow) J.A. Schultes *var*. ***pseudoptera*** (Weatherby ex Svenson) Svenson. {NC, VA}: bogs; rare. June-September. Nova Scotia, Québec 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***. {GA, NC, SC, VA}: bogs; uncommon. June-September. Nova Scotia and Québec 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 (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 (GA, NC, SC, VA), Pd (NC): wet pine savannas, bogs; uncommon (NC Watch List, VA Rare). 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 (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC, VA): bogs, savannas, ditches; common (rare in Piedmont and Mountains). June-September. Nova Scotia 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. Cp (GA, NC, SC, VA): Coastal Plain ponds; rare (NC Watch List, VA Rare). July-September. NC south to FL, west to LA. [= RAB, C, F, FNA, GW, K, S; > *E. vivipara* – S; > *E. curtisii* Small]

Eleocharis aestuum Hines ex A. Haines. Freshwater tidal rivers. ME south to DE, PA, and NJ. [= FNA]

Eleocharis bicolor Chapman. GA west to LA; West Indies; Nicaragua. [= FNA, K, S]

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 keyed at this time; synonymy incomplete}

Eleocharis elliptica Kunth. Calcareous prairies, fens, shores. Labrador west to British Columbia, south to PA, NJ, WV, TN, IA, and ID. [= F, FNA, K; = *E. tenuis* (Willdenow) J.A. Schultes var. *borealis* (Svenson) Gleason – C, G]

Eleocharis interstincta (Vahl) Roemer & J.A. Schultes. ponds. AL and FL west interruptedly to OK and TX; Mexico, Central America, e. South America. [= FNA, GW, K; < *E. equisetoides* – S]

Eleocharis lanceolata Fernald. MO and KS south to LA and TX; disjunct in nc. TN. [= FNA, K]

Eleocharis macrostachya Britton. Québec to AK south to AL, MS, TX, CA, and Mexico; South America. [= FNA, K] {not keyed at this time; 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]

Eleocharis montana (Kunth) Roemer & J.A. Schultes. Cp (GA): {habitat}; rare. 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 keyed at this time}

Eleocharis ovata (Roth) Roemer & J.A. Schultes. {VA} Labrador, Ontario, 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}

Eleocharis wolfii (A. Gray) A. Gray ex Britton. Pd (GA): shallow ephemeral pools on granitic flatrocks; rare (GA Special Concern). OH, WI, MN, and ND south to GA, AL, TN, LA, and TX. [= F, FNA, G, K]

subgenus *Eleocharis*
section *Eleochari*
series *Eleocharis*
subseries *Eleocharis*: erythropoda, fallax, halophila, palustris, smallii
subseries *Truncatae*: 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, quadrangulata, robbinsii
subgenus *Scirpidium*
section *Scirpidium*: acicularis, radicans

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 and 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 virginicum Linnaeus, Tawny Cottongrass. Cp, Mt (GA, NC, SC, VA), Pd (NC, SC, VA): 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; rare (GA Special Concern, NC Watch List, VA Watch List). July-September. Labrador and Newfoundland west to Ontario 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]

Eriophorum angustifolium Honckeny ssp. *scabriusculum* Hultén is erroneously attributed to NC and TN by Kartesz (1999). [= K] {not keyed; synonymy incomplete}

Eriophorum gracile W.D.J. Koch ex Roth, Slender Cottongrass, south to s. PA (Rhoads & Klein 1993), NJ, w. MD (C. Frye, pers comm. 2000), and DE (Kartesz 1999). [= C, FNA; *E. gracile* var. *gracile* – K] {synonymy incomplete}

Eriophorum tenellum Nuttall, Conifer Cottongrass, south to se. PA (Rhoads & Klein 1993) and NJ (Kartesz 1999). [= C, FNA, K] {synonymy incomplete}

Eriophorum vaginatum Linnaeus, south to PA and NJ (Ball & Wujek in FNA 2002b). [= FNA; > *Eriophorum vaginatum* Linnaeus var. *spissum* (Fernald) Boivin – K] {not keyed at this time; synonymy incomplete}

Eriophorum viridicarinatum (Engelmann) Fernald, Darkscale Cottongrass, is seemingly indicated for our area by S; no documentation for this distribution is known. It does range south to e. and w. PA (Rhoads & Klein 1993) and NJ (Kartesz 1999). [= C, FNA, K] {synonymy incomplete}

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 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***
            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***

*? ***Fimbristylis annua*** (Allioni) Roemer & J.A. Schultes. Pd, Cp (GA, NC, SC, VA), Mt (NC, SC, VA): wet, disturbed areas, thin soils of rock outcrops; common, variously interpreted as entirely alien or partly native. July-September. Ranging north to VA and MO. [= 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. Cp, Pd, Mt (GA, NC, SC, VA): moist to wet disturbed areas; common. August-October. Throughout e. North America, from ME west to MN and SD and south to s. FL and TX; also widespread in the Old World and New World tropics. [= RAB, C, FNA, G, GW, K, W, Z; > *F. autumnalis* var. *autumnalis* – F; > *F. autumnalis* var. *mucronulata* (Michaux) Fernald – F; > *F. autumnalis* – S; > *F. geminata* (Nees) Kunth – S]

Fimbristylis brevivaginata Kral, Flatrock Fimbry. Pd (GA): pools and seepage over granite; rare (GA Special Concern). Also in the Cumberland Plateau of AL, on sandstone (Kral 1992). See Kral (1992) for details. [= FNA, K]

Fimbristylis caroliniana (Lamarck) Fernald. Cp (GA, NC, SC, VA): brackish or alkaline sands of marsh edges and dune swales, less typically in savannas or pine flatwoods; common (VA Watch List). July-September. NJ south to s. FL and west and south to TX and the Yucatan Peninsula. 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. Cp (GA, NC, SC, VA): brackish marshes and dune swales; common. July-September. NY (Long Island) south to s. TX and adjacent Mexico, and on the Yucatan peninsula and in the West Indies. Replaced southward (as in the West Indies and Central America by the closely related *F. spadicea* (Linnaeus) Vahl. [= C, F, FNA, G, GW, K, S, Z; < *F. spadicea* (Linnaeus) Vahl – RAB]

*? ***Fimbristylis decipiens*** Kral. Cp (GA, NC), Pd (GA): wet, disturbed areas; rare, possibly introduced. July-September. E. NC south to n. FL and west to e. TX. [= FNA, GW, K, Z]

* ***Fimbristylis dichotoma*** (Linnaeus) Vahl. Cp (GA, NC, SC, VA), Pd (GA): wet, disturbed areas; rare, presumably introduced. July-September. Ranging north to VA. [= FNA, GW, K, Z; < *F. dichotoma* – RAB (also see *F. annua* and *F. tomentosa*); *? F. diphylla* (Retzius) Vahl – S]

* ***Fimbristylis littoralis*** Gaudichaud. Cp, Pd (GA, NC, SC), Mt (NC, SC): disturbed wet ground; common, introduced from 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 Harper ex Small & Britton, Harper's Fimbry. Cp (GA, NC, SC, VA): drawdown zones of natural depression ponds or exposed banks of blackwater rivers; rare (GA Endangered, NC Rare, SC Rare, VA Endangered). 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, and disjunct in the Cumberland Plateau of se. TN, where associated with other Coastal Plain species (Wofford & Jones 1988). 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***. Cp (GA, NC, SC, VA), Pd, Mt (NC, SC, VA): savannas, pine flatwoods, bogs, wet meadows or prairie-like areas; common (VA Rare). 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, an Asian introduction. Cp (GA, NC): disturbed wetlands; uncommon, introduced from 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 (R. LeBlond, pers. comm., 2005). [= FNA, GW, K]

* ***Fimbristylis tomentosa*** Vahl. Cp (GA, NC, SC), Mt, Pd (NC, SC): wet, disturbed areas; uncommon, presumably introduced. July-September. Ranging north to NC, e. TN, and AR. [= FNA, GW, K, Z; < *F. dichotoma* – RAB]

Fimbristylis vahlii (Lamarck) Link. Cp (GA, SC?): on exposed silty or clayey sediments; rare (SC Rare). 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; involucrral 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; annual ..... ***F. pumila***

Fuirena breviseta (Coville) Coville in Harper, Short-bristled Umbrella-sedge. July-October. Cp (GA, NC, SC, VA): savannas, ditches, other wet habitats; common (VA Rare). 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. Cp (GA): pond margins; rare, possibly introduced (GA Special Concern). 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. Cp (GA, NC, SC, VA): savannas, ditches, other wet habitats; common. 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. Cp (GA, NC?): natural lakes, pineland depression ponds, wet savannas; rare (GA Special Concern, NC Watch List). July-October. A Southeastern Coastal Plain endemic: se. GA (Jones & Coile 1988) 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 squarrosa Michaux, Hairy Umbrella-sedge. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC): savannas, seepages, ditches, bogs, other wet habitats; common. 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 (also see *F. breviseta*); = *F. hispida* Elliott – S]

Hemicarpha Nees & Arnott
(see *Lipocarpha*)

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. Pd (GA, NC, SC), Cp (NC, VA): moist soils adjacent to granitic flatrocks, moist sandy sites, low fields; rare (VA Watch List). 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; = *Sc. carinatus* (Hooker & Arnott ex Torrey) A. Gray – S (not *S. carinatus* Sm.); = *I. koilolepis* Steudel]

Isolepis pseudosetacea (Daveau) Gandoger. Cp? (GA): moist soils; rare. E. GA 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]

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 Plant a rhizomatous perennial, mat-forming, the culms arising singly along the rhizome; anthers 0.8-1.1 mm long.
  2 Achene 1.0-1.2 (-1.3) mm long; scale keel denticulate or smooth; stamen 2 (rarely 1); longest inflorescence bract erect. ..... ***K. brevifolia***
  2 Achene 1.5-1.8 mm long; scale keel smooth; stamens 2-3; longest inflorescence bract horizontal to slightly reflexed .... ***K. gracillima***
1 Plant a cespitose annual or perennial, the culms arising clumped; anthers 0.2-0.5 mm long.
  3 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***
  3 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. Pd (GA, NC, SC, VA?): moist soils of fields, ditches, lawns; rare. June-September. Pantropical, north in North America to n. NC, se. OK, and CA. Likely to occur in s. VA. [= FNA, K, S, X, Y; = *Cyperus brevifolius* – RAB, GW, Z; < *Cyperus brevifolius* (Rottbøll) Endlicher & Hasskarl – F, G]

*? ***Kyllinga gracillima*** Miquel, Asiatic Greenhead Sedge. Cp (GA, NC, SC, VA), Pd (NC), Mt (NC, VA): river sand bars, tidal marshes, tidal shores, moist soils of pastures and ditches; rare. 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 (1987). Some authors consider this taxon to be introduced from e. Asia; others consider it possibly native. 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 South Carolina 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. Cp (GA, NC, SC): moist soils of fields, ditches, lawns, shores of ponds and rivers, sand and gravel bars; common. July-September. Pantropical, north in North America to ne. NC and se. AR. Likely to occur in se. VA. [= K, S, X, Y; = *Cyperus sesquiflorus* (Torrey) Mattfeld & Kükenthal ex Kükenthal – RAB, C, GW, Z]

Kyllinga pumila Michaux, Annual Greenhead Sedge. Cp, Pd, Mt (GA, NC, SC, VA): moist soils of fields, ditches, lawns, shores of ponds and rivers; common. July-October. Pantropical, north in North America to e. PA, MO, and e. KS. [= K, S, X, Y; = *Cyperus tenuifolius* (Steudel) Dandy – RAB, C, F, G, GW, W, Z]

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 2.5-12 mm long; anther 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 Scales about as long as the achene, with long awns ..... ***L. aristulata***
  2 Scales reduced, shorter than the achene, awnless ..... ***L. micrantha***

*? ***Lipocarpha aristulata*** (Coville) G. Tucker. Cp (SC): moist ground; rare. Se. SC south to FL, west to the mw. and w. United States; the eastern occurrences may be adventive. [= FNA, K, Z; = *Hemicarpha aristulata* (Coville) Smyth – F, GW; = *H. micrantha* var. *aristulata* Coville – C, G]

Lipocarpha maculata (Michaux) Torrey, American Lipocarpha. Cp (GA, NC, SC, VA): ditches, moist exposed soil; uncommon (VA Rare). July-September. Se. VA south to s. FL, west to AL. [= RAB, C, F, FNA, G, GW, K, S, Z]

Lipocarpha micrantha (Vahl) G. Tucker. Cp (NC, SC, VA), Pd (SC, VA), {GA}: riverbank draw-down zones, other moist sandy areas; rare (SC Rare, NC Rare, VA Rare). July-August. ME west to Ontario and MN, south to s. FL and TX; south into tropical America. [= FNA, K, Z; = *Hemicarpha micrantha* (Vahl) Pax – RAB, F, GW, S; = *H. micrantha* var. *micrantha* – C; = *H. micrantha* var. *minor* (Schrader) Friedland – G]

Oxycaryum Nees

A monotypic genus of tropical and subtropical America and Africa. References: Bruhl in FNA (2002b).

* ***Oxycaryum cubense*** (Poeppig & Kunth) Lye, Cuban Bulrush. Cp (GA): swamps, marshes, ponds, ditches; uncommon, aggressively weedy, probably adventive from the New World tropics. See Bryson et al. (1996). [= FNA, K; = *Scirpus cubensis* Poeppig & Kunth – GW, S] {not keyed at this time}

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: 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 ..... **Key A**
1 Tubercles < 3 mm long.
  2 Inflorescence bracts several, foliaceous, basally bright white, reflexed to horizontally spreading ..... **Key B**
  2 Inflorescence bracts 0-several, capillary to foliaceous, green throughout (straminous in age), variously oriented.
    3 Bristles present, plumose (at least proximally) ..... **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) ..... **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) ..... **Key E**
        5 Achene surface transversely ridged, rugose, or honeycombed-reticulate (sometimes faintly so) ..... **Key F**

Key A - beaksedges with tubercles 3-23 mm long

1 Spikelets in 1-4 globose clusters; tubercle 3-5 mm long; leaf blades 2-8 mm wide ..... ***Rh. tracyi***
1 Spikelets in > 4 paniculate or corymbose clusters; tubercle 10-23 mm long; leaf blades 6-20 mm wide.
2 Longest bristles shorter than the achene.
3 Achene 5-6 mm long, 2.8-3.3 mm wide ..... ***Rh. corniculata*** var. ***corniculata***
3 Achene 4.4-5.3 mm long, 2.4-2.8 mm wide ..... ***Rh. 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.
5 Achene 3.0-3.8 mm wide; tubercle base 1.8-2.4 mm wide; [primarily of fresh tidal marshes] .... ***Rh. macrostachya*** var. ***colpophila***
5 Achene 2.6-3.1 mm wide; tubercle base 1.0-1.8 mm wide; [primarily of non-tidal wetlands] .... ***Rh. macrostachya*** var. ***macrostachya***
4 Plants rhizomatous; primary clusters with 1-6 loosely clustered spikelets; achene (3.5-) 4.0-4.8 mm long.
6 Bristles 2-8 mm long, the central bristle longest on one face, shortest or absent on the other..... ***Rh. careyana***
6 Bristles 7-12 mm long, essentially of equal length..... ***Rh. inundata***

Key B - beaksedges with basally-white bracts (White-bracted Sedges)

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 ..... ***Rh. 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 ..... ***Rh. latifolia***

Key C - beaksedges with plumose bristles

1 Spikelets 2-4 mm long, borne several to many in clusters, none of the spikelets on slender stalks; achene 1.4-1.8 mm long, 0.9-1.4 mm wide ..... ***Rh. plumosa***
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 achene ..... ***Rh. breviseta***
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 length of achene ..... ***Rh. oligantha***

Key D - beaksedges with bristles retrorsely barbed (at least distally) or antrorsely barbed and straplike (flattened)

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 ..... ***Rh. alba***
2 Spikelets with 1 floret; bristles 16-25; achene 2.0-2.4 mm long, 1.3-1.5 mm wide ..... ***Rh. 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 .... ***Rh. 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 ..... ***Rh. 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 ..... ***Rh. cephalantha*** var. ***attenuata***
6 Achene 1.2-1.8 mm wide, 2.1-2.6 mm long.
7 Spikelet clusters 1-3 (-4), subglobose to loosely hemispherical, the lateral clusters mostly subterminal .... ***Rh. cephalantha*** var. ***cephalantha***

7 Spikelet clusters 4-7, densely subglobose, the lowest clusters remote ..... ***Rh. cephalantha*** var. ***pleiocephala***

3 Spikelets 1-5 fruited (if 1-fruited, then the axis terminated by a sterile floret); clusters 2-many, ovoid to turbinate (rarely globose).

8 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..... ***Rh. glomerata*** var. ***glomerata***

8 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.

9 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 ..... ***[Rh. knieskernii]***

9 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.

10 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..... ***Rh. capillacea***

10 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.

11 Scales chestnut brown, the inner with a mucro 0.1-0.2 mm long; longer bristles 0.4 mm shorter than to 0.3 mm longer than the tubercle; achene and tubercle 2.4-2.8 mm long; tubercle 0.9-1.2 mm long; [widespread in our area]..... ***Rh. capitellata***

11 Scales tan, the inner without a mucro, or mucro < 0.05 mm long; longer bristles exceeding tubercle by 0.3-1.0 mm; achene and tubercle 2.0-2.4 mm long; tubercle 0.5-1.1 mm long; [of the Coastal Plain] ..... ***Rh. leptocarpa***

Key E - beaksedges with bristles smooth, or antrorsely barbed and filiform, or absent, the achene surface smooth, minutely pitted, or finely striate

1 Bristles 12 ..... ***Rh. 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.

3 Basal leaves 4-6 mm wide, ciliate, rosulate; scales acuminate, the midrib ciliate; bristles 6, < ½ the length of the achene ..... ***Rh. 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..... ***Rh. solitaria***

2 Leaves long-acuminate at the tip; achene surface smooth or finely striate.

4 Scales white to pale tan; bristles absent or 1-3 rudimentary.

5 Base of plant not bulb-like, not enclosed in bladeless sheaths; achene 1.0-1.2 mm long, 0.8-1.0 mm wide..... ***Rh. chapmanii***

5 Base of plant blub-like, enclosed in bladeless sheaths; achene 1.4-1.8 mm long, 1.2-1.5 mm wide..... ***Rh. pallida***

4 Scales tan, rufous, or brown; bristles present (if rudimentary, then 4-6).

6 Achene 0.6-1.1 mm wide, pyriform, obovoid, or narrowly elliptic, pale to dark brown but not blackish; tubercle margin setose (bearing bristle-like projections).

7 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..... ***[Rh. curtissii]***

7 Achene broadly elliptic to obovoid or pyriform, < 2× as long as wide; tubercle 0.4-1.5 mm long.

8 Leaves 2-4 (-5) mm wide; stipe subtending achene 0.5-1.0 mm long ..... ***Rh. crinipes***

8 Leaves 0.2-1.5 (-2) mm wide; stipe subtending achene < 0.4 mm long.

9 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.

10 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 ..... ***[Rh. fusca]***

10 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 ..... ***Rh. harperi***

9 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.

11 Culms without rhizomes; spikelets 2.5-4 mm long; achene translucent centrally; tubercle 0.4-0.6 mm long ..... ***Rh. filifolia***
11 Culms with delicate rhizomes; spikelets 5-7 mm long; achene uniformly opaque; tubercle 0.6-0.8 mm long ..... ***Rh. pleiantha***

6 Achene > 1 mm wide (except 0.8 mm wide in *Rh. fernaldii* with a blackish surface), suborbicular or broadly ellipsoid; tubercle margin smooth or roughened but not setose.
12 Achene 0.8 mm wide, 0.9-1.0 mm long, blackish ..... ***Rh. fernaldii***
12 Achene 1.1-1.7 mm wide, 1.3-2.0 mm long, brown to dark brown.
13 Tubercle 1.0-2.6 mm long, long-attenuate to subulate..... ***Rh. gracilenta***
13 Tubercle 0.2-0.8 mm long, triangular to triangular-attenuate or with a strap-like beak.
14 Bristles rudimentary to ½ as along as achene body.
15 Larger leaves 2-4 mm wide; mature culms to 13 dm long; floral fascicles (1-) 2-4; tubercle 0.4-0.7 mm long..... ***Rh. fascicularis var. fascicularis***
15 Larger leaves to 1 mm wide; mature culms to 4.5 dm long; floral fascicles 1 (-2); tubercle 0.2-0.5 mm long ..... ***Rh. debilis***
14 Bristles > ½ as long to exceeding achene body.
16 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..... ***Rh. wrightiana***
16 Basal leaves 1.3-4 mm wide, all much shorter than the culm; tubercle triangular to triangular-attenuate.
17 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 .... ***Rh. fascicularis*** *var*. ***distans***
17 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..... ..... ***Rh. fascicularis*** *var*. ***fascicularis***

Key F – beaksedges with bristles smooth, or antrorsely barbed and filiform, or absent, the achene surface transversely ridged, rugose, or honeycombed-reticulate

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.
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 ..... ***Rh. 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..... ***Rh. divergens***
3 Achene surface rough, distinctly transversely ridge..... ***Rh. 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 ..... ***Rh. thornei***
5 Achene including tubercle 1.5-2.9 mm long; tubercle triangular to triangular-acuminate.
6 Tubercle 0.3-0.7 mm long; bristles shorter than the achene..... ***Rh. rariflora***
6 Tubercle 0.8-1.4 mm long; bristles subequaling to exceeding the tubercle..... ***Rh. stenophylla***
4 Culms stouter; leaves wider, not filiform.
7 Achene faces flat or concave; when one face is concave, the opposite face is sometimes slightly convex (slightly biconvex *Rh. decurrens* and *Rh. microcarpa* are keyed here for convenience).
8 Achene at least twice as long as wide, elliptic-oblong; tubercle subulate, 0.8-1.2 mm long..... ***Rh. inexpansa***
8 Achene < twice as long as wide, obovate; tubercle triangular, 0.2-0.9 mm long.
9 Longer bristles exceeding the achene body.
10 Achene ±2.2 mm long, ±1.8 mm wide; tubercle ±0.9 mm long ..... ***Rh. punctata***
10 Achene 0.8-1.2 mm long, 0.7-1.2 mm wide; tubercle 0.2-0.5 mm long.
11 Larger leaves (3-) 4-6 mm wide; bristles exceeding tubercle; achene faces flattened .... ***Rh. elliottii***
11 Larger leaves 1-3 (-4) mm wide, bristles half as long as achene to equaling tubercle; achene faces slightly convex ..... ***Rh. microcarpa***
9 Longer bristles shorter than to equaling achene body, or absent.
12 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..... ***Rh. compressa***
12 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.
13 Bristles rudimentary or absent..... ***Rh. perplexa***
13 Bristles one-half as long to equaling achene.
14 Achene 1.3-1.8 mm long, 0.9-1.2 mm wide, the faces flat with 10-12 transverse ridges.....

.....***Rh. torreyana***

14 Achene 0.8-1.4 mm long, 0.7-1.2 mm wide, the faces slightly biconvex with 6-12 transverse ridges.

15 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..... ***Rh. decurrens***

15 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 ....***Rh. microcarpa***

7 Achenes biconvex or tumid.

16 Achene dark reddish-brown to black, 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.

17 Achene lenticular and transversely ridge, ±1.4 mm long, ±1.2 mm wide..... ***Rh. culixa***

17 Achene tumid, lightly pitted or cancellate in a honeycomb pattern, 1.5-4.2 mm long, 1.4-3.6 mm wide.

18 Leaves 4-8 mm wide; achene 3.0-4.2 mm long, 3.0-3.6 mm wide .....***Rh. megalocarpa***

18 Leaves 2-4 mm wide; achene < 2.7 mm long and < 2.5 mm wide.

19 Achene 2.0-2.7 mm long, 2.0-2.5 mm wide ..... ***Rh. grayi***

19 Achene 1.5-1.8 mm long, 1.4-1.7 mm wide ..... ***Rh. harveyi***

16 Achene amber, reddish-brown, or black, 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).

20 Bristles absent; achene 0.7-1.0 mm long.

21 Scales broadly ovate, obtuse to sub-acute; achene strongly transversely ridged; tubercle depressed, broader than long; style not persistent.....***Rh. nitens***

21 Scales lance-ovate, acute; achene weakly transversely ridged; tubercle triangular-lanceolate, as long as broad or longer; style usually persistent..... ***Rh. scirpoides***

20 Bristles present (occasionally detached in *Rh. decurrens* and *Rh. miliacea* with achenes 1.0-1.4 mm long).

22 Bristles not exceeding the achene body.

23 Cluster branches stiff; bristles 3/4 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.

24 Larger leaves 3-4.5 mm wide; achene 1.3-1.8 mm long, 1.3-1.6 mm wide ....***Rh. recognita***

24 Larger leaves 1.5-2.5 mm wide; achene 1.0-1.4 mm long and wide.

25 Longer bristles 1/3-1/2 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 base 0.6-0.7 mm wide..... ..... ***Rh. globularis*** *var*. ***globularis***

25 Longer bristles 2/3-3/4 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 base 0.7-0.9 mm wide.....***Rh. globularis*** *var*. ***pinetorum***

23 Cluster branches flexuous; bristles one-half as long to equaling the achene (or longer in *Rh. microcarpa*); achene slightly biconvex, 0.8-1.4 mm long, 0.7-1.0 (-1.2) mm wide.

26 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..... ***Rh. decurrens***

26 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.....***Rh. microcarpa***

22 Bristles equaling or longer than the tubercle.

27 Primary branches of the inflorescence spreading at right angles from the culm, each spikelet or small cluster on slender spreading or reflexed stalks.....***Rh. miliacea***

27 Primary branches of the inflorescence ascending.

28 Spikelets 6-9 mm long.....***Rh. odorata***

28 Spikelets < 5 mm long.

29 Tubercle 0.2-0.5 mm long, the edges smooth.

30 Spikelets 3.5-4 mm long; bristles exceeding the tubercle; achene 1.3-1.5 mm long, 1.2-1.3 mm wide.....***Rh. saxicola***

30 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.

31 Inflorescence occupying the upper 1/4-1/2 of the culm, the lowest 2-4 nodes barren.....***Rh. microcarpa***
31 Inflorescence occupying 2/3-3/4 of the length of the culm, the lowest lateral panicle at the first or second node above the base.....***Rh. sulcata***
29 Tubercle 0.4-0.8 mm long, the edges setose or uneven with waxy or crusty irregular protuberances.
32 Achene obovate to suborbicular, 1.2-1.6 mm wide, latitudinal alveoli walls strongly raised into transverse ridges.....***Rh. caduca***
32 Achene slenderly obovoid, 0.8-1.0 mm wide, latitudinal alveoli walls weakly or not at all raised into transverse ridges.....***Rh. mixta***

Rhynchospora alba (Linnaeus) Vahl, Northern White Beaksedge. Cp (GA, NC, SC, VA), Mt (GA, NC, VA): 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; rare (GA Special Concern, NC Rare, VA Rare). July-October. Widespread in northern North America, south to se. NC, nw. NC, ne. GA, ne. TN, MN, 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. [= RAB, C, F, FNA, G, GW, K, S, W, Z]

Rhynchospora baldwinii A. Gray, Baldwin's Beaksedge. Cp (GA, NC, SC): wet savannas, seepages; uncommon (rare in Sandhills). July-August. Se. NC south to c. FL and west to LA. [= RAB, C, FNA, K, S, GW, Z]

Rhynchospora breviseta (Gale) Channell, Short-bristle Beaksedge. Cp (NC, SC): wet savannas; rare (NC Rare). July-September. Se. NC south to c. FL and west to s. MS; West Indies. This species will colonize disturbances (roadsides, powerline corridors), but not aggressively. The leaf tips of ***Rh. breviseta*** are acute and minutely serrulate, while those of the closely related ***Rh. oligantha*** are blunt and smooth; these characters are, however, often difficult to determine. [= RAB, FNA, GW, K; = ***Rh. oligantha*** A. Gray var. ***breviseta*** Gale – Z]

Rhynchospora caduca Elliott, Angle-stem Beaksedge. Cp (GA, NC, SC, VA), Pd (NC, SC): savannas, hardwood swamps, other wet areas; uncommon (VA Watch List). 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 ***Rh. miliacea***. [= RAB, C, F, FNA, G, GW, K, W, Z; > ***Rh. caduca*** – S; > ***Rh. patula*** A. Gray – S]

Rhynchospora capillacea Torrey. Mt (VA): calcareous wetlands; rare (VA Rare). Newfoundland west to Saskatchewan, south to w. VA, ne. TN, and n. AR. [= C, F, FNA, G, K, Z]

Rhynchospora capitellata (Michaux) Vahl, Brownish Beaksedge. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): 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; common (rare in Piedmont and Coastal Plain). 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, ***Rh. 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 ***Rh. leptocarpa***. [= C, F, G, S, W; < ***Rh. capitellata*** – RAB, FNA, GW, K, Z (also see ***Rh. leptocarpa***)]

Rhynchospora careyana Fernald, Carey's Horned Beaksedge. Cp (GA, NC, SC): limesink (doline) depression ponds and in intermittently flooded depression meadows; rare (NC Watch List). July-September. Apparently ranging from se. NC south to FL, but the range poorly known because of confusion with ***Rh. inundata***, from which it is perhaps not specifically distinct. [= FNA, K, S; < ***Rh. inundata*** – RAB; < ***Rh. corniculata*** – GW (listed in synonymy under ***Rh. corniculata*** in GW, but would actually key to ***Rh. inundata)***]

Rhynchospora cephalantha A. Gray ***var. attenuata*** Gale, Small Bunched Beaksedge. Cp (GA?, NC, SC, VA): savannas, sandhill seeps, openings in streamhead pocosins; rare (NC Watch List, VA Rare). 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). [= Z; < ***Rh. cephalantha*** – RAB, C, GW, K; < ***Rh. axillaris*** – S]

Rhynchospora cephalantha A. Gray ***var. cephalantha***, Common Bunched Beaksedge. Cp (GA, NC, SC, VA): savannas; common (VA Rare). July-October. S. NJ south to FL and west to LA. Often weedy, this species occurs commonly along wet roadsides, powerline corridors, and the like. [= F, G, Z; < ***Rh. cephalantha*** – RAB, C, FNA, GW, K; < ***Rh. axillaris*** – S]

Rhynchospora cephalantha A. Gray ***var. pleiocephala*** Fernald & Gale, Many-headed Bunched Beaksedge. Cp (GA, NC, SC, VA): savannas; uncommon (VA Rare). July-October. Se. VA south to FL and west to LA. [= F, G, Z; < ***Rh. cephalantha*** – RAB, C, FNA, GW, K; < ***Rh. axillaris*** – S]

Rhynchospora chalarocephala Fernald & Gale, Loose-head Beaksedge. Cp (GA, NC, SC, VA), Pd (NC, SC, VA), Mt (GA, NC, SC, VA): savannas, limesink ponds, and swamps, often weedy and occurring in abundance on wet roadsides and in powerline corridors; common (rare in Piedmont). July-September. S. NJ south to c. FL and west to LA; disjunct in nw. GA (Jones & Coile 1988) and sc. TN (Coffee County). [= RAB, C, F, FNA, G, GW, K, W, Z]

Rhynchospora chapmanii M.A. Curtis, Chapman's Beaksedge. Cp (GA, NC, SC): savannas, seepage bogs, sandy margins of limesink (doline) ponds, and other wet, acid habitats; uncommon. July-September. Se. NC south to c. FL and west to e. LA; Belize, Nicaragua. [= RAB, FNA, GW, K, S, Z]

Rhynchospora ciliaris (Michaux) C. Mohr, Fringed Beaksedge. Cp (GA, NC, SC): savannas, sandhill seeps; uncommon. July-September. Se. NC south to s. FL and west to LA. [= RAB, FNA, GW, K, S, Z]

Rhynchospora colorata (Linnaeus) H. Pfeiffer, Narrowleaf Whitetop Sedge. Cp (NC, SC, VA): wet savannas, ditches, dune swales; uncommon (VA Rare). 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; = *Dichromena colorata* (Linnaeus) H. Pfeiffer – RAB, F, G, GW, S]

Rhynchospora compressa Carey ex Chapman. Cp (GA, SC): savannas; rare. S. SC south to 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, S, Z]

Rhynchospora corniculata (Lamarck) A. Gray *var.* ***corniculata***, Short-bristle Horned Beaksedge. Cp, Pd (GA, NC, SC, VA): pondcypress savannas in Carolina bays, swamp forests, other wetlands; uncommon. 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; < *Rh. corniculata* (Lamarck) A. Gray – RAB, FNA, GW, K, S]

Rhynchospora crinipes Gale, Alabama Beaksedge. Cp (GA, NC): sand-clay bars in bed of small blackwater river in the Sandhills (NC) and Coastal Plain (GA); rare (US Species of Concern, GA Special Concern, NC Endangered). July-September. This very rare species is related to *Rh. filifolia*, but is a coarser plant, readily distinguishable by characters of the achene, culm, and leaves. Anderson (1988) discusses its systematics, habitat, and rarity. It has been reported only from a few locations in s. AL, w. FL, sc. GA, and sc. NC. Sorrie et al. (1997) report its occurrence in NC. [= FNA, GW, K, Z]

Rhynchospora culixa Gale, Georgia Beaksedge. Cp (GA): pine savannas, flatwoods; rare (GA Special Concern). GA and FL. [= K, Z; = *Rh. harveyi* W. Boott var. *culixa* (Gale) Kral – FNA]

Rhynchospora debilis Gale, Savanna Beaksedge. Cp (GA, NC, SC, VA), Mt (GA): savannas, sandhill seeps; uncommon (VA Rare). July-September. Se. VA south to n. FL and west to se. TX (Brown & Marcus 1998). Like a small version of *Rh. fascicularis*, often with several ascending, cespitose culms, each terminated by a single glomerule. [= RAB, C, F, FNA, GW, K, Z]

Rhynchospora decurrens Chapman, Swamp-forest Beaksedge. Cp (GA, NC, SC): swamp forests and river marshes, especially along blackwater rivers; rare (GA Special Concern, NC Rare). July-August. Se. NC south to s. FL and west to s. MS (Sorrie & Leonard 1999). [= RAB, FNA, GW, K, S, Z]

Rhynchospora divergens Chapman ex M.A. Curtis, White-seeded Beaksedge. Cp (GA, NC, SC): wet savannas, especially in exposed sands; rare (NC Rare). May-September. Se. NC south to s. FL and west to se. TX; Bahamas, Mexico (Chiapas), Belize. *Rh. divergens*, *Rh. pusilla*, and *Rh. thornei* are all small, grass-like plants, very similar in appearance to one another. [= RAB, FNA, GW, K, S]

Rhynchospora elliottii A. Dietrich, Elliott's Beaksedge. Cp (GA, NC, SC): savannas, ditches, other wet habitats, often weedy; rare (NC Watch List). July-September. Se. NC south to nw. 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 *Rh. microcarpa*. [= FNA, GW, K; = *Rh. schoenoides* (Elliott) Wood – RAB, S, Z]

Rhynchospora fascicularis (Michaux) Vahl *var.* ***distans*** (Michaux) Chapman. Cp (GA, NC, SC, VA): savannas and limesink ponds; rare (VA Rare). June-September. Se. VA south to s. FL and west to s. MS (Sorrie & Leonard 1999); West Indies. Appearing to merge with *Rh. wrightiana* on the outer Coastal Plain of NC. [= F, K, Z; < *Rh. fascicularis* – RAB, FNA, G, GW; = *Rh. distans* (Michaux) Vahl – S]

Rhynchospora fascicularis (Michaux) Vahl *var.* ***fascicularis***, Fascicled Beaksedge. Cp (GA, NC, SC, VA): savannas, limesink ponds, ditches; common in the outer Coastal Plain, less common in the fall-line sandhills (VA Rare). June-September. Se. VA south to s. FL and west to se. TX; West Indies. [= F, K, Z; < *Rh. fascicularis* – RAB, FNA, G, GW; = *Rh. fascicularis* – S]

Rhynchospora fernaldii Gale, Fernald's Beaksedge. Cp (GA): pine flatwoods; uncommon. S. GA south to c. peninsular FL, west to s. MS. [= FNA, GW, K, Z]

Rhynchospora filifolia A. Gray, Threadleaf Beaksedge. Cp (GA, NC, SC, VA): sandy shores of limesink (doline) depressions, especially at the lower margin, savannas; uncommon, rare in the fall-line sandhills (VA Rare). July-September. S. NJ south to c. FL and west to e. TX; Cuba, Mexico (Tabasco), Belize, Nicaragua. [= RAB, C, F, FNA, G, K, S, Z; < *Rh. filifolia* – GW (also see *Rh. harperi*)]

Rhynchospora globularis (Chapman) Small *var.* ***globularis***, Globe Beaksedge. Cp, Pd (GA, NC, SC, VA): sandy or peaty depressions, wet ditches, powerline corridors, savannas; uncommon, rare in Piedmont. June-September. Var. *globularis* 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 var. *globularis* and var. *pinetorum* tend to produce shorter plants with smaller glomerules than *Rh. recognita*. Occasional achenes of var. *globularis* exhibit the wide alveoli of var. *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 var. *pinetorum* achenes, with narrow alveoli and horizontal ridging basally or at the summit, but wide alveoli and little or no ridging centrally. [= C, F, FNA, G, K, Z; < *Rh. globularis* – RAB, W; < *Rh. globularis* var. *globularis* – GW (also see *Rh. recognita*); = *Rh. globularis* – S]

Rhynchospora globularis (Chapman) Small *var.* ***pinetorum*** (Small) Gale, Small's Beakrush. Cp (NC, SC): wet calcareous savannas, maritime wet grasslands; rare (NC Rare). June-September. Var. *pinetorum* ranges from 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 var. *globularis*. [= FNA, GW, K, Z; = *Rh. pinetorum* Small – S]

Rhynchospora glomerata (Linnaeus) Vahl *var.* ***glomerata***, Clustered Beaksedge. Cp, Pd, Mt (GA, NC, SC, VA): savannas, bogs, other wet habitats; common (uncommon in Sandhills, rare in Mountains). July-September. Var. *glomerata* ranges from s. NJ south to n. FL and west to e. TX, and inland in KY, TN, AR, and KS. Var. *angusta* Gale occurs in AR, LA, and e. TX. [= Z; < *Rh. glomerata* – RAB, C, F, FNA, G, GW, K, S, W]

Rhynchospora gracilenta A. Gray, Slender Beaksedge. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): savannas, bogs; uncommon (rare in Piedmont and Mountains). July-September. NJ south to n FL and west to e. TX, north in the inland to nc. TN and AR; Cuba, Mexico (Chiapas), Belize, Nicaragua. [= RAB, C, F, FNA, G, GW, K, S, W, Z]

Rhynchospora grayi Kunth, Gray's Beaksedge. Cp (GA, NC, SC, VA): sandhills and other dry, sandy sites; uncommon (VA Rare). June-September. VA south to FL, west to TX. [= RAB, C, F, FNA, G, K, S, Z]

Rhynchospora harperi Small, Harper's Beaksedge. Cp (GA, NC, SC): peaty limesink depression ponds (dolines), from standing water to the upper margins of the pond-shore; rare (GA Special Concern, NC Rare). July-September. Se. NC south to 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, S, Z; < *Rh. filifolia* – GW]

Rhynchospora harveyi W. Boott, Harvey's Beaksedge. Cp (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 (VA Rare). July-August. Se. VA south to n. FL and west to TX and OK, and north in the interior to nc. TN and MO. [= RAB, C, F, G, GW, K, S, W, Z; = *Rh. harveyi* var. *harveyi* – FNA]

Rhynchospora inexpansa (Michaux) Vahl, Nodding Beaksedge. Cp (GA, NC, SC, VA), Pd (GA): wet savannas, streamhead pocosins where frequently burned, usually in peaty situations, often weedy, colonizing disturbances; common. July-September. Se. VA south to n. FL and west to e. TX and AR; West Indies. [= RAB, C, F, FNA, G, GW, K, S, Z]

Rhynchospora inundata (Oakes) Fernald, Narrow-fruit Horned Beaksedge. Cp (NC, SC?), {GA, VA}: 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; rare (NC Watch List, SC Rare, VA Rare). July-September. Apparently ranging from e. MA south to s. FL and west to LA (the range, however, obscured by confusion with *Rh. careyana*). The relation of this species to *Rh. careyana* and to more northern entities of *Rh. inundata* remain unresolved. [= C, F, FNA, G, GW, K, S; < *Rh. inundata* – RAB (also see *Rh. careyana*)]

Rhynchospora latifolia (Baldwin ex Elliott) Thomas, Broadleaf Whitetop Sedge. Cp (GA, NC, SC): wet savannas; uncommon. May-September. A Southeastern Coastal Plain endemic: se. NC south to FL and west to se. TX; disjunct in sc. TN (Coffee County). [= FNA, K; = *Dichromena latifolia* Baldwin ex Elliott – RAB, S, GW]

Rhynchospora leptocarpa (Chapman ex Britton) Small. Cp (GA, NC, SC): seepage bogs, pocosins, especially in openings; uncommon. E. NC south to Panhandle FL, west to se. LA, in the Coastal Plain. It appears that *Rh. leptocarpa* is a valid species, a southeastern Coastal Plain relative of the more northern and montane *Rh. capitellata* (Sorrie 2000). Its occurrence in NC is reported by Sorrie et al. (1997). [= S; < *Rh. capitellata* – RAB, FNA, GW, K, Z]

Rhynchospora macra (C.B. Clarke) Small, Southern White Beaksedge. Cp (GA, NC, SC): *Sphagnum* bogs in frequently-burned streamhead pocosins, and in sandhill seepage bogs; rare (GA Special Concern, NC Endangered, SC Rare). July-September. Sc. NC south to n. FL and west to se. TX; Nicaragua, Puerto Rico. *Rh. macra* is a robust southern relative of *Rh. alba*. Like *Rh. alba* and *Rh. 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, S, Z]

Rhynchospora macrostachya Torrey ex A. Gray *var.* ***colpophila*** Fernald & Gale, Virginia Horned Beaksedge. Cp (NC, VA): tidal freshwater marshes; uncommon (NC Watch List). July-September. Endemic to e. MD, e. VA, and ne. NC. [= F; < *Rh. macrostachya* – RAB, C, FNA, G, GW, K, S]

Rhynchospora macrostachya Torrey ex A. Gray *var.* ***macrostachya***, Tall Horned Beaksedge. Cp (GA, NC, SC, VA), Mt (GA): marshes, swamps, upland depression ponds, other wetlands; uncommon (VA Watch List). July-September. E. MA south to FL and west to e. TX, north in the interior to sc. TN, s. MI, MO, and KS; disjunct (historically) in s. ME. This (and var. *colpophila*) are most readily distinguished from *Rh. corniculata*. *Rh. inundata*, and *Rh. careyana* by the large glomerules composed of numerous spikelets. [= F; < *Rh. macrostachya* – RAB, C, FNA, G, GW, K, S]

Rhynchospora megalocarpa A. Gray, Sandhill Beaksedge. Cp (GA, NC, SC): xeric sandhills; uncommon. June-August. Se. NC south to FL, west to MS. [= RAB, FNA, K, Z; = *Rh. dodecandra* Baldwin ex A. Gray – S]

Rhynchospora microcarpa Baldwin ex A. Gray, Southern Beaksedge. Cp (GA, NC, SC), Pd (NC, SC): swamp forests, clay-based Carolina bays; rare (GA Special Concern, NC Watch List). 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 *Rh. elliottii* and *Rh. perplexa*. *Rh. 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. *Rh. microcarpa* and *Rh. perplexa* have leaves 1-3 mm wide and tubercles as broad as long or broader. In *Rh. microcarpa*, the achene is biconvex and the bristles are half as long as the achene to equaling the tubercle. In *Rh. perplexa*, the achene faces are flattish and the bristles are absent or rudimentary (< ½ as long as the achene). [= RAB, F, FNA, GW, S, Z; < *Rh. microcarpa* – K (also see *Rh. sulcata*)]

Rhynchospora microcephala (Britton) Britton ex Small, Small-headed Beaksedge. Cp (GA, NC, SC, VA), Mt (GA): savannas, sandhill-pocosin ecotones; common. July-October. S. NJ south to c. FL and west to MS; Cuba. [= RAB, C, F, FNA, G, GW, K, S, Z; = *Rh. cephalantha* A. Gray var. *microcephala* (Britton) Kükenthal]

Rhynchospora miliacea (Lamarck) A. Gray, Millet Beaksedge. Cp (GA, NC, SC, VA): swamp forests, including maritime swamp forests; rare (VA Rare). July-August. Se. VA south to s. FL and west to LA; West Indies. The inflorescence branches of *Rh. mixta* and (less commonly) *Rh. caduca* can spread at right angles from the culm, superficially resembling *Rh. miliacea*. The three can be separated by tubercle length: the tubercle of *Rh. miliacea* is 0.2-0.4 mm long, while those of *Rh. mixta* and *Rh. caduca* are 0.4-0.9 mm long. [= RAB, C, F, FNA, G, GW, K, S, Z]

Rhynchospora mixta Britton, Mingled Beaksedge. Cp (GA, NC, SC): swamp forests, marshes; uncommon. June-August. Ne. NC south to c. FL and west to TX. See notes under *Rh. miliacea*. [= RAB, FNA, GW, K, S, Z; > *Rh. mixta* – S; > *Rh. prolifera* Small – S]

Rhynchospora nitens (Vahl) A. Gray, Short-beak Beaksedge. Cp (GA, NC, SC, VA): wet savannas, limesink (doline) ponds, ditches, disturbed wet areas, often weedy; rare (NC Watch List, VA Rare). July-August. Primarily a Coastal Plain endemic: MA south to FL and west to se. TX; lowlands around the Great Lakes; West Indies, Belize, Nicaragua. [= C, FNA, K; = *Psilocarya nitens* (Vahl) Wood – RAB, F, G, GW, S]

Rhynchospora odorata C. Wright ex Grisebach, Fragrant Beaksedge. Cp (GA, NC, SC): maritime swamp forests and maritime wet grasslands; rare (NC Rare). June-August. E. NC south to s. Florida; West Indies and Bahamas. First reported for SC by Nelson & Kelly (1997). [= RAB, F, FNA, GW, K, Z; = *Rh. stipitata* Chapman – S]

Rhynchospora oligantha A. Gray, Feather-bristle Beaksedge. Cp (GA, NC, SC, VA): wet savannas, sandhill-pocosin ecotones, sandhill seepage bogs, sea-level fens, usually in rather peaty, acid places; rare (GA Special Concern, NC Rare, SC Rare, VA Rare). July-August. S. NJ south to n. FL and west to se. TX; Belize, Nicaragua. The leaf tips of *Rh. oligantha* are blunt and smooth, while those of the closely related *Rh. breviseta* 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). [= RAB, C, F, FNA, G, GW, K; < *Rh. oligantha* – S (presumably including *Rh. breviseta*): = *Rh. oligantha* var. *oligantha* – Z]

Rhynchospora pallida M.A. Curtis, Pale Beaksedge. Cp (NC, SC, VA): savanna-pocosin and sandhill-pocosin ecotones, peaty seepage bogs, usually growing in or near *Sphagnum*; rare (NC Watch List, SC Rare, VA Rare). July-September. Long Island, NY south through NJ to nc. SC, primarily in NJ and NC. Like *Rh. alba* and *Rh. 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. [= RAB, C, F, FNA, G, GW, K, S, Z]

Rhynchospora perplexa Britton *var. **perplexa***, Pineland Beaksedge. Cp (GA, NC, SC), Mt (GA), {VA}: savannas, sandhill seepage bogs; uncommon (VA Rare). July-September. E. NC south to s. FL, west to TX, and north in the interior to ec. TN; West Indies. Also see note under *Rh. microcarpa*. [= F; < *Rh. perplexa* – RAB, C, FNA, G, GW, K, S, Z]

Rhynchospora perplexa Britton *var. **virginiana*** Fernald, Virginia Pineland Beaksedge. Cp (VA): savannas; rare (VA Rare). July-September. Var. *virginiana* Fernald, alleged to be endemic to se. VA, should be sought in NC. It 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 *Rh. microcarpa*. [= F; < *Rh. perplexa* – RAB, C, FNA, G, GW, K, S, Z]

Rhynchospora pleiantha (Kükenthal) Gale, Coastal Beaksedge. Cp (GA, NC, SC): sandy margins of limesink depression ponds (dolines), typically in shallow water or at the lower margins of pond-shores; rare (GA Special Concern, NC Rare). July-September. Se. NC south to c. and nw. FL and west to se. AL; also in Cuba. [= RAB, FNA, GW, K, Z; *Rh. fusca* – S, misapplied]

Rhynchospora plumosa Elliott, Plumed Beaksedge. Cp (GA, NC, SC): savannas, sandhill-pocosin ecotones, especially where the sandy surface dries out in summer (on Spodosols such as the Leon soil series); common. July-August. NC south to FL and west to se. TX; West Indies (Cuba), Belize, Honduras, Nicaragua. *Rh. pineticola* C.B. Clarke, from dry sandy pinelands of northern FL, is very similar to *Rh. plumosa*, differing in having leaves 2-3 mm wide and achenes 2.0-2.2 mm long. [= RAB, S; < *Rh. plumosa* – FNA, GW, K, Z]

Rhynchospora punctata Elliott, Pineland Beaksedge. Cp (GA): wet savannas, pitcherplant bogs; rare (GA Special Concern). S. GA south to ne. FL. [= FNA, GW, K, S, Z]

Rhynchospora pusilla Chapman ex M.A. Curtis, Dwarf Beaksedge. Cp (GA, NC, SC), Pd (GA): wet savannas, especially in exposed wet sands of disturbed ground, such as roadsides; uncommon. June-September. E. NC south to s. FL and west to e. TX; West Indies, Mexico (Tabasco, Chiapas), Belize, Guatemala, Nicaragua. *Rh. pusilla, Rh. divergens,* and *Rh. thornei* are all small, grass-like plants, very similar in appearance to one another. [= FNA, GW, K; = *Rh. intermixta* C. Wright – RAB, S]

Rhynchospora rariflora (Michaux) Elliott, Few-flower Beaksedge. Cp, Pd (GA, NC, SC, VA): wet savannas, seepage bogs in the Sandhills, bogs in the Piedmont; common, rare in Piedmont (VA Watch List). July-September. S. NJ south to s. FL and west to e. TX; inland in ec. TN; West Indies, Belize, Honduras, Nicaragua. Resembling *Rh. breviseta* and *Rh. oligantha*, but the spikelets conspicuously smaller. A plant tentatively considered distinct from *Rh. rariflora* has been found in wet savannas and pocosin ecotones in Carteret County, NC; it differs most notably in its distinctly larger achenes and longer tubercles and bristles. It can be distinguished from *Rh. rariflora* as follows: achene 1.36-1.8 mm long, 1.4-1.5 mm wide; tubercle 0.6-1.0 mm long; bristles 2/3-4/5 as long as the achene body (vs. 1.3-1.5 (-1.7) mm long, 1.1-1.4 mm wide; tubercle 0.3-0.6 (-0.7) mm long; bristles 1/3-1/2 (-2/3) as long as the achene body). [= RAB, C, F, FNA, G, GW, K, S, Z]

Rhynchospora recognita (Gale) Kral, Cymose Beakrush. Cp, Pd, Mt (GA, NC, SC, VA): wet to dry low grounds, diabase glades, ditches, powerline corridors, savannas, moist seepage on rock outcrops, other wet areas; common. 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; = *Rh. globularis* (Chapman) Small var. *recognita* Gale – C, F, G, Z; < *Rh. globularis* – RAB, W; < *Rh. globularis* var. *globularis* – GW; *Rh. cymosa* Elliott – S, misapplied]

Rhynchospora saxicola Small. Pd (GA, SC), Cp (GA): seepages on granitic outcrops and Altamaha Grit glades; rare. W. SC south into the Piedmont and rarely Coastal Plain of c. GA and ne. and ec. AL (Kral 1999). [= S; = *Rh. globularis* (Chapman) Small var. *saxicola* (Small) Kükenthal – FNA, K]

Rhynchospora scirpoides (Torrey) A. Gray, Long-beak Beaksedge. Cp (GA, NC, SC, VA): limesink ponds, usually at the lower margins of pond-shores, wet savannas, beaver ponds, and other wetlands with "drawdown" hydrology; rare (GA Special

Concern, NC Rare, VA Rare). July-September. Se. MA south to the panhandle of FL and s. MS (Sorrie & Leonard 1999), and disjunct in the lowlands around the Great Lakes. [= C, FNA, K; = *Psilocarya scirpoides* Torrey – RAB, GW, S; > *Psilocarya scirpoides* var. *grimesii* Fernald & Griscom – F, G]

Rhynchospora solitaria Harper, Autumn Beaksedge. Cp (GA, SC): wet, sandy/peaty depressions; rare (GA Special Concern). 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 ***Rh. 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, S, Z]

Rhynchospora stenophylla Chapman, Coastal Bog Beaksedge. Cp (GA, NC, SC, VA): peaty seepage bogs, streamhead pocosins, savanna-pocosin ecotones, usually growing in *Sphagnum*, especially where frequently burned; rare (GA Special Concern, NC Watch List, SC Rare). 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). [= RAB, FNA, GW, K, S, Z]

Rhynchospora sulcata Gale, Grooved Beaksedge. Cp (GA, SC): limesink ponds (dolines); rare. June-July. Se. SC south to GA (Jones & Coile 1988) and FL. Perhaps not distinct from ***Rh. microcarpa***. [= RAB, GW, Z; < ***Rh. microcarpa*** Baldwin ex A. Gray – K]

Rhynchospora thornei Kral, Thorne's Beaksedge. Cp (GA, NC, SC), Mt (GA): in open sands in savannas underlain by marl, and nearby roadsides, moist limestone barrens and prairies (GA); rare (GA Special Concern, NC Endangered). Known from about 35 locations, in Cp of NC, SC, GA, FL, and AL; also in Ridge and Valley region of AL and GA, and Black Belt region of AL. ***Rh. thornei***, ***Rh. divergens***, and ***Rh. 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]

Rhynchospora torreyana A. Gray, Torrey's Beaksedge. Cp (GA, NC, SC, VA): savannas, seepage bogs, often weedy; common, uncommon in VA, rare in GA (GA Special Concern). July-September. Se. MA south to GA. [= RAB, C, F, G, GW, K, S, Z]

Rhynchospora tracyi Britton, Tracy's Beaksedge. Cp (GA, NC, SC): 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; rare (NC Rare, SC Rare). June-September. A Southeastern Coastal Plain endemic: s. NC south to FL, west to s. MS (Sorrie & Leonard 1999); disjunct in sw. LA; West Indies, Belize. [= RAB, FNA, K, GW, S]

Rhynchospora wrightiana Böckler, Wright's Beaksedge. Cp (GA, NC, SC, VA): wet savannas; rare (NC Watch List, VA Rare). July-September. Se. VA south to c. FL and west to s. AL; West Indies. Appearing to merge with ***Rh. 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. [= RAB, FNA, GW, K, Z; < ***Rh. wrightiana*** – S (also see ***Rh. brachychaeta***)]

Rhynchospora brachychaeta C. Wright. Cp (SC): cypress ponds, other depressions; rare. AL, FL, MS, and SC. Reported for SC by P. McMillan (pers. comm.). Kral in FNA considers this species possibly adventive. [= FNA, K, Z; < ***Rh. wrightiana*** – S]

Rhynchospora curtissii Britton has been reported from SC by Kral (1996) and for NC and SC by Kartesz (1999), but specimens so annotated are misidentified. An East Gulf Coastal Plain endemic, in Panhandle FL, AL, and s. MS (Sorrie & Leonard 1999). [= FNA, GW, K, S, Z]

Rhynchospora fusca (Linnaeus) Aiton f., circumboreal, ranges south in North America to NJ, e. PA (Rhoads & Klein 1993), MD, DE, and WV (FNA, Kartesz 1999). [= C, F, FNA, G, K, Z]

Rhynchospora knieskernii Carey. Pinelands. Endemic in NJ and DE. It has been reported, in error, from SC. [= C, F, FNA, G, K, Z]

Rhynchospora semiplumosa A. Gray, in Coastal Plain of GA. [= S; < ***Rh. plumosa*** – FNA, GW, K, Z] {needs evaluation}

Rhynchospora species 1. Mt (GA): Coosa Valley prairies; rare. Research by Jim Allison. {not keyed at this time}

Schoenoplectus (Reichenbach) Palla 1888 (Bulrush)
(also see *Bolboschoenus*)

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).

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*]..... ***Sch. 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..... .....***Sch. 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..... .....***Sch. californicus***
5 Perianth bristles retrorsely barbed; spikelets obtuse; culms terete throughout their length .... ***Sch. 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*]..... ***Sch. 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*] ..... ***Sch. torreyi***
8 Leaves short, < ½ as long as the culms; achenes plano-convex; styles 2 (-3) branched; [*Schoenoplectus pungens* complex of section *Schoenoplectus*].
9 Main involucral bract 1-2.5 (-6) cm long, with no other reduced, scale-like bracts present; mature culms 4-10 mm wide; sides of the culm strongly concave, wing-angled; [strictly of brackish situations in the outer Coastal Plain] ..... ***Sch. americanus***
9 Main involucral bract (1-) 3-18 cm long, with 1-2 additional, reduced, scale-like bracts present (resembling enlarged scales but lacking a flower); mature culms 1-6 mm wide; sides of the culm flat, slightly concave, or slightly convex; [of inland fresh and salty situations, widespread in our area]..... ***Sch. pungens** var**. pungens***
7 Cespitose annual or perennial; culms terete, 1-6 dm tall.
10 Perianth bristles absent; achenes 1.2-1.6 mm long, transversely rugose; [section *Supini*].
11 Achenes biconvex to obscurely trigonous, the faces convex.....***Sch. erectus** ssp**. raynalii***
11 Achenes biconvex, with a planar or concave area on the adaxial surface.....***Sch. hallii***
10 Perianth bristles 5-6; achenes 1.5-2.0 mm long, smooth, finely pitted, or finely papillose; [section *Actaeogeton*].
12 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.....***Sch. purshianus***
12 Achenes 1.5-1.8 mm long, planoconvex (nearly flat on 1 face), obovate, cuneate at the base, subtruncate at the apex .....***Sch. smithii***

Schoenoplectus acutus (Muhlenberg ex Bigelow) Á. Löve & D. Löve *var***. *acutus***, Hardstem Bulrush, Great Bulrush. Cp (NC), Mt (VA), Pd (VA): marshes; rare (NC Rare, VA Rare). 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; *? Schoenoplectus lacustris* Linnaeus ssp. *glaucus* (Smith) Hartman]

Schoenoplectus americanus (Persoon) Volk ex Schinzius & R. Keller, Olney Threesquare. Cp (GA, NC, SC, VA): tidal freshwater to brackish marshes; rare (NC Watch List). Late May-June; June-September. Nova Scotia 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; = *Scirpus olneyi* – RAB, F, G, GW, S]

Schoenoplectus californicus (C.A. Meyer) J. Soják, Giant Bulrush, Southern Bulrush, Tule. Cp (GA, NC, SC): marshes; rare. SC south to 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]

Schoenoplectus erectus (Poiret) Palla ex J. Raynal *ssp***. *raynalii*** (Schuyler) K. Lye. Cp (GA, SC): sandy or peaty, seasonally wet soils (such as on pond shores); rare (GA Special Concern, SC Rare). September-October. Apparently ranging from SC south to n. FL, 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]

Schoenoplectus etuberculatus (Steudel) J. Soják, Swamp Bulrush, Canby's Bulrush. Cp (GA, NC, SC, VA): beaver ponds, on peat in small depression ponds, in flowing blackwater streams; rare (GA Special Concern, NC Rare, VA Rare). July-August; August-September. DE south to n. FL and west to e. TX (the distribution rather discontinuous); substantially disjunct in s. MO and RI. [= FNA, K, Z; = *Scirpus etuberculatus* (Steudel) Kuntze – RAB, C, F, G, GW, S]

Schoenoplectus hallii (A. Gray) S.G. Smith, Sharpscale Bulrush. Cp (GA): pond shores in peaty sands ; rare (GA Special Concern). 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 *Sch. erectus*. It is reported for sw. GA by Jones & Coile (1988) and Smith in FNA (2002b). It is very similar to *Sch. 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 pungens (Vahl) Palla *var. **pungens***, Common Threesquare, Chairmaker's Rush, Swordgrass. Cp (NC, SC, VA), Pd (NC, VA), Mt (VA), {GA}: marshes, rocky river beds; common. Mid May-June; June-September. The species is circumboreal, ranging in North America from 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*. *Scirpus pungens* (or *Schoenoplectus pungens*) becomes the correct name for this plant (Schuyler 1974). [= FNA, K, Y; < *Scirpus americanus* – RAB, F, G, GW, S, W, misapplied; = *Scirpus pungens* Vahl var. *pungens* – C; < *Schoenoplectus pungens* – Z]

Schoenoplectus purshianus (Fernald) M.T. Strong, Bluntscale Bulrush. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp (NC, VA): marshes; common. 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; *? 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) J. Soják, Smith's Bulrush, Bluntscale Bulrush. Cp (VA): gravelly intertidal beach; rare (VA Rare). July; Late July-August. Québec 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 equalling 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) J. Soják, Swaying Rush, Water Bulrush. Cp (GA?, NC, SC, VA), Mt (VA): beaver ponds, bogs, in highly acid water; rare (NC Rare, SC Rare, VA Rare). May-June; June-August. Newfoundland west to s. AK, south to se. NC, nc. SC, GA, panhandle FL, MO, UT (?), and n. CA (the distribution discontinuous, especially southward). [= FNA, K, Z; = *Scirpus subterminalis* Torrey – RAB, C, F, G, GW, S, W]

Schoenoplectus tabernaemontani (C.C. Gmelin) Palla, Softstem Bulrush, Great Bulrush. Cp (GA, NC, SC, VA), Mt (GA, NC, SC, VA), Pd (NC, SC, VA): marshes, sedge maedows, streambeds, riverbeds, calcareous fens; common. June-September. 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; = *Scirpus tabernaemontani* K.C. Gmelin – W; *? 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. Mt (VA): sinkhole ponds; rare (VA Rare). New Brunswick west to Manitoba, 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]

Schoenoplectus deltarum (Schuyler) J. Soják, Delta Bulrush. Brackish marshes and other wetlands, AL and FL west to KS and TX. [= FNA, K; = *Scirpus deltarum* Schuyler] {not keyed at this time}

* *Schoenoplectus mucronatus* (Linnaeus) Palla, Rough-seed Bulrush. Weed (native of Eurasia) in rice fields and other disturbed situations, known from old collections in PA, NJ, NY and more recently from KY and TN. [= FNA, K; = *Scirpus mucronatus* Linnaeus] {not keyed at this time}

The hybrid *Schoenoplectus etuberculatus* × *subterminalis* has been collected in Hoke Co, NC and Lexington County, SC. It has sterile, malformed achenes.

Scirpus Linnaeus 1753 (Bulrush)

(also see *Bolboschoenus, Isolepis*, *Oxycaryum, Schoenoplectus*, and *Trichophorum*)

A genus of about 20 species, herbs, of circumboreal distribution, also with species in Australia, Malaysia, and South America. The complex of species including *Sc. atrovirens*, *Sc. georgianus*, *Sc. hattorianus*, *Sc. 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; Goetghebeur in Kubitzki (1998b). Key adapted from C, GW, and Z.

1 Bristles smooth, without teeth along the margins, strongly contorted and greatly exceeding the achenes when extended.
  2 Scales usually with inconspicuous midribs; mature bristles exceeding the scales and giving the inflorescence a woolly appearance; achenes 0.6-0.9 mm long, yellowish-gray to nearly white .....***Sc. cyperinus***
  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..... ***Sc. 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.....***Sc. pendulus***

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 *Sc. georgianus*).

4 Spikelets all solitary with distinct pedicels; mature scales with broad green midribs; achenes with protruding angles and concave sides ..... ***Sc. divaricatus***

4 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.

5 Culms with 10-20 leaves; spikelets broadly ovate; scales reddish-brown and, excluding the tips, about as wide as long .....***Sc. polyphyllus***

5 Culms with 2-10 leaves; spikelets broadly ovate to narrowly ovate; scales brown or black and, excluding the tips, mostly longer than wide.

6 Bristle teeth thick-walled and sharp-pointed, densely arranged almost to the base of the bristle.

7 Plants cespitose with short, brownish rhizomes; leaf sheaths green throughout; scales broadest above the middle; achenes with well-developed receptacles and firmly attached bristles.....***Sc. ancistrochaetus***

7 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 with poorly-developed receptacles from which the bristles readily detach..... ***Sc. expansus***

6 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 *Sc. georgianus*).

8 Bristles 0-3, shorter than the achenes; teeth, if present, concentrated near the tips of the bristles..... ..... ***Sc. georgianus***

8 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.

9 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..... ..... ***Sc. flaccidifolius***

9 Mature culms upright or nearly so; glomerules frequently with > 15 spikelets; lower scales of spikelets mucronate, blackish or brownish.

10 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.....***Sc. atrovirens***

10 Lower leaf blades and sheaths nearly smooth; spikelets broadly ovate or ovate; scales mostly blackish; longer bristles usually shorter than or about equalling the achenes; achenes 0.8-1.1 mm long.....***Sc. hattorianus***

Scirpus ancistrochaetus Schuyler, Northeastern Bulrush. Mt (VA): mountain ponds; rare (US Endangered, VA Endangered). 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; < *Sc. atrovirens* var. *atrovirens* – C]

Scirpus atrovirens Willdenow, Black Bulrush. Pd, Mt, Cp (GA?, NC, SC, VA): marshes; common. July-September. Newfoundland west to MN, south to GA and TX; disjunct in AZ. [= FNA, K, Z; < *Scirpus atrovirens* – RAB, GW, S, W; < *Sc. atrovirens* var. *atrovirens* – C, F, G]

Scirpus cyperinus (Linnaeus) Kunth, Woolgrass Bulrush. Cp, Mt, Pd (GA, NC, SC, VA): marshes, disturbed wet ground; common. July-September. Newfoundland west to British Columbia, south to FL, e. TX, and OR. The varieties may be worthy of recognition. [= RAB, FNA, GW, K, W; < *Scirpus cyperinus* – C; > *Scirpus cyperinus* var. *cyperinus* – F; > *Scirpus cyperinus* var. *pelius* Fernald – F; > *Scirpus rubricosus* Fernald – F; > *Scirpus cyperinus* – G, S; > *Scirpus eriophorum* Michaux – G, S]

Scirpus divaricatus Elliott. Cp (GA, NC, SC, VA): swamp forests; common, uncommon in VA (VA Watch List). July-September. Se. VA south to n. FL, west to e. TX, s. TN, and s. MO. [= RAB, C, F, FNA, G, GW, K, S, Z]

Scirpus expansus Fernald, Woodland Bulrush. Mt (NC, SC, VA), Pd (GA, NC, SC, VA), Cp (VA): bogs, marshes, streambeds; common (GA Special Concern). July-September. ME west to MI, south to ne. GA and OH. [= RAB, C, F, FNA, G, GW, K, W, Z; < *Scirpus sylvaticus* Linnaeus – S, misapplied]

Scirpus flaccidifolius (Fernald) Schuyler, Reclining Bulrush. Cp (NC, VA): bottomlands; rare (US Species of Concern, NC Rare, VA Rare). July-September. Endemic to se. VA and ne. NC. A recent status survey (Ludwig 1993) found the following characters to be most useful in distinguishing *Sc. flaccidifolius* from *Sc. 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 *Sc. 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; < *Scirpus atrovirens* var. *atrovirens* – C; = *Scirpus atrovirens* Willdenow var. *flaccidifolius* Fernald – F]

Scirpus georgianus Harper, Georgia Bulrush. Mt, Pd (GA, NC, SC, VA): marshes, wet areas, ditches; common. July-September. Prince Edward Island west to NE, south to GA and e. TX. [= FNA, K, S, Z; < *Scirpus atrovirens* – RAB, GW, W; < *Scirpus atrovirens* var. *atrovirens* – C; = *Scirpus atrovirens* Willdenow var. *georgianus* (Harper) Fernald – F, G]

Scirpus hattorianus Makino, Northern Bulrush. Mt (NC, VA): seepages, ditches, marshes, mostly at moderate to high elevations; uncommon (VA Watch List). July-September. Newfoundland to w. Ontario and WI, south to MD, NC, OH, and IN. [= FNA, K, Z; < *Scirpus atrovirens* – RAB, GW, W; < *Scirpus atrovirens* var. *atrovirens* – C, F, G]

Scirpus lineatus Michaux. Cp (GA, NC, SC, VA): swamp forests over coquina limestone ("marl"); rare (NC Rare, VA Watch List). May-July. Se. VA south to c. FL, west to LA. [= C, FNA, GW, K, Z; = *Scirpus fontinalis* Harper – RAB, F, S; > *Scirpus fontinalis* var. *virginiana* Fernald – G]

Scirpus pendulus Muhlenberg. Mt (GA, VA), Pd, Cp (NC, SC, VA): wet ground over limestone, diabase, or other circumneutral rocks; rare (NC Rare). June-July. ME west to MN, SD, and CO, south to NC, ne. FL, NM, and n. Mexico. [= C, FNA, GW, K, W, Z; = *Sc. lineatus* – RAB, F, G, S, misapplied]

Scirpus polyphyllus Vahl. Mt, Pd (GA, NC, SC, VA), Cp (VA): marshes, mountain bogs; common. 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, Z]

Scirpus atrocinctus Fernald ranges south to WV (Grant, Hampshire, Harrison, Pendleton, Pocahontas, Randolph, and Tucker counties). It is a northern relative of *Sc. cyperinus*, by some not considered distinct. It differs in having spikelets mostly solitary with distinct pedicels (vs. solitary with distinct pedicels or in glomerules with pedicels scarcely developed), scales usually blackish (vs. reddish-brown to brownish, or rarely blackish), and flowering and maturing achenes roughly a month earlier than nearby *Sc. cyperinus*. [= FNA, K; < *Scirpus cyperinus* (Linnaeus) Kunth – C] {synonymy incomplete; not keyed at this time}

Scirpus longii Fernald has been reported as occurring in e. NC by Radford, Ahles, & Bell (1968) and Fernald (1950). This report is in error. It does range south to NJ (Kartesz 1999). [= FNA, C, F, K] {synonymy incomplete; not keyed at this time}

Scirpus microcarpus J. & K. Presl ranges south to WV (Monongalia, Pocahontas, Randolph, and Tucker counties). It should key straightforwardly to key lead 21, differing however from all later species in the key in having the styles mostly 2-parted (vs. 3-parted) and the achenes 2-angled (vs. 3-angled). [= FNA, C, K] {synonymy incomplete; not keyed at this time}

Scirpus pallidus (Britton) Fernald ranges south to se. PA (Rhoads & Klein 1993) and NJ (Kartesz 1999). [= FNA, K; = *Scirpus atrovirens* Willdenow var. *pallidus* Britton – C] {synonymy incomplete; not keyed at this time}

Scirpus pedicellatus Fernald, south to NJ, PA, OH, and KY (Kartesz 1999). [= FNA, K; < *Scirpus cyperinus* (Linnaeus) Kunth – C] {synonymy incomplete; not keyed at this time}

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 Achene body papillose-verrucose, often characterized by raised and undulating transverse ridges; spikelets verticillate in (2-)3-5(-9) sessile clusters ..... ***Scl. verticillata***
  2 Achene body smooth or longitudinally ribbed; spikelets in a single cluster.
    3 Triangular base of achene with a pair of pits on each of the three sides; achene 2-3 mm long ..... ***Scl. georgiana***
    3 Triangular base of achene lacking pits in the three concave sides; achene 3-4 mm long ..... ***Scl. baldwinii***
1 Base of achene with hypogynium.
  4 Achene body smooth (often longitudinally ribbed); hypogynium with 0, 8, or 9 tubercles.
    5 Hypogynium with 8 or 9 minutely papillate tubercles ..... ***Scl. oligantha***
    5 Minutely papillate portion of hypogynium continuous, not divided into separate tubercles.
      6 Achene 1-2 mm long; culm 1-2 mm wide at base; leaves 1-3 mm wide ..... ***Scl. minor***
      6 Achene 2-4 mm long; culm 2.5-6 mm wide at base; leaves 5-9 mm wide.
        7 Plants cespitose to short-rhizomatous; sheaths brown or straminous to reddish, glabrous to glabrate on the ventral surface except for a pubescent and often thickened summit; achenes 2.0-3.3 mm long, 1.12-1.38 × as long as wide (averaging 1.24); of wet to mesic habitats ..... ***Scl. triglomerata***

7 Plants long-rhizomatous to cespitose; sheaths purple to reddish, the ventral surface uniformly pubescent; achenes 2.8-4.0 mm long, 1.35-1.54 × as long as wide (averaging 1.45); mostly of dry to dry-mesic habitats ..... ***Scl. nitida***

4 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.

8 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).

9 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 ..... ***Scl. muehlenbergii***

9 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..... ***Scl. reticularis***

8 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.

10 Achenes 1.5-2 mm long, the hypogynium with 6 paired but distinctly separate tubercles.

11 Culms, leaves, and bracts glabrous or sparsely hirtellous, but not copiously villous-ciliate ..... ***Scl. pauciflora*** *var*. ***pauciflora***

11 Culms, leaves, and bracts copiously villous-cilliate with spreading hairs 0.5-1 mm long..... ***Scl. pauciflora*** *var*. ***caroliniana***

10 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).

12 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.

13 Culms, sheaths, blades, and bracts glabrous; plants of sandy soils (e.g., spodosols)..... ***Scl. ciliata*** *var*. ***glabra***

13 Culms and/or sheaths hairy; blades and bracts ciliate; plants of loamy sands (e.g., ultisols)..... ***Scl. ciliata*** *var*. ***ciliata***

12 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).

14 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 ..... ***Scl. elliottii***

14 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 ..... ***Scl. species 1***

Scleria baldwinii (Torrey) Steudel, Baldwin's Nutrush. Cp (GA, NC, SC): wet savannas, under *Pinus serotina, P. palustris*, and/or *Taxodium ascendens*; rare (NC Rare, SC Rare). June-July. Se. NC south to 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]

Scleria ciliata Michaux var. ***ciliata***, Hairy Nutrush. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC): 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]

Scleria ciliata Michaux var. ***glabra*** (Chapman) Fairey, Smooth Nutrush. Cp (GA, NC, SC, VA?): savannas and flatwoods; frequent in the outer Coastal Plain of NC and SC. NC (VA?) 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; > *S. ciliata* var *curtissii* (Britton) Kessler – Z; > *S. pauciflora* Muhl. ex Willd. var. *curtissii* (Britton) Fairey – K]

Scleria elliottii Chapman, Broad-leaved Hairy Nutrush. Cp (GA, NC, SC, VA): savannas, flatwoods, pine-oak woodlands, meadows, bogs, and clay-based Carolina bays, typically on loamy sands; occasional. 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. elliottii* var. 1. [= S; = *S. ciliata* Michaux var. *elliottii* (Chapman) Fernald – F, FNA, Y; < *S. ciliata* var. *ciliata* – K; < *S. ciliata* – RAB, C, G, GW, W]

Scleria georgiana Core, Georgia Nutrush. Cp (GA, NC, SC): pine savannas, cypress savannas, depression meadows, mostly on the outer coastal plain; rare (NC Rare). June-August. 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; = *S. gracilis* Elliott – S (name preoccupied)]

Scleria minor W. Stone, Slender Nutrush. Cp, Mt (NC, SC, VA): wet savannas and peaty seepages in the Coastal Plain and Sandhills, bogs in the Mountains; rare (NC Watch List, VA Rare). 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. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): open wet sand, pine savannas and flatwoods, depression meadows, cypress savannas, limesink ponds, bogs; common. 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; = *S. muhlenbergii* – F, orthographic variant; = *S. reticularis* var. *pubescens* Britton – G; = *S. setacea* Poiret – S]

Scleria nitida Willdenow, Shining Nutrush. Cp, Mt, Pd (NC, SC, VA) {GA?} (complete distribution by province by state has yet to be determined): 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. May-October. MA, VA, and KY south to FL, west to LA and MO (also see note under *S. triglomerata*). *S. flaccida* Steudel, here synonymized because of achene and sheath characters, is a poorly known entity with pendulous capillary axillary peduncles and swamp habitat as in *S. oligantha*, but with an unlobed hypogynium; F gives a range of se. VA to FL and LA. [= G; < *S. triglomerata* Michaux – RAB, C, FNA, GW, K, S, W; > *S. flaccida* Steudel – F; > *S. nitida* – F]

Scleria oligantha Michaux, Few-flowered Nutrush. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): dry to moist forests and woodlands, swamp forests; common. June-September. NJ and MO south to 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]

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]

Scleria pauciflora Muhlenberg ex Willdenow *var.* ***pauciflora***, Papillose Nutrush. Cp, Pd, Mt (GA, NC, SC, VA): wet to dry pine flatwoods, pine savannas, depression meadows; common. 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]

Scleria reticularis Michaux, Netted Nutrush. Cp (GA, NC, SC): limesink ponds, clay-based Carolina bays; rare (NC Rare). 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 (also see *S. muehlenbergii)*; = *S. reticularis* var. *reticularis* – G]

Scleria species 1, Smooth-seeded Hairy Nutrush. Cp, Pd (NC): 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. On the Coastal Plain, it is associated with other narrow endemics such as *Thalictrum cooleyi, Allium sp. 1*, and *Carex lutea.*

Scleria triglomerata Michaux, Tall Nutrush. Cp, Mt?, Pd (GA, NC, SC, VA): wet to mesic flatwoods, savannas, and hardwood forests; frequent. May-September. VT and Ontario west to MN, south to FL and TX. *S. triglomerata* sensu lato also occurs in Puerto Rico and Mexico, and may include *S. nitida*. [= F, G; < *S. triglomerata* – RAB, C, FNA, GW, K, S, W]

Scleria verticillata Muhlenberg ex Willdenow, Savanna Nutrush. Cp (GA, NC, SC, VA), Mt (VA): 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; rare (NC Rare, VA Rare). July-September. MA and Ontario 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 or near our area. The roots are strongly fragrant. [= RAB, C, F, FNA, G, GW, K, S]

Scleria distans Poiret in J. Lamarck et al. Cp (GA): pine flatwoods, bogs, savannas; rare. GA and FL west to se. TX; tropical America. Known from scattered counties in the Coastal Plain of GA (Jones & Coile 1988). [= FNA; *? S. hirtella* Sw. – GW, K, S, Y, Z, misapplied] {not keyed at this time}

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. Mt (GA, NC, SC): 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; rare (GA Special Concern, NC Rare). July-September. A circumboreal tundra 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. Pd, Mt (VA): woodlands, bluffs, forests; uncommon. ME west to Ontario, 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; = *Scirpus clintonii* – S, misapplied]

Websteria S.H. Wright
(see *Eleocharis*)

DIOSCOREACEAE R. Brown 1810 (Yam Family)

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 halberd-shaped or sagittate, the sides with a concave portion (*D. polystachya*) or continuously convex (*D. alata*); 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*].
  2 Stems broadly winged; leaf margins sagittate, the sides continuously convex ..... ***D. alata***
  2 Stems terete, not winged; leaf margins halberd-shaped, the sides with a concave portion ..... ***D. polystachya***
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*].
  3 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***
  3 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].
    4 Lower leaves in whorls of 4-7, upper leaves alternate; stem terete in cross-section; rhizomes 10-15 mm in diameter, often contorted and much-branched ..... ***D. quaternata***
    4 All leaves alternate (rarely the lowermost approximate, with short internodes, and appearing nearly whorled); stem polygonal in cross-section, with 8-14 narrowly-winged ribs; rhizomes 5-10 mm in diameter, usually relatively straight and little-branched ..... ***D. villosa***

* ***Dioscorea alata*** Linnaeus, White Yam, Great Yam. Cp (GA): disturbed areas, in moist soils; rare, introduced from se. Asia. [= FNA, K, Y, Z]

Dioscorea floridana Bartlett, Florida Wild Yam. Cp (GA, SC): mesic to dry forests, swampy forests; uncommon. 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, Y, Z; = *D. villosa* Linnaeus var. *floridana* (Bartlett) Ahles – RAB]

* ***Dioscorea polystachya*** Turczaninow, Cinnamon Vine, Chinese Yam. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): thickets, disturbed areas, bottomland forests; uncommon, native of China. June-August. [= FNA; = *D. batatas* Decaisne – RAB, C, F, G, W, Z; = *D. oppositifolia* Linnaeus – K, Y, misapplied]

Dioscorea quaternata J.F. Gmelin, Whorled Wild Yam. Mt, Pd (GA, NC, SC, VA): moist forests; common. April-June; September-October. This species has been shown to be quite distinct from *D. villosa*. It has a more northern and montane range than *D. villosa*, ranging from NJ, NY, s. Ontario, WI, MN, and IA south to n. FL and LA, centered, and most abundant, in the Appalachians. The status of *D. glauca* requires further investigation (see Ward 1977c). [= C, F, G, K, S, Y, Z; < *D. villosa* var. *villosa* – RAB; *D. glauca* Muhlenberg ex Bartlett – S; < *D. villosa* – FNA, W]

Dioscorea villosa Linnaeus, Common Wild Yam. Cp, Pd, Mt? (GA, NC, SC, VA): moist forests and woodlands; uncommon. April-June; September-November. MA and RI south to n. FL, primarily in the Coastal Plain. 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 here recognized proves warranted. [= Y; > *D. villosa* var. *villosa* – C; >< *D. villosa* var. *villosa*– RAB (also see *D. quaternata*); < *D. villosa* – FNA, K; > *Dioscorea villosa* Linnaeus var. *hirticaulis* (Bartlett) Ahles – RAB, C; > *D. hirticaulis* Bartlett – F, G, S, Z ; > *D. villosa* – F, G, S, W, Z]

ERIOCAULACEAE Palisot de Beauvois 1828 (Pipewort Family)

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; 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.* ***latifolia]***

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. Cp (NC, VA), Mt (VA): ponds, lakes; uncommon. July-October. New Brunswick and Newfoundland west to Ontario 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. Pd (SC): drawdown shore of manmade lake; rare, introduced from Australasia. See Kilpatrick & McMillan (2003). [= FNA, GW, K, Z]

Eriocaulon compressum Lamarck. Cp (GA, NC, SC, VA), Pd (NC), Mt (NC, VA): ponds, lakes, other depressions, wetter places in pine flatwoods and pine savannas; common. June-October. NJ south to FL, west to e. TX. [= RAB, C, F, FNA, G, GW, K, S, W, Z]

Eriocaulon decangulare Linnaeus *var. **decangulare***, Common Ten-angled Pipewort. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC, SC): wet savannas and pine flatwoods, bogs, seasonally flooded ponds; common. June-October. NJ south to FL, west to sw. AR and e. TX; Mexico, Central America. [= FNA, K; < *E. decangulare* – RAB, C, F, G, GW, S, W, Z]

Eriocaulon koernickianum van Heurck & Mueller-Aargau, Dwarf Pipewort. Pd (GA): seepage areas on granite flatrocks; rare (GA Special Concern). 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. Cp (GA): seepage bogs; rare. Sw. GA, south peninsular FL and 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]

Eriocaulon parkeri B.L. Robinson, Estuary Pipewort. Cp (NC, VA): natural lakes, tidal marshes; uncommon. S. Canada south to e. NC. [= C, F, FNA, G, GW, K, Z]

Eriocaulon ravenelii Chapman. Cp (GA, SC): wet pine savannas; rare. July-September. SC south to s. peninsular and Panhandle FL. [= RAB, FNA, GW, K, S, Z]

Eriocaulon texense Körnick, Texas Hatpins. Cp (GA, NC, SC): sandhill seepage bogs, Altamaha Grit outcrops; rare (GA Special Concern). Sc. NC south to Panhandle FL, west to e. TX. [= FNA, GW, K, Z]

Eriocaulon decangulare Linnaeus var. *latifolium* Chapman ex Moldenke, Panhandle Pipewort, is restricted to Panhandle FL and s. AL. It appears to warrant taxonomic status, but needs additional study. [= FNA, K; < *E. decangulare* – GW, S, Z]

Lachnocaulon Kunth 1841 (Bogbuttons)

A genus of 7 species, herbs, of se. North America and Cuba. References: Kral in FNA (2000); Kral (1966c)=Z; Stützel in Kubitzki (1998b).

1 Trichomes at the tips of the receptacular bracts translucent, the head therefore showing the brown color of the bractlets..... .....***L. minus***
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***

Lachnocaulon anceps (Walter) Morong, Common Bogbuttons. Cp (GA, NC, SC, VA), Pd (GA, NC?), Mt? (GA?): moist to dry sands, moist peats, in pinelands, sometimes locally abundant in open disturbed areas where competition has been removed; common (VA Rare). May-October. S. NJ south to FL, west to se. TX; disjunct in ec. TN. [= RAB, C, F, FNA, G, GW, K, Z; > *L. anceps* – S; > *L. floridanum* – S; > *L. glabrum* Körnick – S]

Lachnocaulon beyrichianum Sporleder ex Körnick, Southern Bogbutton. Cp (GA, NC, SC): upper margins of Coastal Plain doline ponds (sometimes under scrub oaks), flatwoods; rare (GA Special Concern, NC Rare, SC Rare). May-September. Se. NC south to c. peninsular FL. [= RAB, FNA, GW, K, S, Z]

Lachnocaulon minus (Chapman) Small, Brown Bogbutton. Cp (GA, NC, SC): upper margins of Coastal Plain doline ponds, other pineland situations; uncommon (NC Watch List). May-October. E. NC south to c. peninsular FL, west to Panhandle FL and se. AL. [= RAB, FNA, GW, K, Z; > *L. minus* – S; > *L. eciliatum* Small – S]

Lachnocaulon digynum Körnick. Pine savannas, bogs; rare. AL and FL west to TX. [= FNA, GW, K, S, Z] {not keyed at this time}

Lachnocaulon engleri Ruhland. Pondshores, pine savannas; rare. AL and FL. [= FNA, GW, K, S, Z] {not keyed at this time}

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; Stützel in Kubitzki (1998b).

Syngonanthus flavidulus (Michaux) Ruhland, Yellow Hatpins, Bantam-buttons. Cp (GA, NC, SC): pine savannas, pine flatwoods, borders of pineland ponds, and adjacent ditches; uncommon (NC Watch List). May-October. Se. NC south to s. FL, west to s. AL. [= RAB, FNA, GW, K, S, Z]

HAEMODORACEAE R. Brown 1810 (Bloodwort Family)
(also see *MELANTHIACEAE*)

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).

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.

Lachnanthes caroliniana (Lamarck) Dandy, Redroot. Cp (GA, NC, SC, VA), Mt (VA): wet savannas, pocosin edges, shores of Coastal Plain depression ponds (and similar ponds in the mountains of Virginia), ditches, wet disturbed ground; common, rare in Mountains (VA Rare). June-early September; September-November. The range is almost strictly on the Coastal Plain, and rather disjunct: s. Nova Scotia, from MA to DE, from se. VA south to FL and west to LA, with inland disjunctions in w. VA and sc. TN (Coffee County); also in Cuba. 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. The correct spelling of the specific epithet has been disputed; the original spelling was "*caroliana*," and Gandhi (1999) argues convincingly that it is a correctable typographic error. [= RAB, C, FNA, GW, W, Y; = *Lachnanthes caroliana* – K, Z, an orthographic variant; = *L. tinctoria* (J.F. Gmelin) Elliott – F, G; = *Gyrotheca tinctoria* (J.F. Gmelin) Salisbury – S]

HEMEROCALLIDACEAE R. Brown 1810 (Day-lily Family)

A family of about 13 genera and 50 species, herbs, of temperate, subtropical, and tropical regions. The circumscription of this family is uncertain; it is often treated as monotypic, excluding (for instance) the Phormiaceae. References: 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. Cp, Pd, Mt (NC, SC, VA), {GA}: commonly cultivated, frequently escaping to forests, streambanks, suburban woodlands, lawns, waste places; common, introduced from Asia. Late May-early July. [= RAB, C, FNA, G, K, W, Z; > *H. fulva* var. *fulva* – F; > *H. fulva* var. *kwanso* Regel – F]
* ***Hemerocallis lilioasphodelus*** Linnaeus, Yellow Day-lily, Lemon Day-lily. Pd (NC): less commonly cultivated, only rarely escaping; rare, introduced from Asia. May-July. [= C, FNA, K, Z; = *H. flava* (Linnaeus) Linnaeus – F, G]

HOSTACEAE B. Mathew 1988 (Hosta Family)

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. {distr.}: widely planted as a shade ornamental, rarely persistent; common in cultivation, rarely persistent, "native" of Japan (probably only of garden origin). [= FNA, K]
* ***Hosta plantaginea*** (Lamarck) Ascherson, Fragrant Plantain-lily. {distr.}: widely planted as a shade ornamental, rarely persistent; common in cultivation, rarely persistent, native of China. [= FNA, K]
* ***Hosta ventricosa*** (Salisbury) Stearn, Blue Plantain-lily. Mt (NC, VA), Pd (VA), {distr.}: widely planted as a shade ornamental, rarely persistent; common in cultivation, rarely persistent, native of China. [= FNA, K]

HYACINTHACEAE Batsch 1786 (Hyacinth Family)
(also see *AGAVACEAE*)

A family of about 67 genera and 900 species, herbs, nearly cosmopolitan. References: Speta in Kubitzki (1998a); Pfosser et al. (2003).

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 free or fused only at the extreme base.
  3 Bracts 2 per flower; tepals fused at the extreme base; tepals blue (less commonly white or pink); [subfamily *Hyacinthoideae*, tribe *Hyacintheae*].....***Hyacinthoides***
  3 Bracts 0-1 per flower; tepals free; tepals white, with a greenish stripe on the outer surface; [subfamily *Ornithogaloideae*].....***Ornithogalum***

Hyacinthoides Medikus 1791 (Bluebell)

A genus of 3-4 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 (1997)=Z; McNeill in FNA (2002a); Speta in Kubitzki (1998a). Key based on Stace (1997).

1 Racemes erect; perianth campanulate; anthers blue.....***H. hispanica***
1 Racemes pendant at apex; perianth tubular; anthers cream.....***H. nonscripta***

* ***Hyacinthoides hispanica*** (P. Miller) Rothm., Spanish Bluebell. Pd (NC, VA): persistent after cultivation; rare, introduced from Europe. [= FNA, K, Z; = *Endymion hispanicus* (P. Miller) Chouard]
* ***Hyacinthoides nonscripta*** (Linnaeus) Choard ex Rothm., English Bluebell. Pd (VA): persistent after cultivation; rare, introduced from Europe. [= K, Z; = *Scilla non-scripta* (Linnaeus) Hoffmannsegg & Link – C, G; = *Scilla nonscripta* (Linnaeus)

Hoffmannsegg & Link – F; = *Hyacinthoides non-scripta* – FNA, orthographic variant; = *Endymion nonscripta* (Linnaeus) Garcke]

Hyacinthus Linnaeus 1753 (Hyacinth)

A genus of 3 species, herbs, of w. Asia. References: Stace (1997)=Z; Speta in Kubitzki (1998a).

* ***Hyacinthus orientalis*** Linnaeus, Hyacinth. Pd (VA): persistent after cultivation; rare, introduced from 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 (1997)=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 ..... ***M. botryoides***
  2 Leaves nearly terete, 1-3 mm wide ..... ***M. neglectum***

* ***Muscari botryoides*** (Linnaeus) P. Miller, Compact Grape-hyacinth. Pd (NC, VA), Mt, Cp (VA): cultivated as an ornamental, persistent and naturalized in lawns, old fields, suburban woodlands, and disturbed areas; uncommon, introduced from Europe. March-April; May-June. [= RAB, C, F, FNA, G, K, S, Z]
* ***Muscari comosum*** (Linnaeus) P. Miller, Tassel Grape-hyacinth. Pd (GA, NC, VA), Cp (VA): cultivated as an ornamental, persistent and naturalized in lawns, old fields, suburban woodlands, and disturbed areas; rare, introduced from Europe. March-April; May-June. [= C, F, FNA, G, K, Z]
* ***Muscari neglectum*** Gussoni ex Tenore, Grape-hyacinth. Pd (GA, NC, SC, VA), Cp (NC, SC, VA), Mt (GA, VA): cultivated as an ornamental, persistent and naturalized in lawns, old fields, suburban woodlands, and disturbed areas; common, introduced from Europe. March-April; May-June. [= FNA, K, Z; = *M. racemosum* (Linnaeus) Lamarck & Augustin de Candolle – RAB, C, F, G, S; *? 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); 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. Pd (NC, VA), Cp, Mt (VA): lawns and suburban woodlands; cultivated and rarely naturalized or persistent, introduced from w. Asia. March-April. [= RAB, C, F, FNA, G, K]
* ***Ornithogalum umbellatum*** Linnaeus, Star-of-Bethlehem, Snowflake, Nap-at-noon. Pd (GA, NC, SC, VA), Cp (NC, SC, VA), Mt (GA, NC, VA): lawns, old fields, bottomlands, forests; commonly cultivated and persistent and naturalizing, introduced from Europe. March-May. [= RAB, C, F, FNA, G, K, S, W]

Schoenolirion
(see AGAVACEAE)

HYDROCHARITACEAE A.L. de Jussieu 1789 (Frog's-bit Family)

A family of about 17 genera and 80 species, aquatic herbs, cosmopolitan. The Hydrocharitaceae is here circumscribed traditionally; it should perhaps include *Najas*, as suggested by Haynes, Holm-Nielsen, & Les in Kubitzki (1998b). References: Haynes in FNA (2000), Cook in Kubitzki (1998b).

1 Leaves in a basal rosette, 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..... ***Vallisneria***
1 Leaves in whorls along the stem.
3 Leaves in whorls of 2-3 (no whorls with > 4 leaves) ..... ***Elodea***
3 Leaves in whorls of 3-8 (some or most whorls with 4 or more leaves).
4 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***
4 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." Cp, Mt (GA, NC, SC, VA), Pd (GA, VA): ponds and stagnant water of streams or rivers; uncommon, introduced from South America. May-November. This is the "Elodea" or "Anacharis" of the aquarium trade. [= RAB, FNA, GW, K, W; = *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 Flowers perfect, with 3 stamens..... ***[E. schweinitzii]***
1 Flowers unisexual, the staminate with 9 stamens.
2 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***
2 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. Cp, Pd, Mt (NC, VA), {SC}: lakes, ponds, stagnant waters of streams; common (rare in NC). July-September. Québec west to Saskatchewan, south to NC, OK, NM, and CA. [= RAB, C, F, FNA, GW, K, W; = *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. Cp, Mt (NC, VA), Pd (VA): lakes, ponds, stagnant waters of streams; uncommon. July-September. ME and Québec west to MN and ID, south to NC, TN, OK, and NM. [= RAB, C, F, FNA, GW, K, W; = *Anacharis nuttallii* Planchon – G; >< *Philotria canadensis* – S; > *Philotria linearis* Rydberg – S]

Elodea schweinitzii (Planchon) Caspary, Schweinitz's Waterweed, is known only from eighteenth century collections in e. PA and NY. Haynes in FNA (2000) rejects it as a valid taxon. [= C, G, K]

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. Pd (NC, SC, VA), Cp (GA, NC, VA), Mt (VA): ponds, lakes; uncommon (but locally very abundant), introduced from 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. Cp (GA, NC, SC, VA): swamps, marshes, ponds, pools; uncommon. June-September. NJ and MD south to n. 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]

Vallisneria Linnaeus 1753 (Eelgrass)

A genus of 2-10 species, aquatic herbs, of tropical and warm temperate regions of the Old and New World. References: Haynes in FNA (2000), Cook in Kubitzki (1998b).

Vallisneria americana Michaux, Eelgrass, Water-celery, Tapegrass. Cp (GA, NC, SC, VA), Pd (VA), Mt (GA, VA): lakes, rivers, estuaries, sounds; common. July-October. Nova Scotia and Québec west to ND, south to FL, TX, NM, AZ; and south into tropical America. [= RAB, F, FNA, G, GW, K, S, W; *? V. americana* var. *americana* – C; > *V. neotropicalis* Victorin]

HYPOXIDACEAE R. Brown 1814 (Stargrass Family)

A family of about 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. References: Judd (2000)=Z; Herndon in FNA (in prep.); Nordal in Kubitzki (1998a). Key based on Herndon in FNA (2002a).

1 Leaves glabrous, or with a few trichomes near the base; seeds black.
- 2 Leaves filiform, 0.3-1.0 mm wide, stiff; floral bracts much smaller than pedicel, often < 1 mm; ovaries densely pubescent; seeds with truncated pebbling ..... ***H. juncea***
- 2 Leaves over 2 mm wide, soft and flexible; seeds coarsely muricate.
  - 3 Ovaries longer than broad, cylindric, with scattered trichomes; floral bracts usually exceeding pedicels; tepals equaling or shorter than ovaries ..... ***H. curtissii***
  - 3 Ovaries as broad at long or nearly so, deltate, densely pubescent; pedicels much longer than bracts or flowers; tepals much longer than ovaries ..... ***H. hirsuta***

1 Leaves evenly pubescent, at least near the base; seeds black or brown.
- 4 Pedicels much longer than bracts or flowers; seeds black.
  - 5 Leaves flattened, > 1 mm wide; seeds coarsely muricate ..... ***H. hirsuta***
  - 5 Leaves filiform, 0.3-12.0 mm wide; seeds with truncated pebbling ..... ***H. juncea***
- 4 Pedicels < 2× as long as subtending bracts; seeds black or brown.
  - 6 Anthers greater than 2 mm long; flowers much longer than pedicels; floral bracts exceeding pedicels; seeds with round pebbling, black ..... ***H. rigida***
  - 6 Anthers < 2 mm long; {floral bracts character}; seeds muricate and brown, **or** with rounded pebbling and black-iridescent.
    - 7 Tepals 1.5-2× as long as ovaries; seeds pebbled, black but with iridescent membranous coats ..... ***H. sessilis***
    - 7 Tepals ca. 1 (-1.5)× the length of the ovaries; seeds minutely muricate, dark brown ..... ***H. wrightii***

Hypoxis curtissii Rose in Small, Swamp Stargrass. Cp (GA, NC, SC): swamp forests, alluvial forests, water courses; uncommon. March-June; May-July. E. NC south to FL, west to e. TX. [= FNA, K, Z; = *H. hirsuta* (Linnaeus) Coville var. *leptocarpa* (Engelmann & A. Gray) Fernald – RAB; < *H. hirsuta* – C; = *H. leptocarpa* (Engelmann & A. Gray) Small – GW]

Hypoxis hirsuta (Linnaeus) Coville, Common Stargrass. Mt, Pd, Cp (GA, NC, SC, VA): in a wide variety of dry to moist forests; common. March-June; May-July. S. ME west to Saskatchewan and ND, south to GA and e. TX. [= FNA, GW, Z; = *H. hirsuta* var. *hirsuta* – RAB; < *H. hirsuta* – C, K]

Hypoxis juncea Sm., Fringed Stargrass. Cp (GA, NC, SC): wet pine savannas; rare. April-May (-later, especially in response to fire); May-June.(-later, especially in response to fire). Se. NC south to FL, west to s. AL. [= RAB, FNA, GW, K, Z]

Hypoxis rigida Chapman, Savanna Stargrass. Cp (GA, NC, SC): wet pine savannas; rare. April (-later, especially in response to fire); May.(-later, especially in response to fire). Se. NC south to FL, west to e. TX. [= RAB, FNA, GW, Z; < *H. hirsuta* – K]

Hypoxis sessilis Linnaeus, Glossy-seed Stargrass. Cp (GA?, NC, SC, VA): wet pine savannas; rare. April (-later, especially in response to fire); May (-later, especially in response to fire). NC south to FL, west to e. TX, s. AR, and se. OK. [= RAB, FNA, GW, K, Z; > *H. longii* Fernald – C; > *H. sessilis* – C]

Hypoxis wrightii (Baker) Brackett, Bristleseed Stargrass. Cp (GA, NC, SC, VA): wet pine savannas; common. March-April (-later, especially in response to fire); April-May (-later, especially in response to fire). Se. VA south to FL, west to TX; disjunct in the West Indies (Cuba, Bahamas, Jamaica, Hispaniola, Puerto Rico). [= FNA, K, Z; = *H. micrantha* Pollard – RAB, C, GW, misapplied]

IRIDACEAE A.L. de Jussieu 1789 (Iris Family)

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)..... .....***Gladiolus***

1 Inflorescence an umbellate 1-sided cyme; plants from rhizomes or bulbs; flowers actinomorphic.
- 3 Leaves planar; plants from rhizomes (or indistinct) or a bulb (in *Iris xiphium*).
  - 4 Style branches broad, petaloid, terminating in paired crests .....***Iris***
  - 4 Style branches not broad or petaloid.
    - 5 Tepals 16-35 mm long, orange or red; seeds 4-6 mm in diameter..... ***Iris domestica***
    - 5 Tepals 6-15 mm long, blue, purple, lavender, pink, magenta, white, or yellowish-white; seeds 0.6-1.3 mm in diameter.....***Sisyrinchium***
- 3 Leaves plicate; plants from bulbs.
  - 6 Tepals unequal, the inner whorl < ½ as long as the outer whorl .....***[Herbertia]***
  - 6 Tepals nearly equal in length.
    - 7 Style recurved, with 3 flat branches that are < 2 mm long .....***[Calydorea]***
    - 7 Style straight, each of the 3 branches further divided into slender lobes
      - 8 Style branches divided for ca. ½ their length; style arms arching over or between the anthers; tepals dark purple .....***[Alophia]***
      - 8 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. MS west to TX and OK; Mexico; Guyana. [= FNA, K; = *Herbertia drummondii* (Graham) Small]

Belamcanda Adanson 1763 (Blackberry-lily)
(see *Iris*)

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, is apparently endemic to FL (Chafin 2000). The single GA record is by P.O. Schallert, a notoriously sloppy collector, and should therefore be discounted unless additional information comes to light. The species does occur in FL, near the GA border. [= FNA, K; = *Salpingostylis coelestina* (Bartram) Small – S; = *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. Cp (NC, SC): disturbed areas, especially in moist to wet sites, including salt marshes, the parents of the hybrid both native to sub-Saharan Africa. Late June-July. [= FNA, K; = *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).

Various species of *Crocus* are cultivated and are long-persistent at old house sites. {not keyed or otherwise treated}

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 ..... ***Gl. ×gandavensis***
1 Inner tepals < 60 mm long.
  2 Tepals white, cream, orange, or red; perianth tube plus dorsal sepal 60-95 mm long..... ***[Gl. 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 ..... ***Gl. communis***
    3 Anthers ca. 15 mm long; capsules globose, 10-12 mm long; seeds not winged..... ***[Gl. italicus]***

* ***Gladiolus communis*** Linnaeus, False Corn-flag. Cp (NC, SC), Pd (GA): cultivated as ornamentals; commonly cultivated, rarely persisting or weakly spreading. Introduced in TN and KY, as well. [= FNA; > *G. papilio* Hooker – RAB, K, misapplied; > *Gladiolus communis* Linnaeus ssp. *byzantinus* (P. Miller) A. Hamilton – K; > *G. byzantinus* P. Miller]
* ***Gladiolus ×gandavensis*** Van Houtte [*G. dalenii* × *oppositiflorus*]. Cp (GA, NC, SC, VA), Pd, Mt (NC): cultivated as ornamentals; commonly cultivated, rarely persisting or weakly spreading. Goldblatt suggests that as many as 5 species are involved in the origin of the large-flowered garden gladiolus. [= RAB, FNA, K; *? G. hortulanus* Bailey]

* *Gladiolus dalenii* Van Geel ssp. *dalenii*. Introduced in AL and LA. [= FNA]
* *Gladiolus italicus* P. Miller. Introduced in TN. [= FNA, K; *? G. segetum* Ker-Gawler]

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; > *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, exposed at maturity in a blackberry-like cluster..... ..... ***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 Perianths 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 Perianths 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 Perianths 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. {province} (GA): bogs, seeps, marshes; rare (GA Special Concern). East to AL, GA, TN, KY. [= C, F, FNA, G, GW, K; > *I. foliosa* Mackenzie & Bush – S; > *I. mississippiensis* Small – S]

Iris cristata Aiton, Dwarf Crested Iris. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): 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; = *Neubeckia cristata* (Aiton) Alefani – S]

* ***Iris domestica*** (Linnaeus) Goldblatt & Mabberley, Blackberry-lily. Pd (GA, NC, SC, VA), Mt (NC, SC, VA), Cp (GA): dry woodlands, forests, edges of granitic flatrocks, suburban areas; rare, introduced from e. Asia. June-August. [= Z; = *Belamcanda chinensis* (Linnaeus) de Candolle – RAB, C, F, FNA, G, K, S, W]

* ***Iris ensata*** Thunberg, Japanese Iris. Mt (NC): roadsides; rare, 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. Cp (GA): S. IL, MO, and TN south to GA, AL, and LA (introduced elsewhere). [= C, F, FNA, G, GW, K, S]

* ***Iris germanica*** Linnaeus, German Iris, Fleur-de-Lys. Pd (NC, SC, VA), Cp, Mt (VA), {GA}: roadsides, old homesites, ditches; uncommon, cultivated and rarely persistent or escaped, native of Europe. April-May. [= RAB, C, F, FNA, G; > *I. flavescens* Delile – K; > *I.* ×*germanica* – K]

Iris hexagona Walter, Anglepod Blue Flag. Cp (GA, SC): swamps; rare. May-June. SC south to FL. [= RAB, FNA, GW, S; = *I. hexagona* var. *hexagona* – K; > *I. hexagona* – S; > *I. kimballiae* Small – S; > *I. alabamensis* Small – 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. Cp (NC, SC, VA), Pd (VA), Mt (GA, NC): bogs and marshes; rare. May-June; June-July. Nova Scotia 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. Mt (GA, NC, SC, VA), Pd, Cp (NC, VA): swamps, marshes, streams, ponds; uncommon, cultivated as a water plant, native of Eurasia and Africa. May-June; August-October. [= RAB, C, F, FNA, G, GW, K, S, W]

* ***Iris sanguinea*** Hornemann ex Donn, Japanese Iris. Mt (NC): roadsides; rare, cultivated and rarely escaped, native of Japan, n. China, Korea, Japan, and w. Russia. [= K]

Iris savannarum Small. {GA}. In GA and FL. [= FNA, S; = *I. hexagona* Walter var. *savannarum* (Small) R.C. Foster – K]

* ***Iris sibirica*** Linnaeus, Siberian Iris. Pd (VA): cultivated and escaping or persisting near plantings; rare, introduced from Eurasia (c. and e. Europe west to Lake Baikal). [= FNA, K]

Iris tridentata Pursh. Cp (GA, NC, SC): wet savannas, pine flatwoods, margins of pineland pools; rare (GA Special Concern). Late May-June; August-October. Se. NC south to n. FL. [= RAB, FNA, GW, K; *? I. tripetala* – S, misapplied]

Iris verna Linnaeus *var.* ***smalliana*** Fernald ex M.E. Edward, Upland Dwarf Iris. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp (GA): dry, rocky or sandy woodlands and forests; common. 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; < *I. verna* – C, G; < *Neubeckia verna* (Linnaeus) Alefani – S]

Iris verna Linnaeus *var.* ***verna***, Coastal Plain Dwarf Iris, Sandhill Iris. Cp, Pd (GA, NC, SC, VA): longleaf pine sandhills, dry, rocky forests and woodlands; common. 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. Mt, Pd, Cp (VA): {habitat}; uncommon. 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. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): marshes, swamps, streams; uncommon. May; July-September. Sw. Québec to MN, south to w. NC, n. AL, e. TN, AR, and e. KS. [= C, F, K; < *I. virginica* – RAB, FNA, W; = *I. shrevei* Small – G, S]

Iris virginica Linnaeus *var.* ***virginica***, Southern Blue Flag. Cp, Pd (GA, NC, SC, VA): marshes, swamps, streams; common. April-May; July-September. Se. VA south to 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 giganticaerulea Small, Giant Blue Iris, in AL, MS, and LA. [= FNA, K; *I. rivularis* Small – S]

* *Iris xiphium* Linnaeus, introduced in c. TN. {investigate} [= 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, east to AL. [= FNA, K; *Ixia acuta* Bartram; *Nemastylis acuta* Herbert]

Sisyrinchium Linnaeus 1753 (Blue-eyed-grass, Irisette)

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)=Z; Hornberger (1991)=Y; Bicknell (1896, 1899a, 1899b); Goldblatt, Manning, & Rudall in Kubitzki (1998a).

1 Corolla urceolate-campanulate, the segments widely flaring; annual; flowers lavender, pink, magenta, white, or yellowish-white; [plants usually occurring in distinctly weedy habitats, such as roadsides and lawns] ..... ***S. rosulatum***

1 Corolla stellate-rotate; perennial; flowers blue, violet, or white; [plants occurring in various habitats].

2 Inflorescences paired (rarely solitary) and sessile (rarely the outer inflorescence with a peduncle to 7 mm long), closely subtended by a leaf-like bract; outer spathe bract connate 0-1 (-1.5) mm.

3 Stems 1.5-3.4 mm wide, flattened, obviously winged; outer spathe bract 14-30 mm long; capsule 2.8-4.0 mm long ..... ***S. albidum***

3 Stems 0.5-1.0 mm wide, wiry, not winged; outer spathe bract 12-15 mm long; capsules 2.0-3.3 mm long..... ..... ***S. capillare***

2 Inflorescences solitary, terminating the stem or branch, not paired; outer spathe bract connate (0.7-) 2-6 mm.

4 Stems mostly simple, unbranched (sometimes some plants in a population slightly branched).

5 Stems (1.5-) 2.0-3.7 mm wide; capsule 4.0-6.8 mm long..... ***S. montanum*** *var.* ***crebrum***

5 Stems 0.5-1.0 (-2.0) mm wide; capsule 3.2-5.5 mm long..... ***S. mucronatum***

4 Stems mostly branched, with 1-5 nodes.

6 Stems with 2-5 nodes, the branching dichotomous; tepals white, recurved at maturity (like a miniature, white *Lilium superbum*); [endemic to low to medium elevation forests in the Blue Ridge Escarpment region of sw. NC and nw. SC] ..... ***S. dichotomum***

6 Stems with 1-3 nodes, the branching uneven; tepals violet to blue (rarely white), not notably recurved at maturity; [widespread].

7 Widest stems (0.5-) 0.8-1.9 mm wide.

8 Leaf bases not persistent as a fibrous tuft; capsules dark brown to black, 2.0-4.1 mm long..... ..... ***S. atlanticum***

8 Leaf bases persistent as a fibrous tuft; capsules light to medium brown, 2.9-4.3 mm long..... ..... ***S. fuscatum***

7 Widest stems 2.3-5.7 mm wide.

9 First internode equal to or shorter than the longest leaves, or if equalling the leaves then the hyaline margin on the inner spathe bract acute to acuminate; upper stem scabrous..... ***[S. xerophyllum]***

9 First internode equalling or longer than the longest leaves, if equalling the leaves then the hyaline margin of the inner spathe bract broadly obtuse or acute at the apex; upper stem generally glabrous.

10 Leaf bases not persistent or not fibrous; outer spathe bract 18-38 mm long, the margins connate 4-6 mm; capsules dark brown to black, 4.0-7.0 mm long..... ***S. angustifolium***

10 Leaf bases persistent as a basal tuft of fibers; outer spathe bract 18-26 mm long, the margins basally connate 2-4 mm; capsules tan, 2.5-4.8 mm long ..... ***S. nashii***

Sisyrinchium albidum Rafinesque. March-May. Cp, Mt (NC, SC, VA), Pd (NC, SC), {GA}: woodlands, savannas?, mesic sandhills, open limestone barrens; uncommon (VA Rare). March-May; May-June. S. NY west to s. WI, south to panhandle FL, and LA. [= C, F, FNA, G, K, Y, Z; < *S. albidum* – RAB, W (also see *S. capillare*); > *S. albidum* – S; > *S. scabrellum* E.P. Bicknell – S]

Sisyrinchium angustifolium P. Miller. March-June. Mt, Pd, Cp (NC, SC, VA), {GA}: woodlands, forests, meadows, sandhill swales; common. March-June; May-July. VT, NH, and s. Ontario west to WI, e. KS, and OH, south to GA, AL, LA, and TX. [= RAB, C, F, FNA, GW, K, W, Y, Z; > *S. angustifolium* – G, S; > *S. graminoides* E.P. Bicknell – G, S]

Sisyrinchium atlanticum E.P. Bicknell, Atlantic Blue-eyed-grass. Cp, Pd, Mt (NC, SC, VA), {GA}: dry, sandy or rocky places; common. March-June; June-August. Nova Scotia and ME west to OH, IN, and MO, south to FL and LA. [= C, F, FNA, G, GW, K, S, W, Y, Z; = *S. mucronatum* var. *atlanticum* (E.P. Bicknell) Ahles – RAB]

Sisyrinchium capillare E.P. Bicknell, Wiry Blue-eyed-grass. Cp (GA, NC, SC, VA): wet pine savannas and flatwoods; uncommon. March-June; May-June. Se. VA south to GA (and FL?), west to AL. [= C, F, FNA, G, GW, K, S, Z; < *S. albidum* – RAB, W]

Sisyrinchium dichotomum E.P. Bicknell, White Irisette, Isothermal Irisette. Mt, Pd (NC, SC): 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; rare (US Endangered, NC Endangered, SC Rare). May-June; June-August. Endemic to Henderson, Polk, and Rutherford counties, NC, and Greenville County, SC. [= FNA, K, W, Z]

Sisyrinchium fuscatum E.P. Bicknell. Cp, Pd (GA, NC, SC, VA): wet pine savannas, marshy areas; common (VA Watch List). Late April-June; June-October. E. VA (or extreme se. PA?) south to FL, west to MS. [= C, FNA, K, Z; > *S. arenicola* E.P. Bicknell – RAB, F, G, GW; > *S. fuscatum* – S; > *S. incrustatum* E.P. Bicknell – S; > *S. rufipes* E.P. Bicknell – S]

Sisyrinchium montanum Greene *var.* ***crebrum*** Fernald. Mt (NC?, VA?): {habitat in our area not known}; rare. May-July. Newfoundland and Ontario 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 and Z considers var. *crebrum* to range south only to NY, and var. *montanum* south only to OH and PA. Herbarium documentation is needed. [= F, K; < *S. montanum* – G; *? S. angustifolium* – S, misapplied]

Sisyrinchium mucronatum Michaux. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (NC, VA): forests, woodlands, fields; common. April-June; June-July. ME west to Saskatchewan, south to SC, GA, MI, MN. [= C, F, FNA, GW, G, K, S, W, Z; = *S. mucronatum* var. *mucronatum* – RAB]

Sisyrinchium nashii E.P. Bicknell, Nash's Blue-eyed-grass. Cp, Pd (GA, NC, SC), Mt (GA, VA?): woodlands and forests; uncommon. April-June. NC and TN (sw. VA?) south to FL and MS. [= FNA, K, W, Z; > *S. fibrosum* E.P. Bicknell – S]

*? ***Sisyrinchium rosulatum*** E.P. Bicknell, Lawn Blue-eyed-grass. Cp (GA, NC, SC, VA), Pd (GA, SC): lawns, roadsides; uncommon. April-May; May-June. Se. VA south to FL, west to e. TX. Perhaps only adventive in our area. [= RAB, FNA, GW, K, S, Y, Z; > *S. exile* E.P. Bicknell]

Sisyrinchium campestre E.P. Bicknell, Prairie Blue-eyed-grass. MS and MI west to SD and NM. [= FNA, K] {not keyed at this time}

Sisyrinchium corymbosum E.P. Bicknell. Cp (GA): pinelands; rare. Se. GA and ne. FL west to s. AL. See Ward (2005a) for its resurrection. [< *S. atlanticum* Bicknell – FNA, K] {not keyed at this time}

Sisyrinchium langloisii Greene ranges east to AL, GA, and TN. It will key to couplet 8, where difficulties will be encountered. Like *S. atlanticum*, its leaf bases are not persistent in a fibrous tuft, but it differs in having the dark ovary and capsules not contrasting strongly with the much lighter foliage. [= FNA; < *S. langloisii* – K (also see *S. pruinosum*)] {not keyed at this time}

Sisyrinchium miamiense E.P. Bicknell, reported for SC (Kartesz 1999) and GA, AL, MS, and FL (FNA). {investigate} [= FNA, K] {not keyed at this time}

Sisyrinchium pruinosum E.P. Bicknell, ranges east to AL. [= FNA; < *S. langloisii* – K] {not keyed at this time}

Sisyrinchium sagittiferum E.P. Bicknell, ranges east to AL (FNA). [= FNA, K] {not keyed at this time}

Sisyrinchium xerophyllum Greene, Florida Blue-eyed-grass, occurs in FL and allegedly s. GA; it is also alleged to occur in NC (FNA) but this report does not seem plausible. [= FNA, K, S, Z]

JUNCACEAE A.L. de Jussieu 1789 (Rush Family)

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, B. van Eerden, 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; 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*: *abortivus, acuminatus, brachycephalus, brevicaudatus, caesariensis, canadensis, megacephalus, militaris, nodosus, 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 (probably not a *Juncus*): *trifidus*

Identification Notes: For identification of most rushes, it is important to collect plants with mature capsules and seeds. Care must also 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*].....**Key D**
      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 E**
        5 Heads turbinate to hemispherical, 3-15 flowered; [subgenus *Juncus*, section *Ozophyllum*].....**Key F**

KEY A

1 Flowers borne in heads (glomerules) of 2-6; leaves spine-tipped; single bracteole subtending glomerule present at base of pedicel; [subgenus *Juncus*, section *Juncus*] ..... ***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.
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 Rhizomes 5-20 cm long, slender (1-1.5 mm wide), flexuous; inflorescence compact (usually < 5 cm long); heads 2-5 flowered ..... ***J. longii***
3 Rhizomes < 5 cm long (usually < 3 cm), thick (2-4 mm wide) or thin or absent (< 2 mm wide); inflorescence various; heads 2-15 flowered.
4 Heads 2-5 flowered; rhizomes thick (2-4 mm); inflorescence elongate (usually 8-20 cm); seeds narrowly ellipsoid, coarsely ribbed, both ends tailed ..... ***J. biflorus***
4 Heads 5-15 flowered; rhizomes thin or absent (< 2 mm); inflorescence < 8 cm long; seeds plump, finely ribbed, both ends apiculate (but without tails).
5 Perianth straw colored with green midstripe; capsules tan to reddish brown; heads 1-5 (-10) per culm; [calcareous glades inland, east to GA and TN] ..... ***J. filipendulus***
5 Perianth dark brown; capsules brown; heads > 10 per culm; [widespread] ..... ***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 4.0-5.0 mm long, 2 mm longer than perianth, dark reddish purple; heads 3-7 flowered .....
.....***J. trigonocarpus***
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***
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 Rhizomes 2-6 mm thick; perianth acute; culms erect, 3-8.5 dm tall; [southeastern, ranging north to Isle of Wight and City of Suffolk Counties, VA].....***J. abortivus***
1 Rhizomes about 1 mm thick; perianth obtuse; culms ascending to erect, < 5 dm tall; [northeastern, ranging south to Accomack County, VA].....***J. pelocarpus***

KEY E

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. polycephalus***
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 Stamens 6.
4 Plants cespitose, lacking rhizomes.....***J. acuminatus***
4 Plants rhizomatous.
5 Heads 6-20 flowered, 6-9 mm diameter; auricles cartilaginous, 0.5-1.0 mm long.....***J. nodosus***
5 Heads 25-100 flowered, 10-14 mm diameter; auricles membranous, 2.5-4.0 mm long.....***J. torreyi***
3 Stamens 3.
6 Plants cespitose, lacking rhizomes; tepals lanceolate.....***J. acuminatus***
6 Plants rhizomatous; tepals lance-subulate.
7 Mature capsules included, < ½ length of perianth.....***J. brachycarpus***
7 Mature capsules exserted or slightly included.
8 Uppermost stem leaf and/or inflorescence bract > inflorescence; capsule valves separating at apex during dehiscence.....***J. nodosus***
8 Uppermost stem leaf and/or inflorescence bract < inflorescence; capsule valves remaining united.
9 Uppermost cauline leaf blade non-septate, much shorter than its sheath; Outer tepals significantly longer than the inner tepals.....***J. megacephalus***

9 Uppermost cauline leaf blade septate, longer than its sheath; outer tepals and inner tepals of similar length.
10 Heads lobulate; mature capsule 2.0-3.0 mm long.....***J. scirpoides* var. *compositus***
10 Heads spherical, not lobulate; mature capsule 3.0-4.5 mm long.....***J. scirpoides* var. *scirpoides***

KEY F

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.
6 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***
6 Proximal culm leaf shorter than inflorescence; plants cespitose; plants < 8 dm tall.
7 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***
7 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.
3 Mature capsules about 1/3 longer than perianth (roughly 1-1.5 mm longer).....***J. debilis***
3 Mature capsules equaling or barely exceeding perianth.
4 Heads 5-50; capsules 2.8-3.5 mm long ..... ***J. acuminatus***
4 Heads 30-250; capsules 1.9-2.9 mm long.
5 Capsules deep chestnut brown; roots with terminal tubers; inner tepals usually > 2.4 mm long; [plants southeastern] .....***J. elliottii***
5 Capsules straw colored; roots without terminal tubers; inner tepals usually 1.7-2.3 mm long; [plants midwestern, east to nw. FL and se. TN]..... ***J. nodatus***

Juncus abortivus Chapman. Cp (GA, NC, SC, VA): ditches, along pond and stream margins, seepage slopes, disturbed open areas; uncommon. July-October. Se. VA to FL Panhandle. The septae along the narrow leaf blades of *J. abortivus* are often difficult to detect. [= RAB, F, GW, K, S; = *J. pelocarpus* E. Meyer var. *crassicaudex* Engelmann – C, G; < *J. pelocarpus* – FNA, Y]

Juncus acuminatus Michaux. Cp, Pd, Mt (GA, NC, SC, VA): throughout, in damp soils; common. June-August. ME and N.S. to Ont. and MN, south to n. FL, TX and n. Mexico; British Columbia to CA. [= RAB, C, F, FNA, G, GW, K, S, W, Y]

Juncus anthelatus (Wiegand) R.E. Brooks. Mt (NC, VA), Pd (NC): moist or wet sites; uncommon. July-September. New Brunswick 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]

Juncus articulatus Linnaeus, Jointleaf Rush. Mt (VA), Cp (NC): marshes, wet open ground; rare (NC Watch List). July-September. Nearly cosmopolitan; in North America from Newfoundland to AK, south to e. NC (Cape Hatteras, Dare County) and CA. [= RAB, C, FNA, G, K; > *J. articulatus* var. *articulatus* – F; > *J. articulatus* var. *obtusatus* Engelmann – F; = *J. articulatus* ssp. *articulatus* – Y]

Juncus balticus Willdenow ***var. littoralis*** Engelmann. Mt (VA): open calcareous wetlands; rare. The species is circumboreal; var. *littoralis* is North American: Labrador west to British Columbia, 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* ssp. *littoralis* (Engelmann) Snogerup – Y]

Juncus biflorus Elliott. Cp, Pd, Mt (GA, NC, SC, VA): pine savannas, pine flatwoods, mesic areas in sandhill-pocosin ecotones, roadsides, low fields in the Piedmont; common (uncommon in the Mountains). June-October. MA to MI and MO, south to TX and FL. The characters used to split this species from *J. longii* and *J. marginatus* (rhizome length and thickness, glomerule number, seed size and shape) are somewhat variable, and intermediates between these three taxa are frequent, particularly in se. United States. Due to this intergradation, *J. biflorus* and *J. longii* are sometimes treated as synonyms or varieties of *J. marginatus*, but Knapp (2004) supports their recognition. Since all three taxa in this group, fitting the typical species descriptions, are found in our area, they are here recognized at the species level. It is interesting to note that most of the plants in our area displaying typical taxonomic characters are found in natural, or undisturbed habitats; many of the confusing intermediates appear to occur in disturbed wetlands (roadside ditches, cleared aeas). Further investigation of these disturbed-area populations is necessary. [= RAB, F, K, W; < *J. biflorus* – C, G (also see *J. longii*); < *J. marginatus* – FNA, GW, Y (also see *J. biflorus* and *J. longii*); = *J. aristulatus* Michaux var. *biflorus* (Elliott) Small– S]

Juncus brachycarpus Engelmann, Short-fruited Rush. Pd (GA, NC, SC, VA), Cp (NC, SC, VA), Mt (GA): wet, sandy soil; rare (NC Watch List). June-September. MA to IL, south to SC, wc. GA, and TX. [= RAB, C, F, FNA, G, GW, K, S, Y]

Juncus brachycephalus (Engelmann) Buchenau. Mt (GA, VA), Pd, Cp (GA): calcareous wetlands. Nova Scotia 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 brevicaudatus (Engelmann) Fernald, Short-tailed Rush. Mt (NC, VA): bogs and seeps at high elevations; rare (NC Watch List). July-September. Newfoundland to Manitoba south to MN, PA, and in mountains south to NC. [= RAB, C, F, FNA, G, K, W, Y]

Juncus bufonius Linnaeus *var. **bufonius***, Toad Rush. Cp, Pd (GA, NC, SC, VA), Mt (NC, VA): wet, open ground, roadsides, dried pools, drawdown shores; common (rare in upper Piedmont, Sandhills, and Mountains). June-November. Cosmopolitan. [= C, F, G, K; < *J. bufonius* – RAB, FNA, GW, S, W, Y]

Juncus caesariensis Coville, New Jersey Rush. Cp (VA), Mt (NC): sphagnous seepages in the Coastal Plain of VA, seeps and bogs at low to moderate elevations in the Mountains of NC; rare (US Species of Concern, NC Rare). 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 Nova Scotia (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. Cp (GA, NC, SC, VA), Pd, Mt (NC, VA): lake, pond and stream margins, swamps, bogs, seepage slopes, wet meadows, ditches; common (rare in Piedmont and Mountains). July-October. 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, Y; > *J. canadensis* var. *canadensis* – F; > *J. canadensis* var. *euroauster* Fernald – F]

Juncus coriaceus Mackenzie. Cp, Pd, Mt (GA, NC, SC, VA): stream and pond margins, swamps, flatwoods depressions, roadside ditches; common (rare in Mountains). June-September. S. NJ to n. FL, west to e. TX, north in the interior KY, AR, and OK. [= RAB, C, F, FNA, G, GW, K, W, Y; = *J. setaceus* Rostkovius – S, misapplied]

Juncus debilis A. Gray, Weak Rush. Cp, Pd, Mt (GA, NC, SC, VA): marshy shores, stream and pond margins, along puddles in wet, disturbed clearings, ditches; common (uncommon in Piedmont). May-August. RI to MO, south to n. FL and e. TX. [= RAB, C, F, FNA, G, GW, K, S, W, Y]

Juncus dichotomus Elliott. Cp, Pd, Mt (GA, NC, SC, VA): often in disturbed, open, wet areas, ditches, wet meadows; common (rare in western Piedmont and Mountains). June-October. MA to c. peninsular FL, west to OK and TX. 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, 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. Cp, Pd, Mt (GA, NC, SC, VA): low, wet open areas, ditches, margins of ponds and streams; uncommon (rare in Piedmont). May-September. Mostly Coastal Plain from se. VA to n. 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, Y]

Juncus dudleyi Wiegand, Dudley's Rush. Mt (NC, VA), Pd (VA), Cp (SC, VA): calcareous seepages and fens, river-scours; rare. Labrador to Nunavut, south at least to FL, TX, and CA. First reported for South Carolina by Hill & Horn (1997) and for NC by Tom Govus (pers. comm., 2005). [= F, FNA, K, S, W, 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. Cp, Pd, Mt (GA, NC, SC, VA): moist soil, marshes, margin of streams, ponds, lakes and swamps, low meadows; common. June-September. Newfoundland to MN, south to FL and Mexico. Ssp. *effusus* is European, and also occurs (allegedly introduced) in the ne. United States. [= Y, Z; < *J. effusus* – RAB, FNA, GW, S, W (also see *J. pylaei*); = *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. Cp (GA, NC, SC, VA), Pd (GA, NC): margins of ponds and lakes, depressions in savannas and flatwoods, wet, disturbed clearings, roadside ditches; uncommon (rare in Piedmont). May-September. Coastal Plain, DE to cen. penin. 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, Y; < *J. elliottii* var. *elliottii* – K]

Juncus filipendulus Buckley, Texas Plains Rush. Mt (GA): prairies, limestone barrens; rare (GA Special Concern). KY, TN, and AL west to OK and TX. [= FNA, GW, K, S, Y]

Juncus georgianus Coville. Pd (GA, NC, SC): shallow depressions in granitic outcrops; rare (NC Watch List). 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. Cp, Mt (VA): {habitat}; rare. [= C, FNA, W; > *J. gerardi* var. *gerardi* – F; = *J. gerardi* – G, orthographic variant; > *J. gerardii* var. *gerardii* – K; > *J. gerardii* ssp. *gerardii* -- Y]

Juncus gymnocarpus Coville, Seep Rush. Mt (GA, NC, SC): bogs, seeps, streambanks; rare (GA Special Concern, NC Rare). 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 n. cen. Panhandle FL. In our area, *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, Y]

* ***Juncus inflexus*** Linnaeus. Mt (VA): wet meadows, disturbed wet or moist ground; rare, native of Eurasia. Introduced in VA (Virginia Botanical Associates 2006, Kartesz 1999). [= C, F, FNA, G, K, Y]

Juncus longii Fernald. Cp (GA, NC, VA), Pd (GA, NC, SC), Mt? (NC): usually in very wet, often inundated sites, bogs, ditches, rooting in clay or peat; uncommon (NC Watch List). June-August. MD south through VA, NC, SC to MS (Knapp 2004); more extensive distributions are based on misattribution. [= 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. Cp, Pd, Mt (GA, NC, SC, VA): wet meadows, bogs, generally throughout in wet, sandy or peaty soil; common. June-September. Nova Scotia to Ontario, south to FL and TX. [= RAB, C, G, K, S, W; > *J. marginatus* var. *marginatus* – F; > *J. marginatus* var. *setosus* Coville – F; < *J. marginatus* – FNA, GW, Y (also see *J. biflorus* and *J. longii*); > J. marginatus – G; J. setosus (Coville) Small – G]

Juncus megacephalus M.A. Curtis, Large-headed Rush. Cp (GA, NC, SC, VA): brackish and freshwater marshes, bogs, ditches, wet, open places; uncommon. June-August. Coastal Plain, VA to s. FL, west to se. TX; e. MD (Sorrie, pers. comm.). [= RAB, C, F, FNA, G, GW, K, S, Y]

Juncus militaris Bigelow, Bayonet Rush. Cp (NC): lakeshores; rare. Nova Scotia to MD, DE, and ne. PA; inland near the Great Lakes; disjunct at Phelps Lake, NC (Sorrie, pers.comm, 2005). [= C, F, FNA, G, K, Y]

Juncus nodosus Linnaeus. Mt (VA): {habitat}; rare. Newfoundland to British Columbia, south to w. VA, WV, IN, MO, TX, and CA. [= C, F, FNA, G, Y; > *J. nodosus* var. *nodosus* – K] {add to synonymy}

Juncus pelocarpus E. Meyer. Cp (VA): sea-level fens; rare. Labrador west to MN, south to DE, e. VA, n. IN. [= K; = *J. pelocarpus* var. *pelocarpus* – C, G; > *J. pelocarpus* var. *pelocarpus* – F; < *J. pelocarpus* – FNA, Y (also see *J. abortivus*)]

Juncus polycephalus Michaux, Many-headed Rush. Cp (GA, NC, SC): sandy pond margins, ditches, savannas; uncommon. July-September. Coastal plain, NC to s. FL, west to e. TX; TN. [= RAB, F, FNA, GW, K, S, Y]

Juncus pylaei Laharpe, Common Rush. Cp, Pd, Mt? {NC, SC, VA}: moist soil, marshes, margin of streams, ponds, lakes and swamps, low meadows; common {additional checking of herbarium collections needed to determine actual range of this variety in our area; var. *solutus* as well}. June-September. Throughout eastern North America, south to NC. [= 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. Cp (GA, NC, SC, VA), Pd, Mt (GA): streams, ponds, lakes, ditches, wet depressions in flatwoods, cypress savannas; common (rare in Piedmont and Mountains). June-October. DE to s. FL, west to TX, north into OK and TN. This species commonly forms dense mats – a useful field character. [= RAB, C, F, FNA, G, GW, K, S, Y]

Juncus roemerianus Scheele, Black Needle Rush. Cp (GA, NC, SC, VA): coastal tidal marshes, forming dense stands at and above mean high tide, above the *Spartina alterniflora* zone; common. 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, Y]

Juncus scirpoides Lamarck *var. **compositus*** Harper. Cp (GA, NC, SC, VA): roadsides, wet, open, disturbed areas, ?; uncommon. June-October. Coastal Plain: NC, GA, FL, AL, MS, LA, SC, TX, VA. [= S; < *J. scirpoides* – RAB, FNA, GW, K, Y; >< *J. scirpoides* -- K; <*? J. scirpoides* var. *meridionalis* Buchenau – F, application uncertain; > *J. glomeratus* Batson – K, nomen nudum]

Juncus scirpoides Lamarck *var. **scirpoides***. Cp, Pd, Mt (GA, NC, SC, VA): wet, open, disturbed areas, ditches, sandhill pocosin ecotones and seepage bogs, savannas and wet pine flatwoods, wet meadows; common (rare in Mountains). June-October. S. NY to s. FL, mostly Coastal Plain and Piedmont; west to TX; IN to MI, MO, OK. *J. scirpoides* is here tentatively divided into three taxa: [= F, S; < *J. scirpoides* – RAB, C, FNA, G, GW, K, W, Y]

Juncus secundus Beauvois ex Poiret. Pd, Mt (GA, NC, SC, VA), Cp (VA): dry fields, rock outcrops; rare (NC Watch List). June-September. ME to IN, south to e. OK, n. AL, and n. GA. [= RAB, C, F, FNA, G, K, S, W, Y]

Juncus subcaudatus (Engelmann) Coville & Blake, Somewhat-tailed Rush. Mt (GA, NC, SC, VA), Pd, Cp (VA): bogs, mossy woods and other wet places; common. July-October. Nova Scotia 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, Y; > *J. subcaudatus* var. *subcaudatus* – F, K]

Juncus tenuis Willdenow, Path Rush. Cp, Pd, Mt (GA, NC, SC, VA): dry or moist soil along roadsides and paths, fields; common (uncommon in se. Coastal Plain). June-September. Labrador west to AK, south to FL, TX, CA. *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; < *J. tenuis* var. *tenuis* – C; > *J. tenuis* var. *tenuis* – F; > *J. tenuis* var. *williamsii* Fernald – F]

Juncus torreyi Coville, Torrey's Rush. Mt (GA, VA), Pd (VA), {NC}. June-September. New Brunswick west to British Columbia, south to GA, TX, CA, and n. Mexico. [= FNA, C, F, G, GW, K, S, W, Y]

Juncus trifidus Linnaeus, Highland Rush. Mt (NC, VA): rock crevices at high elevations, on greenstone, mica scist, amphibolite, and hornblende gneiss; rare (NC Endangered). June-September. The species is circumboreal, occurring in arctic-alpine situations in n. Europe and n. North America where it ranges from Newfoundland to Québec, 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. Cp (GA, NC, SC), Pd (GA, NC): seepage slopes, bogs, along stream margins, ditches; common, rare in Piedmont. 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, Y]

Juncus validus Coville *var. **validus***, Vigorous Rush. Cp (GA, NC, SC, VA), Pd (GA, SC), Mt (GA): stream and pond margins, roadside ditches, wet, open, often disturbed ground; uncommon. 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]

* *Juncus acutus* Linnaeus ssp. *leopoldii* (Parlatore) Snogerup. Cp (GA): {habitat unknown}; rare. Reported for se. GA by Jones & Coile (1988) and Kartesz (1999), but not by FNA. {investigate} [= FNA, K, Y] {not keyed, pending verification}

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]

Juncus compressus Jacquin. Disturbed ground, ditches, in saline or alkaline soils. Nova Scotia to Ontario, south to MD, PA, w. NY, MI, WS, and sporadically distributed westward in high elevations. [= FNA, C, F, G, K] {add to synonymy; not yet keyed}

Juncus filiformis Linnaeus, Thread Rush. Bogs, wet acid areas. Circumboreal, south in North America to e. PA, w. PA, WV, n. MI, and n. MN. [= C, F, FNA, G, K]

Juncus interior Wiegand. Prairies, disturbed sites. OH west to Saskatchewan, south to e. TN, AL, LA, TX, and NM. Also reported for VA and NC (Kartesz 1999); the NC report is based on a misidentified specimen. {investigate} [= FNA, G, S, W, Y; > *J. interior* var. *interior* – K; < *J. tenuis* Willdenow var. *tenuis* – C; < *J. tenuis* – GW]

Juncus nodatus Coville. Shallow water, marshes, sloughs, savannas, bogs. KY west to KS, south to TN, AL, FL, LA, and TX. [= FNA, C, G, GW, K, Y; ? *J. robustus*, preoccupied] {synonymy incomplete}

Luzula Augustin 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 or in small clusters of (1-) 2-4 (-8); inflorescences branched, unbranched, or dichasial.
- 2 Flowers borne in small clusters of (1-) 2-4 (-8); perianth white to pink; inflorescences dichasial; seeds lacking an appendage (or with a inconspicuous appendage); [alien species, naturalized north of our area]; [subgenus *Luzula*, section *Anthelaea*] ..... ***[L. luzuloides ssp. luzuloides]***
- 2 Flowers borne singly; perianth tan to brown (the margins of the segments often translucent); inflorescences erect or lax, branching or not; seeds with a conspicuous appendage; [native species, widespread in our area]; [subgenus *Pterodes*].
  - 3 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***
  - 3 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*].
- 4 Inflorescence branches divergent, at least some widely spreading; glomerules capitate to broadly ovoid, not cylindric.... ..... ***L. echinata***
- 4 Inflorescence branches erect, none widely spreading; glomerules often cylindric (less commonly merely capitate).
  - 6 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***
  - 6 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***. Mt, Pd (NC, SC, VA): moist forests; common. April-August. Newfoundland west to Manitoba, south to SC and AR. [= RAB, C, F, FNA, G, GW, K; = *Juncoides saltuense* (Fernald) Small – S; < *L. acuminata* – W; = *L. acuminata* ssp. *acuminata* – Z]

Luzula acuminata Rafinesque *var. **carolinae*** (S. Watson) Fernald. Mt, Pd, Cp (GA, NC, SC, VA): moist forests; common. 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; = *L. acuminata* ssp. *carolinae* (S. Watson) Z. Kaplan – Z]

Luzula bulbosa (Wood) Smyth & Smyth. Pd, Mt (GA, NC, SC, VA), Cp (NC, VA): dry forests and fields; common. March-August. MA, PA, IN, and NE south to n. FL, LA, and c. TX. [= RAB, C, F, FNA, GW, K, Z; = *L. campestris* (Linnaeus) Augustin de Candolle var. *bulbosa* Wood – G; = *Juncoides bulbosum* – S; < *L. multiflora* – W]

Luzula echinata (Small) F.J. Hermann. Mt, Pd, Cp (GA, NC, SC, VA): forests, bogs; common. Se. MA, se. NY PA, WV, and IA south to GA, AL, MS, and e. TX. March-August. [= RAB, C, FNA, GW, K, Z; > *L. echinata* var. *echinata* – F; > *L. echinata* var. *mesochorea* F.J. Hermann – F; = *L. campestris* (Linnaeus) Augustin de Candolle var. *echinata* (Small) Fernald & Wiegand – G; = *Juncoides echinatum* Small – S; < *L. multiflora* – W]

Luzula multiflora (Ehrhart) Lejeune *var. **multiflora***. Mt, Pd, Cp (VA), {NC?, SC?}: forests; common. March-August. Newfoundland and Ontario, south to VA, KY, and MO. [= F; < *L. multiflora* – RAB, C; = *L. campestris* (Linnaeus) Augustin de Candolle var. *multiflora* (Ehrhart) Celak – G; = *L. multiflora* ssp. *multiflora* var. *multiflora* – K; = *L. multiflora* ssp. *multiflora* – FNA, Z; < *L. multiflora* – W]

* *Luzula luzuloides* (Lamarck) Dandy & Wilmott ssp. *luzuloides*, is a native of Europe, naturalized in ne. North America as far south as se. PA (Rhoads & Klein 1993). It may occur in our area. [= FNA, Z; < *L. luzuloides* – C, F, K]

JUNCAGINACEAE L.C. Richard 1808 (Arrowgrass Family)

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 ..... ***[T. maritima]***
1 Pistils 6, 3 fertile and 3 sterile; fruits **either** 7-8.3 mm **or** 1-2 mm long; central axis between broadly winged.
  2 Fruits elongate, 7-8.3 mm long; tepals 6; [of PA northward] ..... ***[T. palustris]***
  2 Fruits globose, 1-2 mm long; tepals 3; [of DE and MD southward ..... ***T. striata***

Triglochin striata Ruiz & Pavón, Southern Arrowgrass. Cp (GA, NC, SC, VA): brackish to nearly freshwater marshes; uncommon (VA Watch List). 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 FL and west to LA, and also on the west coast in CA and OR. [= F, FNA, G, K; = *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]

Triglochin palustris Linnaeus. Brackish coastal habitats and inland bogs. Circumboreal, south in North America to PA, IN, IA, NE, and NM. [= F, FNA, G, K; = *T. palustre* – C, Z, orthographic variant]

LEMNACEAE A. Gray 1821 (Duckweed Family)
[see ***ARACEAE***]

LILIACEAE A.L. de Jussieu 1789 (Lily Family)
(also see *AGAVACEAE*, *ALLIACEAE, ALSTROEMERIACEAE, AMARYLLIDACEAE, ASPARAGACEAE, COLCHICACEAE, HEMEROCALLIDACEAE, HOSTACEAE, HYACINTHACEAE, HYPOXIDACEAE, MELANTHIACEAE, NARTHECIACEAE, RUSCACEAE, SMILACACEAE, THEMIDACEAE, TOFIELDIACEAE, TRILLIACEAE*)

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); Tamura in Kubitzki (1998a).

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.*
LILIACEAE: *Clintonia, Erythronium, Lilium, Medeola, Prosartes, Streptopus, Tricyrtis, Tulipa.*
MELANTHIACEAE: *Amianthium, Anticlea, Chamaelirium, Helonias, Schoenocaulon, Stenanthium, Veratrum, Toxicoscordion, Xerophyllum, Zigadenus.*
SMILACACEAE: *Smilax.*
TRILLIACEAE: *Trillium.* (or to be included in MELANTHIACEAE)
ASPARAGALES
AGAVACEAE: *Camassia, Manfreda, Schoenolirion, Yucca.* (or to be included in ASPARAGACEAE)
ALLIACEAE: *Allium, Ipheion, Nothoscordum.*
AMARYLLIDACEAE: *Crinum, Galanthus, Hymenocallis, Leucojum, Lycoris, Narcissus, Sternbergia, Zephyranthes.* (or to be included in ALLIACEAE)
ASPARAGACEAE: *Asparagus.*
HEMEROCALLIDACEAE: *Hemerocallis.* (or to be included in XANTHORRHOEACEAE)
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, Calopogon, Cleistes, Coeloglossum, Corallorhiza, Cypripedium, Epidendrum, Epipactis, Galearis, Goodyera, Habenaria, Hexalectris, Isotria, Liparis, Listera, Malaxis, Platanthera, Pogonia, Ponthieva, Pteroglossaspis, Spiranthes, Tipularia, Triphora, Zeuxine.*
RUSCACEAE: *Convallaria, Liriope, Maianthemum, Nolina, Polygonatum.* (or to be included in ASPARAGACEAE)
THEMIDACEAE: *Dichelostemma*. (or to be included in ASPARAGACEAE)
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*, tribe *Tulipeae*] ..... ***Erythronium***
1 Leaves on a stem; flowers not scapose; tepals orange, red, rose, yellow, or white.
  3 Leaves whorled at at least 1 node.
    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***
    4 Leaves occurring at several nodes, these variously whorled and/or alternate; flowers orange, red, or yellow; [subfamily *Lilioideae*, tribe *Lilieae*] ..... ***Lilium***
  3 Leaves alternate at all nodes.
    5 Leafy stem branched; fruit a berry.
      6 Stems brownish, wiry; inflorescence terminal ..... ***Prosartes***
      6 Stems green, rather succulent; inflorescence axillary ..... ***Streptopus***
    5 Leafy stem unbranched; fruit a capsule.
      7 Leaves at 1-6 nodes; flowers cup-shaped, the tepals incurved-erect; [subfamily *Lilioideae*, tribe *Tulipeae*] ..... ***[Tulipa]***
      7 Leaves at 7 or more nodes; flowers with tepals recurved.
        8 Flowers whitish or lavender with darker spots; leaves often dark-spotted ..... [***Tricyrtis]***
        8 Flowers orange, red, or yellow (rarely white); leaves unspotted ..... ***Lilium***

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. Mt (GA, NC, VA): spruce-fir forests, northern hardwood forests, less commonly in red oak forests; common (GA Special Concern). Late May-June; July-September. Labrador west to Manitoba, 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. Mt (GA, NC, SC, VA): 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; common. 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 ..... ***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. Mt (GA, VA), Pd (VA): rich, mesic forests, in very nutrient-rich alluvial soils; rare (VA Rare). March-April. S. Ontario west to MN, south to n. VA, nw. GA, KY, sc. TN, MO, and OK. [= C, K, S, W, Y; = *E. albidum* var. *albidum* – F, G]

Erythronium americanum Ker-Gawler *ssp.* ***americanum***, American Trout Lily. Pd (NC, SC, VA), Mt, Cp (NC, VA): moist bottomland or slope forests, especially over mafic rocks; common in VA, much rarer in NC (NC Watch List). February-April; April-May. New Brunswick west to Ontario 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 than *E. umbilicatum* ssp. *umbilicatum*. [= FNA, GW, K, Y, Z; < *E. americanum* – RAB, F, G, S (also see *E. umbilicatum*); < *E. americanum* – C, W]

Erythronium americanum Ker-Gawler *ssp.* ***harperi*** (W. Wolf) Parks & Hardin, Harper's Trout Lily. Mt (GA): moist forests; rare. Ne. TN and nc. TN south to extreme se. TN, nw. GA, and nc. AL. [= FNA, GW, K, Y, Z; < *E. americanum* – S]

Erythronium umbilicatum Parks & Hardin *ssp.* ***monostolum*** Parks & Hardin, Southern Appalachian Trout Lily. Mt (NC): high elevation coves, slopes, and grassy balds; uncommon. 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. Mt, Pd, Cp (GA, NC, SC, VA): moist bottomland or slope forests, or in rather dry upland habitats; common. 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]

Erythronium rostratum W. Wolf, Beaked Trout Lily. C. TN, MO, and se. KS, south to c. AL, wc. LA, and se. OK. [= FNA, GW, K, Y, Z; < *E. americanum* – S]

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; [escaped exotic] ..... ***L. lancifolium***
1 Dark bulblets never produced; [native (except *L. formosanum*), though some species also cultivated].
  2 Flowers white; leaves narrowly linear; [escaped exotic] ..... ***L. formosanum***
  2 Flowers orange or yellow; leaves lanceolate, oblanceolate, or obovate; [native].
    3 Flowers erect, facing upwards; tepals clawed.
      4 Leaves (at least some of them) whorled or verticillate; [of the Mountains] ..... ***L. philadelphicum*** *var.* ***philadelphicum***
      4 Leaves all alternate; [of the Coastal Plain] ..... ***L. catesbaei***
    3 Flowers nodding or declined, facing downwards or to the side; tepals narrowed to the base, but not clawed.
      5 Leaves smooth on the margins and veins below, or minutely crenulate with scattered to moderately dense translucent papillae (at 10× or more), these rounded and broader than tall (if present).
        6 Leaves oblanceolate to obovate, thick in texture (subcoriaceous); inflorescence an umbel of 1-4 (rarely more) flowers; flowering plants 0.4-1.5 m tall; leaves alternate and whorled, often as many as 1/2 or more of the nodes bearing a single leaf ..... ***L. michauxii***
        6 Leaves lanceolate, thin in texture; inflorescence a raceme of (1-) 3-30 (-70) flowers; flowering plants 1-3 m tall; leaves mostly whorled, only a few of the lowermost and/or uppermost nodes bearing a single leaf ..... ***L. superbum***
      5 Leaves densely papillose-scabrid on the margins and usually also the veins beneath (at 10× or more), the papillae elongate (taller than broad).
        7 Leaves mostly alternate (the majority of nodes with a single leaf), typically with 1-8 whorls mid-stem, the remainder of the leaves alternate; plants with both bulbs and rhizomes; tepals recurved 180-360 degrees from the flower axis; inner tepals (petals) 1.25-1.5× as wide as the outer tepals (sepals); [of sphagnous sandhill seepage bogs of the upper Coastal Plain] ..... ***L. pyrophilum***
        7 Leaves mostly whorled (the majority of nodes with whorls of leaves, typically with 5-15 whorls, sometimes with several alternate leaves at the very bottom and top of the stem; plants with bulbs only; tepals recurved 25-90 degrees from the flower axis; inner tepals (petals) ca. 1× as wide as the outer tepals (sepals); [of various moist to wet habitats of the Mountains, occasionally cultivated and escaped elsewhere].
          8 Anthers 5-15 mm long; filaments strongly outcurved, the anthers borne far apart; tepals strongly recurved, usually > 150 degrees from the axis of the individual flower; [west of the Blue Ridge, in our area in nw. GA and also approaching our area in e. TN]..... ***L. michiganense***
          8 Anthers 4-10 mm long; filaments straight or nearly so, the anthers thus borne close together; tepals slightly to moderately recurved, from 10-120 degrees from the axis of the individual flower; [fairly widespread in the Mountains and Piedmont in our area, westwards and northwards].
            9 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 ..... ***L. grayi***
            9 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.
              10 Perianth yellow (rarely orange to red); mid-cauline leaves 5-10× as long as wide..... ***L. canadense*** *var.* ***canadense***
              10 Perianth orange to red; mid-cauline leaves 2-5× as long as wide ..... ***L. canadense*** *var.* ***editorum***

Lilium canadense Linnaeus *var.* ***canadense***, Yellow Canada Lily. Mt (NC, VA): wet meadows; uncommon (NC Rare). June-July; late July-September. Apparently ranging from New Brunswick 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; < *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. Mt, Pd (GA, NC, SC, VA): wet meadows, forest openings; uncommon (GA Special Concern, NC Rare, SC Rare). June-July; late July-September. According to Adams & Dress (1982), who emphasize tepal color in distinguishing the infraspecific taxa, ranging from New Brunswick west to s. Ontario, south (mostly in and west of the Appalachians) to n. GA and n. AL. Wherry (1946) and F 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; < *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. Cp (GA, NC, SC, VA): pine savannas, sandhill seeps; uncommon (VA Rare). Mid June-mid September; September-November. Se. NC south to FL and west to LA, on the Coastal Plain. [= GW, S; > *L. catesbaei* var. *catesbaei* – RAB; > *L. catesbaei* var. *longii* Fernald – RAB, C, F, G; > *L. catesbaei* ssp. *catesbaei* – K; > *L. catesbaei* ssp. *longii* (Fernald) Wherry – K, Y; > *L. catesbaei* ssp. *typicum* – Y]

* ***Lilium formosanum*** A. Wallace, Formosa Lily. Cp (NC): escaped from cultivation; rare, introduced from Asia. This species is introduced at various locations in the Southeast, including Florida and Louisiana (Kartesz 1999), and has been documented from Richmond Co. NC (Sorrie, pers. comm.). FNA states that this material may actually represent *L. philippinense* Baker. [= FNA, K]

Lilium grayi S. Watson, Gray's Lily, Roan Lily. Mt (NC, VA): bogs, seepages, grassy balds, moist forests, and wet meadows, at medium to high elevations; rare (US Species of Concern, NC Threatened, VA Rare). 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 lancifolium*** Thunberg, Tiger Lily. Pd (NC, VA): disturbed areas, trash heaps; rare, introduced from 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]

Lilium michauxii Poiret, Carolina Lily. Mt, Pd, Cp (GA, NC, SC, VA): dry upland forests, ridges, slopes, and ridges; common (uncommon in Coastal Plain). 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, X, Y, Z; < *L. michauxii* – RAB (also see *L. pyrophilum*); = *L. carolinianum* Michaux – S]

Lilium michiganense Farwell, Michigan Lily. Mt (GA): wet prairies and calcareous flatwoods; rare (GA Special Concern). Ontario 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. Mt (GA, NC, VA): grassy balds, moist to wet meadows (especially in thin soils over rock), open woodlands; rare (GA Special Concern, NC Rare, VA Watch List). June-July; August-October. The species ranges from ME west to British Columbia, 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. Ontario 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 British Columbia south to NM. [= C, F, G, K; < *L. philadelphicum* – RAB, FNA, S, W; = *L. philadelphicum* ssp. *philadelphicum* – Y]

Lilium pyrophilum M.W. Skinner & Sorrie, Sandhills Bog Lily. Cp (NC, SC, VA): peaty seepage bogs in the Sandhills and peaty swamp margins in the upper Coastal Plain; rare (US Species of Concern, NC Rare). July. 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. Mt (GA, NC, VA), Pd (GA, NC, VA), Cp (GA, NC, SC, VA): cove forests and moist forests, moist ravines, blackwater stream swamps; common (rare in Piedmont, rare in NC Coastal Plain). 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 as "*Lilium* species 1" (Weakley 1993). 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, S, W, X, Y, Z; < *L. superbum* – G (also see *L. michiganense*)]

Lilium iridollae M.G. Henry. Coastal Plain bogs. AL and Panhandle FL. [= FNA, GW; < *L. iridollae* – K (also see *L. pyrophilum*)] {not keyed at this time}

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. Mt, Pd, Cp (GA, NC, SC, VA): moist forests, usually with acidic soils; common. Mid April-mid June; September-October. Québec and Ontario 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. [= RAB, C, F, FNA, G, GW, K, S, W]

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); Shinwari et al. (1994)=X; 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, small, and moderately spreading relative to the stem; 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, large, and widely spreading relative to the stem; 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. Mt (GA, NC, SC, VA), Pd (VA): deciduous forests, especially coves; common. April-May; August-September. Primarily an Appalachian species: NY and s. Ontario south to n. GA (Jones & Coile 1988) and AL. [= FNA, K, X, Y; = *Disporum lanuginosum* (Michaux) Nicholson – RAB, C, F, G, S, W, Z]

Prosartes maculata (Buckley) A. Gray, Spotted Mandarin, Nodding Mandarin. Mt (GA, NC, VA): nutrient-rich deciduous forests, especially cove forests; rare (NC Watch List, VA Rare). April-May; July-August. AL, n. GA, KY, MI, w. NC, OH, TN, w. VA, and 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, X, Y; = *Disporum maculatum* (Buckley) Britton – RAB, C, F, G, S, W, 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) Augustin de Candolle *var.* ***amplexifolius***, White Mandarin, Pagoda-bells. Mt (NC, VA): moist forests and seepages at high elevations; rare (NC Rare, VA Rare). 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 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. Mt (GA, NC, VA): moist forests at high elevations; uncommon (GA Rare). 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. 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. Ontario and nw. PA west to MI, WI, MN, and s. Manitoba. Var. *curvipes* (Vail) Fassett is western, ranging from AK to se. British Columbia 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; > *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]

Tricyrtis Wallich 1826 (Toadlily)

A genus of about 18 species, of e. Asia. References: Tamura in Kubitzki (1998a).

* *Tricyrtis hirta* (Thunberg) Hooker, Toadlily, native of e. Asia, is cultivated as an ornamental and may escape or persist, as in se. PA (Rhoads & Klein 1993). [= 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, is very commonly cultivated and is "occasionally naturalized in moist meadows, fields and roadsides" in se. PA (Rhoads & Klein 1993) and MD (Kartesz 1999). [= FNA, K]

MARANTACEAE Petersen in Engler & Prantl 1888 (Arrowroot Family)

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 ..... ***Th. dealbata***
1 Flowers separated on the rachis, thye zigzag internodes 5-10 mm long; leaves glabrous at the base on the upper surface; bracts of the inflorescence green or purple, not pruinose ..... ***[Th. geniculata]***

Thalia dealbata Fraser ex Roscoe, Powdery Thalia, Powdery Alligator-flag. Cp (GA, SC): swamp forests, wet ditches, brackish marshes; rare (GA Rare). May-September; June-October. Ne. SC south to FL, west to TX and OK. [= RAB, FNA, GW, K, S]

Thalia geniculata Linnaeus, Lilies, Bent Thalia, Bent Alligator-flag. Ponds, sloughs, marshes. AL, FL, LA, south through the New World tropics. [= FNA, GW, K, S]

MAYACACEAE Kunth 1840 (Bogmoss Family)

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 (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 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, Z; > *M. aubletii* Michaux – RAB, S; > *Mayaca fluviatilis* – RAB, S]

MELANTHIACEAE Batsch 1802 (Bunchflower Family)

A family of about 16 genera and 170 species, mostly temperate and northern hemisphere, but extending into South America. Further modifications of the circumscription of the Melanthiaceae (and re-assignments of genera) may be needed; see Zomlefer et al. (2001) and Tamura et al. (2004). References: Dahlgren, Clifford, & Yeo (1985); Zomlefer (1997a, 1999)=Z; Zomlefer (1996, 2003); Tamura in Kubitzki (1998a); Zomlefer et al. (2001).

1 Leaves 3, whorled at the summit of the stem ..... ***[Trillium in TRILLIACEAE]***
1 Leaves many, not whorled at the summit of the stem.
  2 Leaves 1-2 mm wide, linear, stiff, sclerified ..... ***Xerophyllum***
  2 Leaves 3-150 mm wide, linear, obovate, or oblanceolate, not notably stiff.
    3 Flowers pink ..... ***Helonias***
    3 Flowers white, cream, yellowish, or greenish, or brownish.
      4 Inflorescence a panicle.
        5 Inflorescence axes scurfy-pubescent; seeds winged; leaves **either** linear **or** broader, < 14 cm wide ..... ***Veratrum***
        5 Inflorescence axes glabrous; seeds not winged (though sometimes angled); leaves linear, < 2 cm wide.
          6 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***
          6 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.
            7 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***
            7 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***
      4 Inflorescence a spike or raceme.
        8 Leaves obovate, distinctly wider towards the rounded tip, 15-60 cm wide ..... ***Chamaelirium***
        8 Leaves linear, with parallel margins, 2-23 mm wide.
          9 Inflorescence a spike ..... ***Schoenocaulon***
          9 Inflorescence a raceme.
            10 Basal leaves many, 4-23 mm wide; capsule 5-7 mm long, 5-7 mm wide; bulb broadly ovoid ..... ***Amianthium***
            10 Basal leaves 1-3, 2-7 mm wide; capsule 7-9 mm long, 3-4 mm wide; bulb cylindrical ..... ***Stenanthium densum***

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 (1997)=Z; Zomlefer & Judd (2002)=Y; Utech in FNA (2002a); Tamura in Kubitzki (1998a).

Amianthium muscitoxicum (Walter) A. Gray, Fly-poison. Mt, Pd, Cp (GA, NC, SC, VA): mesic forests, pine savannas, meadows; common. 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, FNA, G, GW, W, 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 & Judd (2002)=Y; Zomlefer et al. (2001); Schwartz in FNA (2002a).

Anticlea glauca Kunth, White Death-camas. Mt (NC, VA): limestone and dolostone woodlands, glades, cliffs, and outcrops; rare (NC Rare, VA Watch List). 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 Québec 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 VA and 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 New Brunswick west to ND, south to 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; = *Z. glaucus* Nuttall – RAB, F, W, Z; = *Z. elegans* var. *glaucus* (Nuttall) Preece – C; < *Z. elegans* – FNA; = *Zygadenus glaucus* – G, orthographic variant; < *Anticlea chlorantha* (Richardson) Rydberg – S, misapplied]

Chamaelirium Willdenow 1808 (Devil's-bit)

A monotypic genus, an herb of temperate e. North America. References: Zomlefer (1997)=Z; Tamura in Kubitzki (1998a); Utech in FNA (2002a).

Chamaelirium luteum (Linnaeus) A. Gray, Devil's-bit. Mt, Pd, Cp (GA, NC, SC, VA): moist slopes, bottomlands, wet savannas; common (rare in Coastal Plain). March-May; September-November. MA west to Ontario, 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. *Ch. obovale* Small (or other previously unnamed entities) may warrant recognition at some level. [= RAB, C, F, FNA, G, GW, K, W, Z; > *Ch. luteum* – S; > *Ch. 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. References: Zomlefer (1997)=Z; Utech in FNA (2002a); Tamura in Kubitzki (1998a).

Helonias bullata Linnaeus, Swamp Pink. Mt (GA, NC, SC, VA), Cp (VA): bogs, usually under dense shrubs in peaty soils, in the VA Coastal Plain in acidic sandy seepage swamps; rare (US Threatened, GA Threatened, NC Threatened, SC Rare, VA Endangered). 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]

Melanthium Linnaeus 1753 (Bunchflower)
(see *Veratrum*)

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; Tamura in Kubitzki (1998a); Frame in FNA (2002a).

Schoenocaulon dubium (Michaux) Small, Florida Feathershank. Cp (GA): dry pine savannas, sandhills; rare (GA Special Concern). S. GA and n. peninsular FL south to s. peninsular FL. [= FNA, K, S, 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 (1997)=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 5-20 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. Cp (GA, NC, SC, VA): pine savannas, pine flatwoods; common, rare in VA (VA Rare). April-early June; late May-July. Se. VA south to 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 (also including *S. leimanthoides*); = *Zygadenus densus* – G (an orthographic variant); *Tracyanthus angustifolius* (Michaux) Small – S]

Stenanthium gramineum (Ker-Gawler) Morong *var.* ***gramineum***, Common Featherbells. Cp, Pd (GA, NC, VA), Mt (NC): moist forests, grassy balds, to 1700m in elevation; uncommon. 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, Z]

Stenanthium gramineum (Ker-Gawler) Morong *var.* ***micranthum*** Fernald, Small Featherbells. Mt (GA, NC, SC, VA), Pd (GA, NC, VA): dry upland forests and woodlands; uncommon. July-early September; August-October. W. VA and TN south to panhandle FL and n. AL. [= F, K; < *S. gramineum* – RAB, C, FNA, G, S, W, Z]

Stenanthium gramineum (Ker-Gawler) Morong *var.* ***robustum*** (S. Watson) Fernald, Giant Featherbells, Bog Featherbells. Mt (NC, VA?): wet meadows, bogs; rare (NC Watch List). July-early September; August-October. PA south to w. NC. [= F, K; = *S. robustum* S. Watson – S; < *S. gramineum* – RAB, C, FNA, G, W, Z]

Stenanthium leimanthoides (A. Gray) Zomlefer & Judd, Pinebarrens Death-camas. Mt (NC, VA), Cp (GA): high elevation rock outcrops, shrub balds, seepage areas at high elevations, in the Coastal Plain in sandhill bogs and wet pine savannas; rare (GA Special Concern, NC Rare, VA Rare). 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 2 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 *Leiophyllum buxifolium* 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, Z; < *Zigadenus densus* (Desrousseaux) Fernald – FNA; = *Zygadenus leimanthoides* – G (an orthographic variant); = *Oceanoros leimanthoides* (A. Gray) Small – S]

Stenanthium diffusum Wofford, Rockhouse Featherbells. Sandstone rockhouses of the Cumberland Plateau of ne. TN (known from Fentress, Morgan, Pickett, Scott counties, TN; to be sought in adjacent KY).

Veratrum Linnaeus 1753 (White-hellebore)

A genus of about 55 species, herbs of temperate Northern Hemisphere. *Veratrum* is here interpreted broadly, including *Melanthium*, following the molecular phylogeny work of Zomlefer et al. (2003). 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. latifolium***
    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 latifolium (Desrousseaux) Zomlefer, Crisped Bunchflower. Mt (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): moist forests; uncommon (rare in Coastal Plain and Piedmont) (GA Special Concern). July-August; September-October. An Appalachian endemic: CT south to NC and SC. [= Z; = *Melanthium hybridum* Walter – RAB, C, F, G, W, misapplied; = *Melanthium latifolium* Desrousseaux – FNA, K, S]

Veratrum parviflorum Michaux, Mountain Bunchflower. Mt (GA, NC, SC, VA): moist to rather dry forests, up to at least 1700m; common. July-early September; August-October. A Southern Appalachian endemic: 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]

Veratrum virginicum (Linnaeus) Aiton, Bog Bunchflower, Virginia Bunchflower. Cp (GA, NC, SC, VA), Mt, Pd (NC, SC, VA): savannas, bogs, seepage bogs, wet forests; uncommon (SC Rare). June-August; August-October. Widespread in e. North America. 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*). [= Z; *Melanthium virginicum* Linnaeus – RAB, C, F, FNA, G, GW, K, W; > *Melanthium dispersum* Small – S; > *Melant\hium virginicum* – S]

Veratrum viride Aiton, White-hellebore, Indian Poke, Green Hellebore, Cornhusk Lily. Mt (GA, NC, VA), Pd (VA): seeps, streambanks, wet boulderfields; common (GA Special Concern). June-August; July-September. Québec and Ontario 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, 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. Mt (GA, NC), Cp (GA): circumneutral soil of woodlands over mafic rocks (such as amphibolite) or other calcareous substrates; rare (GA Rare, NC Rare). 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, and sw. NC (Polk County). [= C, F, G, Z; = *Melanthium woodii* (J.W. Robbins ex Wood) Bodkin – FNA, K; > *V. intermedium* Chapman – S]

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. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): 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; uncommon (GA Rare, NC Watch List, SC Rare). May-June; July-August. In two disjunct areas; the Coastal Plain of s. NJ and DE, and the Southern Appalachians from w. VA 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, Z]

Zigadenus Michaux 1803 (Death-camas)
(also see *Anticlea, Stenanthium*)

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).

1 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, bearing 2 glands well above the base ..... ***Zigadenus glaberrimus***
1 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.
  2 Inner tepals (petals) 7-12 mm long, clawed, with a single bilobed gland borne well above the base; [of calcareous habitats in the Mountains] ..... *[see **Anticlea elegans**]*
  2 Inner tepals 3-6 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 and Coastal Plain].
    3 Inflorescence a raceme; flowers all bisexual; plants 3-10 dm tall; flowering April-early June; [(in our area) of the Coastal Plain] ..... ***[**see **Stenanthium densum]***
    3 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 5-20 dm tall; flowering July-August; [(in our area) of the Mountains] ..... ***[**see **Stenanthium leimanthoides]***

Zigadenus glaberrimus Michaux, Large Death-camas, Snakeroot. Cp (GA, NC, SC, VA): sandhill seepage bogs, pine savannas, pocosin edges; common, rare in VA (VA Rare). Late June-early September; August-November. Se. VA south to panhandle FL, west to se. TX, on the Coastal Plain. This species is superficially somewhat similar to *Melanthium virginicum*; *Z. glaberrimus* has the stem and inflorescence axis glabrous (vs. scurfy-pubescent in *M. virginicum*). [= RAB, C, F, FNA, GW, K, Z; = *Zygadenus glaberrimus* – G, S (an orthographic variant)]

NAJADACEAE A.L. de Jussieu 1789 (Naiad Family)

A family of a single genus and about 40 species, nearly cosmopolitan. The Najadaceae should perhaps be merged into the Hydrocharitaceae (Haynes, Holm-Nielsen, & Les 1998b). References: Haynes in FNA (2000); Haynes (1979)=Z; Haynes & Hellquist (1996); Haynes, Holm-Nielsen, & Les in Kubitzki (1998b).

Najas Linnaeus 1753 (Naiad, Bushy-pondweed, Water-nymph)

A genus of about 40 species, nearly cosmopolitan. Probably better included in the Hydrocharitaceae (Angiosperm Phylogeny Group (2003). 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 flexilis (Willdenow) Rostkovius & Schmidt, Northern Naiad. Cp, Pd, Mt (VA): lakes and rivers; uncommon. July-August. Newfoundland west to Ontario, south to VA, MD, MO, and NE; also in the west from Alberta and Saskatchewan south to OR and UT. [= C, F, FNA, G, K, S, W, Z; = *Naias flexilis* – S, orthographic variant]

Najas gracillima (A. Braun ex Engelmann) Magnus, Slender Naiad, Bushy Naiad. Mt, Cp (NC, SC, VA), Pd (NC, VA): ponds and lakes; uncommon. July-October. Nova Scotia west to MN, south to NC, AL, and MO; disjunct in CA. Haynes (1979) reports that this species cannot tolerate pollution and is apparently declining in abundance. [= RAB, C, F, FNA, G, K, W, Z]

Najas guadalupensis (Sprengel) Magnus *var.* ***guadalupensis***, Common Naiad, Southern Naiad. Cp, Pd, Mt (GA, NC, SC, VA): lakes and rivers; common. July-October. Var. *guadalupensis* ranges from ME west to Alberta 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, infraspecific taxa not distinguished; = *Najas guadalupensis* ssp. *guadalupensis* – FNA, K; *Naias guadelupensis* – S, orthographic variant and infraspecific taxa not distinguished]

* ***Najas minor*** Allioni, Spinyleaf Naiad. Pd, Mt, Cp (GA, NC, SC, VA): ponds, lakes, and reservoirs, particularly where eutrophic; uncommon, 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, Z]

Najas filifolia Haynes, Narrowleaf Naiad. Cp (GA): lakes; rare (GA Special Concern). Sw. GA (Jones & Coile 1988) to FL (Haynes in FNA 2000). [= FNA, K, Z; = *Najas ancistrocarpa* A. Braun – GW] {not keyed at this time}

Najas guadalupensis (Sprengel) Magnus *var.* ***floridana*** Haynes & Wentz, in 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 keyed at this time}

Najas marina Linnaeus, Holly-leaf Naiad, occurs both n. and s. of our area and should be sought. It occurs in brackish or calcareous waters. It is dioecious (vs. monoecious in our 4 species), and has the lower side of the midvein of the leaves prickly (vs. smooth in our 4 species). [= C, F, FNA, G, K; = *Naias marina* – S, orthographic variant]

NARTHECIACEAE E.M. Fries 1846 (Bog-asphodel Family)

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. Cp (GA, NC, SC, VA): pine savannas, seepage bogs, pine flatwoods; uncommon (VA Rare). Mid May-July; August. S. MD south to c. peninsular 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, X, Y, Z]

Aletris farinosa Linnaeus, Northern White Colic-root, Mealy Colic-root, Stargrass. Cp, Mt, Pd (GA, NC, SC, VA): pine savannas, pine flatwoods, seepage bogs, upland woodlands, roadbanks; common. Late April-early June; July-August. S. ME, s. Ontario, 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, X, Z]

Aletris lutea Small, Yellow Colic-root. Cp (GA): pine savannas; uncommon. E. GA (in immediate proximity to the SC border) south to s. FL, and west to e. LA (Weigant 2002). 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, X, Y, Z]

Aletris obovata Nash ex Small, Southern White Colic-root. Cp (GA, SC): pine savannas; rare (SC Rare). May-early June; August. Se. SC south to c. peninsular FL, west to s. MS. [= RAB, FNA, GW, K, S, X, Y, Z]

Lophiola Ker-Gawler 1814 (Golden Crest)

A monotypic genus, of temperate e. North America. As here interpreted to include *L. americana* and *L. septentrionalis*, *Lophiola* is monotypic, consisting only of *L. aurea*. *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 (or a very broad Liliaceae), as shown by studies of anatomy, pollen ultrastructure, and chemistry, though its placement in that family is also not without problems (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. Cp (GA, NC): mucky depressions in wet savannas, and in adjacent ditches; rare (GA Special Concern, NC Endangered). Late May-June; August-September. A species of Southeastern Coastal Plain affinities, but with a peculiar, fragmented distribution, occurring primarily on the Gulf Coast from FL and sw. GA west to MS, with disjunct segments of range in se. NC, n. DE and s. NJ, and Nova Scotia. 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; [of 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; [of Mountain bogs] ..... ***N. montanum***

Narthecium americanum Ker-Gawler, Yellow Asphodel. Cp (SC): wet seepages or savannas; rare (US Species of Concern, NC Endangered, SC Rare). June-July; August-September. S. NJ and DE; disjunct in c. SC. It is still possible that this species will be relocated in our area, perhaps in mucky seepages in the Sandhills. [= C, F, G, Q, X; < *Narthecium americanum* – RAB, FNA, GW, K, W, Y, in part only (also see *N. montanum*); = *Abama americana* (Ker-Gawler) Morong – S, Z]

Narthecium montanum (Small) C.H. Grey, Appalachian Yellow Asphodel. Mt (NC): bogs; rare (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. [= Q, X; < *Narthecium americanum* – RAB, FNA, GW, K, W, Y, in part; = *Abama montana* Small – S, Z]

NOLINACEAE Nakai 1943 (Beargrass Family)

(see *RUSCACEAE*)

ORCHIDACEAE A.L. de Jussieu 1789 (Orchid Family)

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 (*Cleistes* 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 ..... ***Cleistes***
          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).

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. Mt, Pd (GA, NC, SC, VA), Cp (VA): rich, mesic forests; common. May-June. Québec 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).

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. *Cleistes* has 3 brown to purplish brown sepals.

Arethusa bulbosa Linnaeus, Dragon's-mouth, Bog-rose, Arethusa. Mt (NC, SC, VA): bogs; rare (NC Endangered, SC Rare, VA Rare). May-June. Widespread in ne. North America, south to NJ and IN 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]

Calopogon R. Brown 1813 (Grass-pink)

A genus of 5 species (one with two varieties), endemic to e. North America. The only other taxon 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. 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 of each plant opening simultaneously..... ***C. barbatus***
  2 Leaf not appressed to the inflorescence during flowering; flowers > 1 cm apart; flowers faintly to distinctly fragrant; flowers of each 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. Cp (GA, NC, SC): savannas, sandhill seeps; rare (NC Watch List, SC Rare). April-early May. A Southeastern Coastal Plain endemic: se. NC south to c. FL and west to e. LA. [= RAB, FNA, GW, K, L, X, Y, Z; = *Limodorum parviflorum* (Lindley) Nash – S]

Calopogon multiflorus Lindley, Many-flowered Grass-pink. Cp (GA, NC, SC?): pine savannas, pine flatwoods, pitcher plant bogs; rare (GA Special Concern, NC Rare). May-June. A Southeastern Coastal Plain endemic: FL and e. GA to LA, with disjunct populations in Onslow Co., NC. Reported for SC (Charleston-Berkeley Co. line) (P. McMillan 2000). [= FNA, GW, K, L, X, Y, Z; = *Limodorum multiflorum* (Lindley) C. Mohr – S]

Calopogon oklahomensis D.H. Goldman, Oklahoma Grass-pink. Cp (GA, SC): pine savannas; rare. 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. Cp (GA, NC, SC, VA): savannas, sandhill seeps; uncommon (VA Rare). May-July. A Southeastern Coastal Plain endemic: se. VA south to FL and west to LA. [= RAB, C, F, FNA, G, GW, K, L, X, Y, Z; = *Limodorum pallidum* (Chapman) C. Mohr – S]

Calopogon tuberosus (Linnaeus) Britton, Sterns, & Poggenburg *var.* ***tuberosus***, Common Grass-pink. Cp, Mt, Pd (GA, NC, SC, VA): savannas, sandhill seeps, floating peat mats, in the Piedmont and Mountains in bogs; uncommon, rare in Mountains and Piedmont (VA Watch List). April-July. Widespread in e. North America, also in Cuba and the West Indies; var. *simpsonii* (Chapman) Magrath occurs in FL, Cuba, and the West Indies. [= FNA, K, L, Y, Z; = *C. pulchellus* R. Brown – F, G, RAB, X; < *C. tuberosus* – C, GW, W; = *Limodorum tuberosum* Linnaeus – S]

Cleistes L.C. Richard ex Lindley 1840 (Spreading Pogonia, Rosebud Orchid)

As traditionally circumscribed, a genus of about 55 species, primarily of tropical America. The circumscription of this genus is uncertain (Cameron & Chase 1999; Cameron et al. 1999; Pridgeon et al. 1999c); it appears that North American "*Cleistes*" is not closely related to South American *Cleistes* (which includes the type of the genus), and either a new genus will need to be named to house our two species, or alternatively, *Pogonia*, *Isotria*, and N. American "*Cleistes*" could be combined into *Pogonia* (a generic disposition popular many decades ago). References: Catling & Gregg (1992)=Z; Gregg & Catling in FNA (2002a); Gregg (1991).

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 (Coastal Plain populations) or odorless (Mountain and upper Piedmont populations) ..... ***C. bifaria***
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***

Cleistes bifaria (Fernald) Catling & Gregg, Small Spreading Pogonia. Mt (GA, NC, SC, VA), Cp, Pd (GA, NC, SC): savannas, sandhill seeps, moist to fairly dry meadows, dry ridgetops under pines (where seasonally moist); uncommon (GA Special Concern, VA Rare). May-July. The species ranges in the Mountains and Piedmont from WV south through w. VA, e. KY, w. NC, and e. TN to w. SC, n. GA and n. AL, and in the Coastal Plain from se. NC to c. peninsular FL and west to e. LA (Catling & Gregg 1992). Catling & Gregg (1992) make a convincing case for the recognition of *C. bifaria* and *C. divaricata* as

specifically distinct, based on differences in morphology, range, phenology (in the sympatric portions of their ranges), and floral fragrance. The co-occurrence of the two species at such sites as the Green Swamp, Brunswick County, NC, where phenologically separated, supports their taxonomic status. Where co-occurring, *C. bifaria* flowers on average about 10 days before *C. divaricata*. More recent studies (Smith et al. 2004) suggest the probability that montane and Coastal Plain populations of "*C. bifaria*" represent 2 different species. [= FNA, K, Z; < *C. divaricata* – RAB, C, G, GW, L, S, W, X; = *C. divaricata* var. *bifaria* Fernald – F; = *Pogonia bifaria* (Fernald) P.M. Brown & Wunderlin]

Cleistes divaricata (Linnaeus) Ames, Large Spreading Pogonia. Cp (GA, NC, SC, VA): pine savannas; uncommon (VA Rare). May-mid June. S. NJ to sw. GA and ne. FL, in the Coastal Plain; reports from more inland areas are based on a taxonomic concept of *C. divaricata* including *C. bifaria*. [= FNA, K, Z; < *C. divaricata* – RAB, C, G, GW, K, L, S, W, X (also see *C. bifaria*); = *C. divaricata* var. *divaricata* – F; = *Pogonia divaricata* (Linnaeus) R. Brown]

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* Neck. 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).

Coeloglossum viride (Linnaeus) Hartman *var.* ***virescens*** (Muhlenberg ex Willdenow) Luer, Long-bracted Frog Orchid. Mt (NC, VA): moist woods; uncommon, rare south of VA (NC Rare). 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).

1 Lip with two lateral teeth or lobes; lateral sepals spreading to down-curved.
  2 Sepals 1-veined ..... ***[C. trfida]***
  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. Mt (VA): dry-mesic to mesic forests, especially near roadsides; rare. 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 Monroe and Pocahontas counties, WV, and Giles, Alleghany, and Bath counties, VA. It is most closely related to *C. striata* Lindley. [= FNA, Z]

Corallorhiza maculata (Rafinesque) Rafinesque *var.* ***maculata***, Eastern Spotted Coralroot. Mt (GA, NC, VA): moist forests, northern hardwood forests; uncommon (GA Special Concern). July-August. Var. *maculata* is irregularly distributed in much of North America, primarily northern, from Newfoundland Québec, and MN south to PA, OH, and IN, and south in the Appalachians to ne. GA, in the west from British Columbia 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, X; < *Corallorrhiza maculata* – S, orthographic variant]

Corallorhiza maculata (Rafinesque) Rafinesque *var.* ***occidentalis*** (Lindley) Ames, Western Spotted Coralroot. Mt (VA): forests; rare (VA Rare). 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. Ontario, 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, X; < *Corallorrhiza maculata* – S, orthographic variant]

Corallorhiza odontorhiza (Willdenow) Poiret, Autumn Coralroot. Mt, Pd, Cp (GA, NC, SC, VA): forests; uncommon. August-October. The cleistogamous form is the more common, and is widespread in e. North America, from ME, NY, s. Ontario, MI, and MN south to SC, c. GA, 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 Ontario, 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, 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 wisteriana Conrad, Spring Coralroot. Mt, Pd, Cp (GA, NC, SC, VA): moist forests; rare (NC Watch List). 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, X, Z; = *Corallorrhiza wisteriana* – S, orthographic variant]

Corallorhiza trifida Châtelain, Early Coralroot, Pale Coralroot. Boreal forests, bogs, peaty swamps. May. South to DC {specimen at NCU}, MD, WV, PA, NJ (Magrath & Freudenstein in FNA 2002, Kartesz 1999), and, allegedly, to GA (Small 1933). [= FNA, G, K, L, Z; > *C. trifida* var. *verna* (Nuttall) Fernald – C, F; = *Corallorrhiza corallorrhiza* – S]

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). 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 Outer surface of uppermost sheathing bract glabrous or sparsely or inconspicuously pubescent when young; pouch-like lip 15-29 mm long; flower scent intense and sweet..... ***[C. parviflorum var. makasin]***
        5 Outer surface of uppermost sheathing bract densely and conspicuously silvery-pubescent when young, or rarely glabrescent; pouch-like lip 2.0-5.4 cm long; flower scent moderate to faint, rose-like or pungent-musty.
          6 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***
          6 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. Pd, Mt (GA, NC, SC, VA), Cp (NC, SC, VA): dry to mesic, acid forests and woodlands, often under pine or other conifers; common. April-July. Newfoundland west to n. Alberta, south to NC, SC, TN, n. IN, and MN. [= RAB, C, F, FNA, G, K, L, W, X; = *Fissipes acaulis* (Aiton) Small – S]

Cypripedium candidum Muhlenberg ex Willdenow, White Lady's-slipper. Mt (VA): calcareous barrens; rare (VA Rare). NY and NJ west to ND, south to w. VA and MO. [= C, F, FNA, G, K, L, X]

Cypripedium kentuckiense C.F. Reed, Kentucky Yellow Lady's-slipper. Cp (GA, VA): sandy ravine bottoms and springhead seeps along small streams; rare (GA Special Concern, VA Rare). 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 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. Mt (GA, NC, VA): mesic forests, seepy forests over amphibolite, other habitats; rare (NC Watch List). April-June. Rather widespread in North America, south in the east to NC and GA. 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, in part; = *C. parviflorum* – K, S; = *C. calceolus* var. *parviflorum* (Salisbury) Fernald – C, F, L, W]

Cypripedium parviflorum Salisbury *var.* ***pubescens*** (Willdenow) Knight, Large Yellow Lady's-slipper, Whippoorwill Shoes. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (VA): rich mesic forests; uncommon (NC Watch List, SC Rare). April-June. Widespread in e. North America. [= FNA, Y, Z; < *C. calceolus* Linnaeus var. *pubescens* (Willdenow) Correll – RAB, G, X (also see *C. parviflorum* var. *parviflorum*); = *C. pubescens* Willdenow – K, S; = *C. calceolus* var. *pubescens* (Willdenow) Correll – C, F, L, W]

Cypripedium reginae Walter, Showy Lady's-slipper, Queen Lady's-slipper. Mt (GA?, NC*, VA): over circumneutral to basic rocks, or (allegedly) in mossy wet forests under *Rhododendron*; rare (NC Watch List, VA Rare). May-June. Widespread in ne. North America, south to NC (?), GA, TN, and AR. 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, X]

Cypripedium parviflorum Salisbury var. *makasin* (Farwell) Sheviak ranges south to PA and NJ (Kartesz 1999). Var. *makasin* is the northern, small-flowered plant, characteristically of calcareous fens, often confused with var. *parviflorum*. It may reach our area. [= K, Y, Z] {synonymy incomplete}

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).

Epidendrum magnoliae Muhlenberg, Green-fly Orchid. Cp (GA, NC, SC): epiphytic on limbs of trees, especially *Taxodium*, in blackwater river swamps, usually on relatively horizontal limbs mixed with *Pleopeltis polypodioides*, also rarely in crevices of Altamaha Grit outcrops; uncommon (NC Rare, SC Rare). July-October. The northernmost epiphytic orchid: se. NC south to FL and west to LA; also in ne. Mexico. It is locally rather common, but rarely seen as it occurs 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, 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).

* ***Epipactis helleborine*** (Linnaeus) Crantz, Broad-leaved Helleborine. Mt (GA, NC, VA): forests; rare, introduced from 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, X; = *E. latifolia* (Linnaeus) Allioni – G]

Eulophia R. Brown ex Lindley 1823
(also see *Pteroglossaspis*)

A genus of about 215 species, pantropical (Romero-González in FNA 2002). References: Romero-González in FNA (2002a).

Eulophia alta (Linnaeus) Fawcett & Rendle, Wild Coco. Cp (GA): flatwoods, swamps; rare. 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]

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).

Galearis spectabilis (Linnaeus) Rafinesque, Showy Orchis. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): rich, deciduous forests, most typically over calcareous or mafic rocks; common (SC Rare). April-July. New Brunswick and Québec west to MN, south to GA and AR. [= FNA, K, L, W; = *Orchis spectabilis* Linnaeus – RAB, C, F, G, 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).

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. Mt, Pd, Cp (GA, NC, SC, VA): dry to moist forests and woodlands; common. June-August. New Brunswick west to Ontario 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, X; = *Peramium pubescens* (Willdenow) MacM. – S]

Goodyera repens (Linnaeus) R. Brown, Lesser Rattlesnake-orchid. Mt (NC, SC, VA): moist forests, usually under conifers and rhododendrons; uncommon (NC Watch List, VA Watch List). 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, X; > *Peramium ophioides* (Fernald) Rydberg – S]

Goodyera tesselata Loddiges, Checkered Rattlesnake-plantain, south to MD, PA, and NJ (Kallunki in FNA 2002, Kartesz 1999). Probably an allopolyploid, derived from *G. oblongifolia* × *repens*. [= FNA, C, F, G, K, L, X]

Habenaria Willdenow 1805 (Longspur Orchid, Habenaria)
(also see *Coeloglossum*, *Platanthera*)

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).

1 Spur 4-10 cm long; [terrestrial, though in moist habitats].....***H. quinqueseta***
1 Spur 0.4-1.4 cm long; [aquatic or semi-aquatic in marshes and swamps].....***H. repens***

Habenaria quinqueseta (Michaux) A. Eaton, Long-horned Habenaria. Cp (GA, SC): pine flatwoods, pinelands, Altamaha Grit outcrops, rarely in swamps; rare (GA Special Concern, SC Rare). August-October. *H. quinqueseta* (in the narrow sense) ranges from SC south to s. FL, west to se. TX. The related *H. macroceratitis* Willdenow, differing in its spur 12-18 cm long (vs. 4-10 cm) occurs in peninsular FL; also in the West Indies, Mexico, Central America, and n. South America. [= FNA, K; = *H. quinqueseta* var. *quinqueseta* – L; < *H. quinqueseta* – RAB, GW, S, X (including *H. macroceratitis*)]

Habenaria repens Nuttall, Water-spider Orchid, Floating Orchid. Cp (GA, NC, SC, VA?): blackwater swamps, pools, banks of creeks and rivers; rare (NC Watch List, VA Rare). 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, X]

Hexalectris Rafinesque 1825 (Crested Coralroot)

A genus of about 7 species, mycotrophic, of s. North America. References: Catling & Engel (1993)=Z; Catling (2004)=Y; Goldman, Coleman, Magrath, & Catling in FNA (2002a).

Hexalectris spicata (Walter) Barnhart *var*. ***spicata***, Crested Coralroot, Brunetta. Pd, Mt, Cp (GA, NC, SC, VA): dry forests and woodlands, especially over mafic or calcareous rocks, such as diabase, gabbro, calcareous siltstone, and dolomite (though sometimes in distinctly acid situations); rare (NC Rare, VA Watch List). July-August. Var. *spicata* is widespread in se. North

America, ranging from MD, OH, and MO south to FL, TX, and Mexico. Var. *arizonica* (S. Watson) Catling & Engel, an autopollinating relative, is distributed from e. TX west to AZ, south into Mexico. The yellow and purple flowers borne on a brown stem present a very peculiar color combination. The genus is primarily Mexican. [= FNA, Y, Z; < *H. spicata* – RAB, C, F, G, K, L, S, W, 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).

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. Mt (GA, NC, SC), Pd (NC, VA), Cp (NC): moist forests, in the mountains and upper Piedmont usually with *Pinus strobus*; rare (US Endangered, GA Threatened, NC Endangered, SC Rare, VA Endangered). 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. Mt, Pd, Cp (GA, NC, SC, VA): moist to dry forests; common (uncommon in GA, SC, NC). April-July. Widespread in e. North America, from ME and MI south to panhandle FL and e. TX. [= RAB, C, F, FNA, G, K, L, S, W, X; = *Pogonia verticillata* (Muhlenberg ex Willdenow) Nuttall]

Liparis L.C. Richard 1817 (Wide-lip Orchid, Twayblade)

A genus of about 250-350 species, cosmopolitan. Regerences: Magrath in FNA (2002a).

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. Mt (GA, NC, SC, VA), Pd (GA, NC, VA), Cp (NC, VA): moist forests, floodplains; uncommon (SC Rare). May-July. VT and Ontario west to MN, south to GA and AR; also in China. [= RAB, C, F, FNA, G, GW, K, L, S, W, X]

Liparis loeselii (Linnaeus) L.C. Richard, Fen Orchid, Loesel's Twayblade, Bog Twayblade, Yellow Wide-lip Orchid. Mt (NC, VA), Cp (NC, VA), Pd (VA): 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; rare (NC Rare, VA Rare). May-July. Nova Scotia and Québec west to Mackenzie and British Columbia, south to ne. NC, sw. NC, AL, AR, KS, NE, and WA. [= RAB, C, F, FNA, G, GW, K, L, S, W, X]

Listera R. Brown 1813 (Twayblade)

A genus of about 25 species, boreal, north temperate, and south temperate (Magrath & Coleman in FNA 2002). References: Magrath & Coleman in FNA (2002a).

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. Cp (GA, NC, SC, VA), Pd (GA), Mt (NC): swamps, second terraces in floodplain forests, wet woods under *Rhododendron maximum*; uncommon (GA Special Concern, NC Watch List, SC Rare). March-July. Mainly a Southeastern Coastal Plain species, from NJ south to FL 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, X; = *Ophrys australis* (Lindley) House – S]

Listera cordata (Linnaeus) R. Brown *var.* ***cordata***, Heartleaf Twayblade, Lesser Twayblade. Mt (NC): habitat not known; rare (NC Watch List). 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, X]

Listera smallii Wiegand, Appalachian Twayblade, Small's Twayblade, Kidneyleaf Twayblade. Mt (GA, NC, SC, VA): shaded swamps, wet slopes, nearly always beneath *Rhododendron maximum*; uncommon (GA Special Concern, SC Rare, VA Watch List). 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, X; = *Ophrys smallii* (Wiegand) House – S]

Listera convallarioides (Swartz) Nuttall was attributed to NC by Correll (1950); this record of this far-northern species is almost certainly an error. {not keyed}

Malaxis Solander ex Swartz 1788 (Adder's-mouth)fYucca

A genus of about 250-300 species, nearly cosmopolitan. References: Catling (1991)=Z; Catling & Magrath in FNA (2002a). 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 Lip pointed, acuminate, lacking lateral lobes ..... ***[M. brachypoda]***
  2 Lip bifid, with 2 well-developed lateral lobes on either side of a smaller central lobe.
    3 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***
    3 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. Mt (NC, VA), Pd (NC, SC), Cp (SC, VA): dry, open, upland forests, shale barrens; rare (NC Rare, VA Watch List). 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, X, in part]

Malaxis spicata Swartz, Florida Adder's-mouth. Cp (GA, NC, SC, VA): maritime swamp forests, calcareous but mucky swamps in the outer Coastal Plain, spring-fed swamps, wet hammocks; rare (GA Special Concern, NC Rare, VA Rare). July-August. Se. VA south to FL; n. West Indies. [= RAB, C, FNA, G, GW, K, L, S, X; *M. floridana* (Chapman) Kuntze – F]

Malaxis unifolia Michaux, Green Adder's-mouth. Cp, Mt, Pd (GA, NC, SC, VA): bogs, moist forested slopes, in the Sandhills in longleaf-oak-hickory forests; uncommon (rare in Piedmont and Coastal Plain). June-August. 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, X, in part only (also see *M. bayardii*)]

Malaxis brachypoda (A. Gray) Fernald, White Malaxis, ranges as far south as sc. PA (Rhoads & Klein 1993) and NJ (Kartesz 1999), 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]

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); Reddoch & Reddoch (1993); Pridgeon et al. (1999b).

Identification Notes: hybrids are frequent and are not keyed; they are generally intermediate in characters and are found in mixed populations of the two parents. Further information follows the species accounts.

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.
3 Stem bractless ..... ***[P. hookeri]***
3 Stem with bracts.
4 Corolla spur 28-47 mm long; hemipollinarium 4.6-6.8 mm long; seeds (0.72-) 0.76-0.97 mm long ..... ***[P. macrophylla]***
4 Corolla spur 14-28 mm long; hemipollinarium 3.0-4.8 mm long; seeds 0.54-0.72 (-0.79) ..... ***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.
5 Lip 11-15 mm long; spur mostly 40-50 mm long ..... ***P. integrilabia***
5 Lip 2-8 mm long; spur 4-23 mm long.
6 Flowers green, greenish-white, yellowish-green, yellowish-white, or dull-white.
7 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***
7 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.
8 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***
8 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***
6 Flowers golden-yellow or bright-white.
9 Flowers golden-yellow; spur 4-8 mm long; lip minutely crenulate, directed downwards ..... ***P. integra***
9 Flowers bright-white; spur 11-23 mm long; lip entire, directed upwards ..... ***P. nivea***

1 Lip either fringed, deeply divided into 3 lobes, or both.
10 Lip not deeply divided into 3 lobes, deeply fringed; flowers white, yellow, orange.
11 Flowers white; spur 15-50 mm long.
12 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 (between the base and the fringed portion); lip fringing short and relatively coarse; [of Newfoundland west to MI and IL, south to GA] ..... ***P. blephariglottis***
12 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***
11 Flowers yellow to orange; spur 5-33 mm long.
13 Spur 20-33 mm long, exceeding the 12-27 mm long ovary; undivided portion of lip 8-12 mm long ..... ***P. ciliaris***
13 Spur 4-17 mm long, equal to or shorter than the ovary; undivided portion of lip 4-6 mm long.
14 Spur 8-17 mm long, about as long as the 10-19 mm long ovary; spur orifice circular ..... ***P. chapmanii***
14 Spur 4-10 mm long, shorter than the 7-13 mm long ovary; spur orifice keyhole-shaped or triangular ..... ***P. cristata***
10 Lip deeply divided into 3 lobes, the lobes deeply fringed, shallowly fringed, eroded, or entire; flowers purple or greenish-white or yellowish-white.
15 Lateral lobes of lip deeply fringed (nearly or entirely to the point of junction with the central lobe of the lip); flowers greenish-white or yellowish-white.
16 Perianth greenish-white; lateral petals linear-spatulate, < 2 mm wide, blunt, entire to inconspicuously crenulate; lateral sepals deflexed ..... ***P. lacera***
16 Perianth white or cream; lateral petals cuneate to broadly obovate, 4-12 mm wide, toothed; lateral sepals divergent ..... ***P. leucophaea***
13 Lateral lobes of lip entire, eroded, or shallowly fringed (generally no > 1/2 way from the apex to the point of junction with the central lobe of the lip); flowers purple (or rarely white in albino forms).
17 Lobes of lip eroded or entire, few (if any) of the segments > 1 mm long ..... ***P. peramoena***
17 Lobes of lip shallowly fringed, most or all of the segments > 1 mm long.
18 Lobes of lip fringed from 1/3 to ½ of the way to the base of the lobes; opening to nectary widely rounded (the pollen sacs spread widely apart); spur 20-26 mm long ..... ***P. grandiflora***
18 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***

Platanthera blephariglottis (Willdenow) Lindley, Small White Fringed Orchid. Cp (GA, NC, SC, VA): seepages, sandhill-pocosin ecotones; uncommon (GA Special Concern). July-September. 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; = ***Platanthera blephariglottis***]

Platanthera chapmanii (Small) Luer, Chapman's Orange-fringed Orchid. Cp (GA): pine savannas; rare (GA Special Concern). 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). [= FNA, K; = *Blephariglottis chapmanii* Small – S] {synonymy incomplete}

Platanthera ciliaris (Linnaeus) Lindley, Yellow Fringed Orchid. Cp, Mt, Pd (GA, NC, SC, VA): savannas, moist roadbanks, meadows, pastures; common (rare in Piedmont). July-September. Widespread in e. North America, *P. ciliaris* is probably our most common and least habitat-specific *Platanthera*. [= FNA, K, L, W; = *Habenaria ciliaris* (Linnaeus) R. Brown – RAB, C, F, G, GW, X; = *Blephariglottis ciliaris* (Linnaeus) Rydberg – S]

Platanthera clavellata (Michaux) Luer, Small Green Wood Orchid. Mt, Pd, Cp (GA, NC, SC, VA): seepages, bogs, swamps, other wet places; common (uncommon in Piedmont). June-September. Widespread in e. North America. [= FNA, K, L, W; = *Habenaria clavellata* (Michaux) Sprengel – C, G, GW, 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. Cp (GA, NC, SC): savannas, seepages, sandhill-pocosin ecotones; uncommon (but locally abundant) (GA Special Concern, VA Rare). 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; < *Habenaria blephariglottis* (Willdenow) Hooker var. *blephariglottis* – RAB, X; *Habenaria blephariglottis* var. *conspicua* (Nash) Ames – C, F; < *Habenaria blephariglottis* – GW; *Blephariglottis conspicua* (Nash) Small – S (also see *Platanthera integrilabia*); *Blephariglottis blephariglottis* (Willdenow) Rydberg – S (possibly misapplied)]

Platanthera cristata (Michaux) Lindley, Crested Fringed Orchid, Golden Fringed Orchid. Cp (GA, NC, SC, VA), Mt (NC, SC, VA): savannas, bogs, moist roadsides; uncommon (rare in Mountains). 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; = *Habenaria cristata* (Michaux) R. Brown – RAB, C, F, G, GW, X; = *Blephariglottis cristata* (Michaux) Rafinesque – S]

Platanthera flava (Linnaeus) Lindley *var.* ***flava***, Southern Rein Orchid, Southern Gypsy-spike. Cp, Pd (GA, NC, SC, VA): shaded wet places, such as swampy forests; uncommon (rare in Piedmont) (VA Watch List). March-September. Var. *flava* has a scattered range in se. and sc. United States, primarily (but not solely) on the Coastal Plain, north to MD and IL; remarkably disjunct in s. Nova Scotia, 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. Mt (GA, NC, VA), Pd (NC): bogs, seepages; rare (GA Special Concern, NC Rare, VA Watch List). May-September. Var. *herbiola* is more northern, widespread in ne. North America, south (in the mountains and upper Piedmont) to NC. 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, X; = *Perularia flava* (Linnaeus) Farwell – S, apparently misapplied]

Platanthera grandiflora (Bigelow) Lindley, Large Purple Fringed Orchid, Plume-royal. Mt (GA, NC, VA): bogs, seepages, moist places at high elevations; rare (NC Rare, VA Rare). June-August. Widespread in ne. North America, south in the mountains to NC and n. GA. [= 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]

Platanthera integra (Nuttall) A. Gray ex Beck, Golden Fringeless Orchid, Yellow Fringeless Orchid. Cp (GA, NC, SC), Mt, Pd (NC): savannas in the Coastal Plain, bogs in the Mountains and Piedmont; rare (GA Special Concern, NC Threatened, SC Rare). 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; = *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. Mt (GA, NC, SC, VA?), Pd (GA): bogs, red maple - gum swamps, seeps and streambanks; rare (US Species of Concern, GA Threatened, NC Endangered, SC Rare, VA Rare). 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]

Platanthera lacera (Michaux) G. Don, Green Fringed Orchid, Ragged Fringed Orchid, Ragged Orchid. Mt, Pd, Cp (GA, NC, SC, VA): swamps, bogs, seepages; uncommon, rare in Piedmont and Coastal Plain (SC Rare). 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, X; > *Habenaria lacera* var. *lacera* – F; = *Blephariglottis lacera* (Michaux) Farwell – S; > *Platanthera lacera* var. *lacera* – L]

Platanthera leucophaea (Nuttall) Lindley, Prairie Fringed Orchid. Mt (VA): damp calcareous meadows; rare (US Threatened, VA Rare). 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]

Platanthera nivea (Nuttall) Luer, Snowy Orchid, Bog-spike. Cp (GA, NC, SC): wet savannas; rare (GA Special Concern, NC Rare). May-September. Essentially a Southeastern Coastal plain endemic, ***P. nivea*** ranges from s. NJ 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, X; = ***Gymnadeniopsis nivea*** (Nuttall) Rydberg – S]

Platanthera orbiculata (Pursh) Lindley, Large Round-leaved Orchid, Dinner-plate Orchid. Mt, Pd (NC, VA): moist hardwood forests, especially over amphibolite; uncommon (rare in Piedmont). June-September. Newfoundland and 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; see note below for further discussion. Pollination is by night-flying moths, likely noctuids. [= FNA; = *Habenaria orbiculata* (Pursh) Lindley – RAB; = *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 peramoena (A. Gray) A. Gray, Purple Fringeless Orchid, Purple Spire Orchid, Pride-of-the-peak. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): bogs, seepages, moist forests; rare (GA Special Concern, NC Rare, SC Rare, VA Rare). 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. [= FNA, K, L, W; = *Habenaria peramoena* A. Gray – RAB, C, F, G, GW, X; = *Blephariglottis peramoena* (A. Gray) Rydberg – S]

Platanthera psycodes (Linnaeus) Lindley, Small Purple Fringed Orchid, Butterfly Orchid. Mt (GA, NC, SC, VA): northern hardwood forersts, other moist forests, seepages, bogs; uncommon (GA Special Concern). June-August. Widespread in ne. North America, south in the mountains to n. GA. [= FNA, K, L, W; = *Habenaria psycodes* (Linnaeus) Sprengel var. *psycodes* – RAB, C, G, X; = *Habenaria psycodes* – F, GW; = *Blephariglottis psycodes* (Linnaeus) Rydberg – S]

Platanthera aquilonis Sheviak, south to NJ and PA. [= FNA; ***P. hyperborea*** (Linnaeus) Lindley var. *hyperborea* – K, misapplied; *Habenaria hyperborea* (Linnaeus) R. Brown var. *hyperborea*, misapplied] {not keyed; synonymy incomplete}

Platanthera hookeri (Torrey & A. Gray) Lindley, Hooker's Orchid, ranges south to s. PA, in rich moist forests. [= FNA, K, L; = *Habenaria hookeri* Torrey – C, F, G, X]

Platanthera huronensis (Nuttall) Lindley, south to NJ (Sheviak 2002, Kartesz 1999) and PA (Kartesz 1999). [= FNA, K; = *Habenaria hyperborea* (Linnaeus) R. Brown var. *huronensis* (Nuttall) Farwell] {not keyed; synonymy incomplete}

Platanthera macrophylla (Goldie) P.M. Brown is apparently reported from NC and VA by Luer (1975). I have seen no verification of this distribution, nor is it validated by Reddoch & Reddoch (1993) or Sheviak in FNA (2002). ***P. macrophylla*** does range south to sw. PA and might be expected in montane VA. It generally occurs in coniferous swamps, from Nova Scotia west to n. MI, south to sw. PA and MD (Kartesz 1999). [= FNA, K; = ***P. orbiculata*** var. *macrophylla* (Goldie) Luer – L; = *Habenaria orbiculata* (Pursh) Torrey var. *macrophylla* (Goldie) B. Boivin – C, F; < *Habenaria orbiculata* – G, X (also see ***P. macrophylla***)]

The following hybrids are known from our area (others should be expected):

Platanthera* ×*andrewsii (M. White) Luer [***P. lacera*** × ***psycodes***]. This hybrid is known from several locations in the Mountains. It is distinguished by characteristics intermediate between the two parents, especially the purple to pale lavender flowers, the central lobe of the lip long and narrow and deeply fringed. [= FNA]

Platanthera* ×*bicolor (Rafinesque) Luer [***P. blephariglottis*** × ***ciliaris***]. This hybrid is rather common in the Coastal Plain, and can sometimes be found by the hundreds where both parents are abundant. The flowers from a distance appear a pale, creamy orange; when observed more closely, they prove to be bicolored, the broader portions pale orange, the fringed portions white. [= FNA]

Platanthera* ×*canbyi (Ames) Luer [***P. blephariglottis*** × ***cristata***]. This hybrid is known from a few locations in the Coastal Plain. It is intermediate between the parents. [= FNA]

Platanthera* ×*channellii Folsom [***P. ciliaris*** × ***cristata***]. This hybrid is known from several sites in the Coastal Plain (Charleston County, SC), Piedmont (Iredell County, NC), and Mountains (Henderson County, NC). It can be distinguished by its intermediate morphology, especially the spur 11-15 mm long. Folsom (1984) and Brown (2004) discuss the closely related *P. chapmanii* (Small) Luer, ranging from se. GA to panhandle FL, and in e. TX, which they recognize as a species, based on its occurrence in populations independent of its parents, pollination biology, and subtle morphologic distinction from *P.* ×*channellii*. [= FNA; *P.* ×*chapmanii* – misapplied]

Platythelys Garay (Jug Orchid)

A genus of about 9 species, of the New World tropics and subtropics. References: Ackerman in FNA (2002a).

Platythelys querceticola (Lindley) Garay, Jug Orchid. Wet hammocks and swamps. FL, AL, MS, and LA; Mexico; West Indies; Central America; South America. Known from FL counties (Franklin and Nassau) adjacent to GA. [= FNA, K; = *Erythrodes querceticola* (Lindley) Ames – L, X; = *Physurus querceticola* Lindley – S; ? ***P. latifolia*** (Linnaeus) Garay & Ormerod] {not keyed at this time}

Pogonia Antoine Laurent de Jussieu 1789 (Rose Pogonia, Pogonia)
(also see *Cleistes, Isotria*)

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*. References: Catling & Sheviak in FNA (2002a).

Pogonia ophioglossoides (Linnaeus) Ker-Gawler, Rose Pogonia, Snakemouth, Beardflower, Ettercap, Addermouth. Cp (GA, NC, SC, VA), Mt (NC, SC, VA), Pd (GA, NC, SC, VA): savannas, bogs, especially in open peaty or gravelly situations; uncommon (rare in Piedmont and Mountains) (VA Watch List). May-June. Widespread in e. North America. [= RAB, C, FNA, G, GW, K, L, S, W, 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).

Ponthieva racemosa (Walter) C. Mohr, Shadow Witch. Cp (GA, NC, SC, VA): bottomlands, floodplains, moist ravines, nearly always over calcareous rock ("marl" or coquina limestone); rare (GA, Special Concern, NC Rare, SC Rare, VA Watch List). September-October. Se. VA south to 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, 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).

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. Cp (GA, NC, SC): mesic pinelands with blackjack oak, other sandhills and dry-mesic to mesic longleaf pinelands; rare (US Species of Concern, GA Special Concern, NC Endangered, SC Rare). 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; = *Eulophia ecristata* (Fernald) Ames – RAB, L, X; = *Triorchos ecristatus* (Fernald) Small – S]

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. This treatment, already rather different from RAB (1968) 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).

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..... ***S. ovalis*** *var.* ***erostellata***
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.
2 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***
2 Lip clearly differentiated from petals; buds opening into normal flowers; column normal; leaves present or absent at flowering.
3 Basal calli 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 our area in sw. VA] ..... ***S. magnicamporum***
3 Basal calli 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].
4 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***
4 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].
5 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***
5 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 5-12 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].

4 Lip truncate at the tip, 5-7.5 mm long; flowers yellowish, creamy, or ivory, arcuate-nodding for most to all the length of the perianth; [of PA northwards] ..... ***[S. casei var. casei]***

4 Lip acute to rounded at the tip, usually > 7.5 mm long; flowers white to yellowish, arcuate-nodding only at the base of the perianth; [widespread in our area] ..... ***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].

5 Rachis densely pubescent; flowers yellowish to pale greenish yellow, the lip yellow centrally; [flowering February-April]; [of s. SC southwards and westwards] ..... ***S. brevilabris***

5 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].

6 Flowers yellowish to pale greenish yellow; lip yellow centrally ..... ***S. floridana***

6 Flowers white, lip green centrally.

7 Leaves oblanceolate, withering at anthesis; lateral sepals spatulate, green at base; flowering February-May ..... ***S. eatonii***

7 Leaves ovate to obovate or elliptic, spreading, present or absent at anthesis; lateral sepals acuminate, white throughout; flowering July-September.

8 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***

8 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. Cp (GA, SC): pine savannas; rare (GA Rare). Se. SC south to s. GA and n. FL, and west to se. TX, in dry to moist open sites. [= FNA, K; = *S. gracilis* (Bigelow) Beck var. *brevilabris* (Lindley) Correll – GW]

Spiranthes cernua (Linnaeus) L.C. Richard, Nodding Ladies'-tresses. Mt, Pd, Cp (GA, NC, SC, VA): bogs, swamps, ditches, usually in acidic, sphagnous situations; common (uncommon in Piedmont and Coastal Plain). July-November. Widespread in e. North America. [= FNA, G, K, L, W; = *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. Cp (GA, NC, SC, VA): dry to moist pine flatwoods; uncommon (GA Rare). February-May. A Southeastern Coastal Plain endemic: se. VA south to 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]

Spiranthes floridana (Wherry) Cory, Florida Ladies'-tresses. Cp (GA, NC, SC): wet savannas, other moist sites; rare (GA Rare, NC Rare). April-May. A Southeastern Coastal Plain endemic: se. NC south to FL and west to TX, a Southeastern Coastal Plain endemic. [= FNA, K; = *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. Mt, Pd, Cp (GA, NC, SC, VA): fields, meadows, pastures, woodlands; uncommon. August-September. Widespread in se. North America, north to s. NH, MI, WI, and KA. [= C, FNA, K, L, W; = *S. gracilis* (Bigelow) Beck var. *gracilis* – RAB, GW, X; = *S. gracilis* – F; < *S. gracilis* – G (apparently including *S. lacera* var. *lacera*); = *Ibidium gracile* (Bigelow) House – S]

Spiranthes lacera (Rafinesque) Rafinesque ***var. lacera***, Northern Slender Ladies'-tresses. Mt (NC, VA): clearings, openings; rare. July. Nova Scotia and New Brunswick west to Saskatchewan, 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. Cp (GA, NC, SC), {VA?}: pond cypress depressions and savannas, swamps; rare (NC Rare, SC Rare). May-August. A Southeastern Coastal plain endemic: NJ south to FL and west to se. TX. [= RAB, C, FNA, K, L, X; = *S. ×laciniata* – F, GW; = *Ibidium laciniatum* (Small) House – S]

Spiranthes longilabris Lindley, Giant Spiral Orchid. Cp (GA, NC, SC): wet savannas; rare (GA Rare, NC Threatened, SC Rare). Late October-December. A Southeastern Coastal Plain endemic: se. NC south to FL and west to LA. [= RAB, FNA, GW, K, L, X; = *Ibidium longilabre* (Lindley) House – S]

Spiranthes lucida (H.H. Eaton) Ames, Shining Ladies'-tresses. Mt (NC, VA): sunny seepage over amphibolite or other basic rock; rare (NC Rare, VA Rare). 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, X; *Ibidium plantagineum* (Rafinesque) House – S]

Spiranthes magnicamporum Sheviak, Great Plains Ladies'-tresses. Mt (GA, VA): grassy barrens and glades over limestone; rare (GA Endangered, VA Rare). Primarily in the Great Plains, from ND south to TX, east (often as widely disjunct populations) to sw. Ontario, se. PA, sw. VA (Ludwig 1999), KY, w. TN, and nw. GA. [= C, FNA, K, L; < *S. cernua* – G; < *S. cernua* var. *cernua* – F, X]

Spiranthes ochroleuca (Rydberg) Rydberg, Yellow Nodding Ladies'-tresses. Mt (NC, SC?, VA): meadows and pastures at moderate to high elevations, up to at least 1500m in elevation; rare (NC Rare, VA Rare). 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. Cp (GA, NC, SC, VA): swamps and marshes; uncommon (VA Rare). September-November. A Southeastern Coastal Plain endemic: se. VA south to FL and west to se. TX. [= F, FNA, G, K, L; = *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. Pd (NC, SC, VA), Cp (GA, NC, SC), Mt (GA, VA): swamp forests, bottomland forests; uncommon (GA Rare). 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; < *S. ovalis* – RAB, F, G, GW, L, X; < *Ibidium ovale* (Lindley) House – S; ? *S. montana* Rafinesque]

Spiranthes praecox (Walter) S. Watson, Grass-leaved Ladies'-tresses, Giant Ladies'-tresses. Cp (GA, NC, SC, VA), Pd (NC, VA), Mt (GA, VA): savannas, swamps, bogs; uncommon (rare in Piedmont). March-July. A Southeastern Coastal plain endemic: NJ south to FL and west to TX. [< *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. Cp (GA, NC, SC, VA): live oak hammocks, other woodlands; rare (GA Rare). Late March-early May. VA south to c. peninsular FL, west to e. TX. [< *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. Mt, Pd, Cp (GA, NC, SC, VA): in a wide variety of habitats, especially relatively well-drained woodlands and fields; common. June-September. Widespread in se. North America, north to MA, OH, and MO. [= C, FNA, G, K, L, W; > *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. Cp, Pd, Mt (GA, NC, SC, VA): savannas, bogs, marshes, fairly dry fields; common (uncommon in Piedmont, rare in Mountains). March-July (-early September in the mountains). MA to FL and west to TX and SD, also in Mexico and Central America. [= RAB, C, F, FNA, G, GW, K, L, W, X; = *Ibidium vernale* (Engelmann & A. Gray) House – S]

Spiranthes casei Catling & Cruise var. *casei*. Nova Scotia and ME west to WI, south to PA, in moist to dry open sites. [= FNA, K] {add to synonymy}

Spiranthes ovalis Lindley *var.* ***ovalis***, Oval Ladies'-tresses. Cp (GA): [= FNA, K] {not keyed at this time; add to synonymy}

Spiranthes romanzoffiana Chamissso. Bogs, meadows, and other habitats. Nova Scotia and Labrador west to AK, south to PA, IN, NM, AZ, and CA. [= FNA, K] {not keyed; add to synonymy}

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).

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. Pd, Cp, Mt (GA, NC, SC, VA): in a wide variety of mesic to rather dry forests; common. July-September. Se. MA, s. NY, OH, IN, and s. MI south to FL and TX. Along with *Goodyera pubescens*, *Tipularia* is one of the commonest orchids in NC (indeed in e. North America). [= RAB, C, F, FNA, G, K, L, W, 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.

Triphora trianthophora (Swartz) Rydberg *var.* ***trianthophora***, Three Birds Orchid, Nodding Pogonia, Nodding Ettercap. Mt (GA, NC, SC, VA), Cp, Pd (NC, SC, VA): humid forests and swamps, rhododendron thickets, especially on rotten logs or on humus; rare (GA Rare, NC Watch List, SC Rare, VA Rare). July-September. The species is widespread (but scattered) in e. North America, and south into Central America. Var. *trianthophora* occurs Maine and Ontario west WI, south to FL amd e. TX; disjunct in nc. Mexico; var. *mexicana* (S. Watson) Medley 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. [= Z; = *T. trianthophora* ssp. *trianthophora* – FNA; < *T. trianthophora* – RAB, C, F, G, GW, K, L, S, W, X]

Zeuxine Lindley 1826 (Soldier Orchid)

A genus of about 26 species, of tropical and subtropical Old World (introduced elsewhere). References: Ackerman in FNA (2002a).

* ***Zeuxine strateumatica*** (Linnaeus) Lindley, Lawn Orchid, Soldier Orchid. Cp (GA): lawns, rare, introduced from Asia. [= FNA, GW, K, L]

POACEAE (R. Brown) Barnhart 1895 ***or GRAMINEAE*** A.L. de Jussieu 1789 (Grass Family)

A family of about 670 genera and 10,000 species, cosmopolitan. References: Flora of North America Editorial Committee (2003a)=FNA; Hitchcock and Chase (1950)=HC; Blomquist (1948).

[note: only a small portion of the key to genera complete]

Key A – tribe *Andropogoneae*

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 (Goat Grass)

References: Tucker (1996)=Z.

1 Spikelets cylindric; glumes with 4 awns; rachis disarticulating at maturity ..... ***Ae. cylindrica***
1 Spikelets nearly ovate; glumes with 1 awn; rachis not disarticulating at maturity ..... ***Ae. neglecta***

* ***Aegilops cylindrica*** Host, Jointed Goat Grass. Mt, Pd (VA): disturbed areas; uncommon, introduced from s. Europe. [= C, F, G, HC, K, Z]
* ***Aegilops neglecta*** Req. ex Bertoloni, Small Goat Grass. Cp (VA): disturbed areas; rare, introduced from s. Europe. Reported from Arlington County, VA. [= Z; *Ae. ovata* Linnaeus – C, G, HC, apparently misapplied; *Ae. geniculata* Roth – K, apparently misapplied]

* *Aegilops triuncialis* Linnaeus. {MD} [= K] {not keyed at this time; synonymy incomplete}

Agropyron Gaertner 1770
(see *Elymus, Elytrigia, Pascopyrum*)

Agrostis Linnaeus 1753 (Bentgrass)
(also see *Lachnagrostis* and *Polypogon*)

A genus of about 220 species, primarily temperate. References: Tucker (1996)=Z.

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 (collectively) 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.
      4 Stolons well developed; leaves mostly < 5 cm long ..... ***A. stolonifera*** *var.* ***palustris***
      4 Stolons poorly developed or absent; leaves mostly > 7 cm long ..... ***A. stolonifera*** *var.* ***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 (collectively) March-November; [subgenus *Vilfa*].
  5 Lemma usually awned (sometimes unawned), the awn inserted near the apex, 4-10 mm long, straight, very delicate and flexuous; annual, flowering April-June ..... ***A. elliottiana***
  5 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 (collectively) March-November.
    6 Lemma with a 3-6 mm long, geniculate awn inserted near the middle; [of high elevation rock outcrops] ..... ***A. mertensii***
    6 Lemma awnless or with a 0-3 mm long, straight awn inserted near the tip; [of various habitats].
      7 Spikelets 1.2-2 mm long; anthers 0.3-0.6 mm long; plants flowering March-July ..... ***A. hyemalis***
      7 Spikelets (1.8-) 2.2-3.5 (-3.7) mm long; anthers (collectively) 0.3-1.2 mm long; plants flowering June-November.
        8 Leaves mostly involute, 1-2 (-3) mm wide; panicle branches mostly forking well beyond the middle ..... ***A. scabra***
        8 Leaves flat, 2-6 mm wide; panicle branches mostly forking at or below the middle.
          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. Cp (GA, NC, SC, VA), Mt (VA): wet savannas, sinkhole ponds, edges of swamp forests; rare (NC Watch List, VA Watch List). October-November. MA (?) and NJ south to se. LA, primarily on the Coastal Plain. [= F, HC, Z; < *A. perennans* – RAB, FNA GW, K; = *A. perennans* var. *elata* (Pursh) A. Hitchcock – C, G, S]

* ***Agrostis capillaris*** Linnaeus, Rhode Island Bentgrass, Colonial Bentgrass, Browntop. Mt (NC, SC, VA), Pd, Cp (VA): meadows, roadsides, disturbed areas; uncommon, introduced from Europe (and possibly n. North America). June-August. [= C, FNA, K, Z; = *A. tenuis* Sibthorp – RAB, G, HC, S, W; > *A. tenuis* var. *tenuis* – F]

Agrostis elliottiana J.A. Schultes, Elliott's Bentgrass, Southern Bentgrass. Pd, Cp (GA, NC, SC, VA), Mt (GA, NC, SC): dry soils of barrens, fields, and rock outcrops; uncommon (VA Watch List). April-June. MD west to s. OH, and e. KS, south to panhandle FL and c. TX. [= RAB, C, F, FNA, G, HC, K, S, W, Z]

* ***Agrostis gigantea*** Roth, Redtop, Black Bentgrass. June-October. Mt, Pd (GA), {provinces} (SC, VA). [= C, F, FNA, K, W, Z; < *A. stolonifera* – RAB, GW; = *A. stolonifera* Linnaeus var. *major* (Gaudin) Farwell – G; = *A. alba* – HC, misapplied; >< *A. alba* – S, misapplied]

Agrostis hyemalis (Walter) Britton, Sterns, & Poggenburg, Ticklegrass, Small Bentgrass. Mt, Pd, Cp (GA, NC, SC, VA: roadsides, other disturbed habitats; common. March-July. [= F, FNA, K, 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*]

Agrostis mertensii Trinius, Arctic Bentgrass. Mt (NC, VA): in thin soil of high elevation rocky summits; rare (NC Rare). July-August. Circumboreal, in North America south to ME (Mt. Katahdin), NH (White Mountains), VT, NY (Adirondack Mountains), WV (Spruce Knob), TN (Roan Mountain, Mt. Leconte), NC (Roan Mountain, Big Yellow Mountain, Black Mountains), Québec, British Columbia, CO, UT (?), and AK. [= C, FNA, K, W, Z; > *A. borealis* Hartman – RAB, HC, S; > *A. borealis* Hartman var. *americana* (Scribner) Fernald – F, G]

Agrostis perennans (Walter) Tuckerman, Upland Bent, Autumn Bentgrass. Mt, Pd, Cp (GA, NC, SC, VA): . August-October. [= HC, Z; < *A. perennans* – RAB, FNA, GW, K, W (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. (GA, NC, SC, VA). (VA Watch List). June-November. [= FNA, GW, K, 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 *var.* ***palustris*** (Hudson) Farwell, Creeping Bentgrass. June-October. [= C; < *A. stolonifera* – RAB, FNA GW, W (also see *A. gigantea*); = *A. alba* Linnaeus var. *palustris* (Hudson) Persoon – F, misapplied; = *A. stolonifera* var. *compacta* Hartman – G; = *A. palustris* Hudson – HC, Z; < *A. stolonifera* – K; < *A. alba* – S, misapplied]

* ***Agrostis stolonifera*** Linnaeus *var.* ***stolonifera***. June-October. [= C, G; < *A. stolonifera* – RAB, FNA, GW, W (also see *A. gigantea*); = *A. alba* Linnaeus var. *alba* – F, misapplied; = *A. stolonifera* – HC, Z; < *A. stolonifera* – K; >< *A. alba* – S, misapplied]

* *Agrostis canina* Linnaeus, Brown Bentgrass, Velvet Bentgrass, ranges south to DE, se. PA (Rhoads & Klein 1993), WV, and TN (Kartesz 1999). [= C, FNA, K] {not keyed at this time; synonymy incomplete}

Aira Linnaeus (Hair Grass)

References: Tucker (1996)=Z.

1 Panicle dense and spike-like, the branches short and appressed to ascending ..... ***A. praecox***
1 Panicle open, the branches elongate, diffusely spreading or ascending.
  2 Lemma of both the lower floret and the upper floret with an awn 2-4 mm long ..... ***A. caryophyllea***
  2 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. Pd (GA, NC, SC, VA), Cp (GA, NC, VA), Mt (NC): fields, roadsides, disturbed areas; uncommon, introduced from Europe. May. [= RAB, C, G, HC, K, Z; = *Aspris caryophyllea* (Linnaeus) Nash – S]

* ***Aira elegantissima*** Schur, Elegant Hair Grass. Pd, Cp (GA, NC, SC, VA), Mt (GA, SC): fields, roadsides, disturbed areas; common, introduced from Europe. May-June. [= C, Z; *? A. elegans* Willdenow ex Kunth – RAB, G, HC, K; = *Aspris capillaris* (Host) A.S. Hitchcock – S]

* ***Aira praecox*** Linnaeus, Early Hair Grass. Cp (NC, VA): fields, roadsides, disturbed areas; uncommon, introduced from Europe. Reported for NC by Burk (1961), and recently collected in the NC Sandhills (B.Sorrie, pers.comm. 2004). [= C, G, HC, K, Z]

Alopecurus Linnaeus (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. Mt (VA): [habitat]; rare (VA Watch List). Circumboreal, south in North America to NJ, w. VA, IN, MO, and CA. [= F, K; < *A. aequalis* – C, G, HC]

Alopecurus carolinianus Walter, Carolina Foxtail Grass. Cp, Pd (GA, NC, SC, VA), Mt (VA): moist fields, ditches, forests; common (rare in Mountains). April-May. MA west to British Columbia, south to n. FL and CA. [= RAB, C, F, G, GW, HC, K, Z; = *A. ramosus* Poiret – S]

* ***Alopecurus geniculatus*** Linnaeus, Water Foxtail Grass. Mt, Pd, Cp (VA): disturbed areas; rare, introduced from Eurasia. [= C, F, G, HC; > *A. geniculatus* var. *geniculatus* – K]

* ***Alopecurus myosuroides*** Hudson, Slender Foxtail Grass. Pd (NC, VA), Cp (VA): moist fields; uncommon, introduced from Europe. April-May. [= RAB, C, F, G, HC, K, S, Z]

* ***Alopecurus pratensis*** Linnaeus, Meadow Foxtail. Mt (NC, VA), Pd (GA): roadsides, fields; rare, 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). [= C, F, G, HC, K]

Ammophila Host (Beach-grass)

A genus of 2 species, north temperate. References: Tucker (1996)=Z.

1 Ligule 10-30 mm long ..... ***[A. arenaria]***
1 Ligule 1-3 mm long ..... ***A. breviligulata***

Ammophila breviligulata Fernald, American Beach-grass. Cp (NC, *SC, VA): dunes; common. August-September. 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. [= RAB, C, F, G, HC, K, S, Z]

* *Ammophila arenaria* (Linnaeus) Link, European Beach-grass, is introduced in MD and PA (Kartesz 1999). [= C, F, HC, K]

Amphicarpum Kunth (Peanut-grass, Goober-grass)

The genus consists only of the two species treated here, remarkable for their dimorphic spikelets, some of them cleistogamous and subterranean ("goobers"), 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, Pinebarrens Goober-grass. Cp (GA, NC, SC, VA), Pd (VA): wet, peaty, open soils, especially peat-burns in pocosin edges, primarily in the outer Coastal Plain, responding strongly to fire; uncommon, rare in VA (VA Rare). 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, Florida Goober-grass, Blue Maiden-cane. Cp (GA, NC, SC): clay-based Carolina bays in the inner Coastal Plain; rare (NC Rare, SC Rare). 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)
(also see *Bothriochloa* and *Schizachyrium*)

A genus of about 100-110 species, mainly tropical.

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. Cp (NC): moist disturbed ground; rare, apparently introduced from farther south (NC Watch List). This curious record (the specimen at GH, collected by Randolph and Randolph in 1922 in Pamlico County, NC, 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. Cp (GA, SC): moist to wet pinelands, natural pond margins, bogs, disturbed roadsides; rare (GA Special Concern). 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. Cp (GA, NC, SC): wet savannas, ditches adjacent to savannas, depressional wetlands; common. 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. Cp (GA, NC, SC): dry to mesic pine flatwoods, sandhills, adjacent roadbanks; uncommon. 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. Cp, Pd, Mt (GA, NC, SC, VA): dry to moist forests, woodlands, fields, and disturbed areas; common (uncommon in Mountains). September-October. Widespread in se. United States, from 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; > *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. Cp (GA): longleaf pine sandhills; rare. 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 keyed at this time}

Andropogon gerardii Vitman, Big Bluestem, Turkeyfoot. Cp, Pd, Mt (GA, NC, SC, VA): 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); common. July-October. Québec west to Saskatchewan, 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]

Andropogon glaucopsis Elliott, Chalky Bluestem. Cp (GA, NC, SC, VA): wet savannas, pine flatwoods, ditches, wet disturbed sites; uncommon (VA Watch List). 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***. Cp, Pd, Mt (GA, NC, SC, VA): swamps, wet savannas, pine flatwoods, wet disturbed sites; common. 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; < *A. glomeratus* – HC, S, W]

Andropogon glomeratus (Walter) Britton, Sterns, & Poggenburg *var. **hirsutior*** (Hackel) C. Mohr. Cp (GA, NC, SC, VA): wet savannas, pine flatwoods, adjacent ditches, other wet disturbed sites; common. 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. Cp (GA, NC, SC): dry sandy soils of sandhills and dunes; rare (GA Special Concern, NC Watch List). 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. Cp (GA, NC, SC, VA): wet savannas, sphagnous bogs; rare (GA Special Concern, NC Rare, VA Rare). 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. Cp (GA, NC, SC, VA): clay-based Carolina bays and boggy wetlands; rare (NC Watch List, VA Watch List). 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. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): maritime wet grasslands, brackish marsh edges, moist disturbed sites; common (VA Watch List). 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. Cp, Pd, Mt (GA, NC, SC, VA): dry to moist soils; common (uncommon in Mountains). 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. Cp, Pd (GA, NC, SC): dry sandy or clayey soils of sandhills, disturbed sites; rare (NC Watch List). 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. Cp (GA, NC, SC, VA): savannas, flatwoods, maritime wet grasslands, disturbed pinelands; uncommon (VA Watch List). 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". Cp, Pd, Mt (GA, NC, SC, VA): old fields, roadbanks, disturbed sites; common. September-October. Widespread, from 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; < *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 (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 mostly 3-5 mm wide, ascending to erect, not squarrose (lacking a sharp bend outward at the summit of the sheath), medium green, with a very short taper to a blunt or rounded apex, the lower sheaths crowded and keeled (therefore distichous), generally suffused with purple; spikelets usually purple (fading tan); leaf margins scaberulous .....***A. rufa***

1 Leaves mostly 5-10 mm wide, spreading, usually squarrose (with a sharp bend outward at the summit of the sheath), yellowish green, with a long taper to a sharp apex, the lower sheaths not crowded, keeled, or distichous, green; spikelets usually green (fading yellow); leaf margins papillose-ciliate towards the base .....***A. villosa***

Anthenantia rufa (Nuttall) J.A. Schultes, Purple Silkyscale. Cp (GA, NC, SC): wet savannas in the outer Coastal Plain, seepage bogs and moist sandhill-pocosin ecotones in the fall-line sandhills; rare (NC Watch List, SC Rare). 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. Cp (GA, NC, SC): sandhills, especially in submesic swales; uncommon (rare in the outer Coastal Plain). 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 (Vernal Grass)

References: Tucker (1996)=Z.

1 Annual, geniculate; ligules 0.5-2 mm long; glumes glabrous; leaves 1-2 mm wide ..... ***A. aristatum***
1 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. Cp (NC, SC, VA), Pd, Mt (VA): roadsides, disturbed areas; rare, introduced from Europe. April-June. [= RAB, C, G, HC, K, S, Z; = *A. puelii* Lecoq & Lamotte – F]

* ***Anthoxanthum odoratum*** Linnaeus, Sweet Vernal Grass Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): lawns, roadsides, disturbed areas; common, introduced from 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, G, HC, S, W, Z; = *A. odoratum* ssp. *odoratum* – K]

Apera Adanson

* *Apera spica-venti* (Linnaeus) Palisot de Beauvois, reported for se. PA (Rhoads & Klein 1993), MD, and KY (Kartesz 1999). [= K]

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 ..... ***A. oligantha***
  3 First glume 1-2-nerved.
    4 Lateral awns < 8 mm long; plant an annual.
      5 Central awn 1-27 mm long, not spirally coiled at its base (above the awn column), either straight, curving, or contorted (when dry); lateral 2 awns 0-18 mm long, contorted at base and more-or-less divergent.
        6 Central awn (8-) 12-27 mm long; lateral awns (1-) 6-18 mm long ..... ***A. longespica* var. *geniculata***
        6 Central awn mostly 1-10 (-14) mm long; lateral awns 0-5 (-8) mm long ..... ***A. longespica* var. *longespica***
      5 Central awn 3-8 mm long, spirally coiled at its base (above the awn column) like a corkscrew, 1/2 to 3 full turns (when dry); lateral 2 awns 0.7-4 mm long, straight, 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***

4 Lateral awns > 8 mm long; plant an annual or perennial.

8 Sheaths lanose or floccose (the hairs kinked and intertwined); nodes of the panicle axis with tufts of lanose or floccose hairs.....***A. lanosa***

8 Sheaths glabrous to pilose (the hairs straight and usually appressed, not intertwined); nodes of the panicle axis glabrous or pilose.

9 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.

10 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***

10 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***

9 Awn column or lemma beak absent or < 7 mm long; lemma body not separated from the awns by an articulation zone.

11 Spikelets borne singly at each node of the main axis, the inflorescence thus a spike or raceme ....***A. mohrii***

11 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 or raceme.

12 First glume 1/3 to 3/4 as long as the second glume; awns 40-100 mm long..... .....***A. purpurea*** *var.* ***longiseta***

12 First glume > 3/4 as long as the second glume; awns 8-40 mm long.

13 Annual .....***A. longespica*** *var.* ***geniculata***

13 Perennial.

14 Central awn 15-40 mm long; first glume prominently 2-keeled, (8-) 9-14 mm long when mature .....***A. palustris***

14 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.

15 Central awn about 2× as thick as the lateral awns, divergent to reflexed; first glume 1-keeled or weakly 2-keeled; [plants of moist to wet habitats].

16 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***

16 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***

15 Central awn < 1.5× as thick as the lateral awns, erect to divergent; first glume 1-keeled (rarely weakly 2-keeled); [plants of dry habitats].

17 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***

17 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.

18 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***

18 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 beyrichiana Trinius & Ruprecht, Southern Wiregrass. Cp (GA, SC): sandhills, savannas, from very dry to seasonally saturated soils; common. 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. Cp (GA, NC, SC): dry sandy soils of sandhills; rare (NC Watch List, SC Rare). 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. Cp, Pd (GA, NC, SC, VA): roadsides, disturbed areas, bare eroding soil; uncommon. August-October. ME west to WY, south to 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, Z]

Aristida dichotoma Michaux, Fork-tip Three-awn. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, fields, disturbed areas, bare eroding soil; common. August-October. ME west to WI, south to FL and TX. See *A. curtissii* for comments. [= RAB, C, G, HC, S; = *A. dichotoma* var. *dichotoma* – F, FNA, K, W, Z]

Aristida lanosa Muhlenberg ex Elliott, Woollysheath Three-awn. Cp, Pd (GA, NC, SC, VA): dry sandy soils of sandhills and fields; common, rare in Piedmont (VA Watch List). August-October. NJ south to FL, west to TX, north in the interior to MO and OK. [= RAB, C, FNA, G, HC, K, S, 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, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): 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; > *A. intermedia* Scribner & Ball – F, G, S; > *A. longespica* – G]

Aristida longespica Poiret ***var. longespica***, Eastern Slim-spike Three-awn. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): disturbed areas; uncommon? 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; = *A. longespica* – S]

Aristida mohrii Nash, Mohr's Three-awn. Cp (GA, SC): sandhills; rare. 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. Pd, Cp, Mt (GA, NC, SC, VA): roadsides, fields, disturbed areas; common. August-October. VT west to SD, south to FL and TX, scattered elsewhere as a weed. [= RAB, C, F, FNA, G, HC, K, W, S, Z]

Aristida palustris (Chapman) Vasey, Longleaf Three-awn. Cp (GA, NC, SC): wet pine savannas, limesink depressions; uncommon. 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 purpurascens Poiret, Arrowfeather. Cp, Pd, Mt (GA, NC, SC, VA): dry habitats, especially in dry sandy soils; common. 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; > *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. Cp (SC): disturbed areas; rare, 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 simpliciflora Chapman, Southern Three-awn, Chapman's Three-awn. Cp (GA, NC): wet pine savannas; rare (GA Special Concern, NC Rare). Sw. GA west through the FL Panhandle and c. AL to s. MS (Sorrie & Leonard 1999), and south into central Peninsular Florida; 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. Cp (GA, NC?, SC): wet pine savannas and seepage areas; rare (NC Watch List). 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. Cp (NC, SC), Pd (NC): 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; common, rare in Piedmont. 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. Cp (GA, NC, SC): sandy habitats in the Coastal Plain; uncommon? 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. Cp (GA, NC, SC, VA): sandhills, coastal dunes (in VA), other dry, sandy habitats such as sandy roadsides; common, rare in VA (VA Watch List). 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. Cp (GA, NC, SC, VA), Pd (GA), Mt (NC): moist to wet savannas, mountain bogs (Henderson Co., NC), other moist habitats; common. 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]

* ***Aristida adscensionis*** Linnaeus, Sixweeks Three-awn, has been reported as an introduction (from western United States) in SC (FNA, Kartesz 1999). {investigate} [= F, FNA, G, K] {not keyed at this time; synonymy incomplete}

Aristida basiramea Engelmann ex Vasey, Forktip Three-awn. Occurs in VA, SC, etc. (FNA). [= F, FNA, G, K; = *A. basiramea* var. *basiramea* – C] {not keyed at this time; synonymy incomplete}

Aristida gyrans Chapman, Corkscrew Three-awn. Cp (GA): dry pinelands; rare (GA Special Concern). 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, K, S] {not keyed at this time; synonymy incomplete}

Aristida ramosissima Engelmann ex A. Gray. East to Panhandle FL, c. TN, and e. KY (FNA) and might occur in our area. It is similar to *A. oligantha* and will key to it; it differs in having the central awn of the lemma 9-30 mm long (vs. 30-70 mm long), and the awn of the second glume 3-7 mm long (vs. 7.5-17 mm long). [= C, F, FNA, G, K, S] {not keyed at this time; synonymy incomplete}

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, SC). There is no evidence that either are naturalized.

Arrhenatherum Palisot de Beauvois (False Oatgrass)

References: Tucker (1996)=Z.

1 Base of culm consisting of a series of adjacent (moniliform) corms ca. 1 cm in diameter.....***A. elatius* var. *bulbosum***
1 Base of culm not swollen or cormose .....***A. elatius* var. *elatius***

* ***Arrhenatherum elatius*** (Linnaeus) J. & K. Presl *var.* ***bulbosum*** (Willdenow) Spenner, Tuber Oatgrass, Onion Couch. (VA): habitat in our area not known; abundance not known, introduced from 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, Z; < *A. elatius* – GW, W; = *A. elatius* var. *tuberosum* Thiel. – S]

* ***Arrhenatherum elatius*** (Linnaeus) J. & K. Presl *var.* ***elatius***, Tall Oatgrass. Pd (GA, NC, VA), Mt, Cp (NC, VA): meadows, fields, roadsides; common, introduced from Europe. May-June. [= C, F, G, HC, K, S, Z; < *A. elatius* – RAB, GW, W]

Arthraxon Palisot de Beauvois (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. Cp, Pd, Mt (GA, NC, SC, VA): moist ditches, bottomlands, disturbed areas; common, 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 (Cane)

Both species of *Arundinaria* were 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: Tucker (1988)=Y; McClure (1973)=Z; McClure (1963); Judziewicz et al. (2000)=X; Triplett, Weakley, & Clark (2006)=Q. The key adapted from Y and Z.

1 Primary branches with 0-1 compressed basal internodes; culm internodes usually sulcate; culm leaves deciduous; culms to 10 m tall; rhizomes lacking air canals ..... ***A. gigantea***
1 Primary branches with 2-5 compressed basal internodes; 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).
  2 Foliage blades chartaceous, deciduous, abaxial surfaces pilose or glabrous, weakly tessellate; primary branches usually < 35 cm long, basal nodes 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 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. Mt, Pd (GA, NC, SC): dry to moist forests on slopes; common. The short plants (often only knee-high, though sometimes head-high) on mountain slopes south of Asheville are autumn-deciduous, whereas both "rivercane" appears to be evergreen. [= Q; < *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; apparently and implicitly included in the concept of either *A. tecta* or *A. gigantea* by earlier authors]

Arundinaria gigantea (Walter) Walter, Giant Cane, River Cane. Mt, Pd, Cp (GA, NC, SC, VA): swamps, floodplains; common. April-July. Widespread in se. North America, ranging from s. DE 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, HC, Q, S, Y; < *A. gigantea* – RAB, C, GW (also see *A. tecta*); = *A. gigantea* ssp. *gigantea* – K, Z; > *A. gigantea* ssp. *gigantea* – X; > *A. gigantea* (Walter) Walter ssp. *macrosperma* (Michaux) McClure – X; > *A. macrosperma* Michaux]

Arundinaria tecta Walter, Switch Cane, Small Cane. Cp, Pd (GA, NC, SC, VA): savannas, pocosins, canebrakes, generally (but not solely) in wetlands; common. April-July. Primarily a Southeastern Coastal Plain endemic: e. VA 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. [= Q; < *A. gigantea* – RAB, C, GW; < *A. tecta* – F, HC, S, Y; < *A. gigantea* ssp. *tecta* (Walter) McClure – K, X, Z]

Arundo Linnaeus (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. Cp, Pd (GA, NC, SC, VA), Mt (NC, VA): disturbed areas; uncommon, introduced from the Old World. September-October. Var. *versicolor*, with leaves transversely striped white and green, is better considered only as 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)

References: Tucker (1996)=Z.

1 Lemmas pubescent with brown hairs; lemmas with long bent awns ..... ***A. fatua***
1 Lemmas glabrous or scabrous; lemmas unawned or with relatively straight awns ..... ***A. sativa***

* ***Avena fatua*** Linnaeus, Wild Oats. (VA). {needs herbarium checks}. [= C, F, G, HC, K]

* ***Avena sativa*** Linnaeus, Oats. Mt (NC, SC, VA), Pd, Cp (GA, NC, SC, VA): fields and disturbed areas; commonly cultivated, uncommonly escaping. 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, G, HC, K, S, W, Z; > *A. sativa* var. *orientalis* (Schreber) Alefeld – F; > *A. sativa* var. *sativa* – F]

Axonopus Palisot de Beauvois (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. Cp (GA, SC, VA?): lawns; rare, 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. Cp, Pd (GA, NC, SC, VA): sandy forests, roadsides, lawns; common. 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. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): sandy forests, bottomlands, roadsides, lawns; common. 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 (Bamboo)

* *Bambusa oldhamii* Munro is reported for NC (Kartesz 1999). {investigate} [=*Sinocalamus latiflorus* (Munro) McClure – K, misapplied]

* *Bambusa vulgaris* Schrader ex J.C. Wendland, Common Bamboo, is reported for SC (Kartesz 1999). {investigate} [= K]

Bothriochloa Kuntze (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..... ***B. barbinodis***
1 Sessile spikelets 3-4.5 mm long.
  2 Pedicellate spikelets about as long as the sessile spikelets.
    3 Rachises longer than the branches.....***[B. bladhii]***
    3 Rachises shorter than the branches.....***B. ischaemum* *var*. *songarica***
  2 Pedicellate spikelets much shorter than the sessile spikelets.
    4 Panicles reddish when mature; hairs below the sessile spikelets sparse and ca. 1/4 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 .....***B. laguroides* *ssp*. *torreyana***

* ***Bothriochloa barbinodis*** (Lagasca y Segura) Herter, Cane Bluestem, Pinhole Bluestem. Cp, Pd (SC): disturbed areas; rare, introduced from w. United States. [= FNA, K; > *Bothriochloa perforata* (Trinius ex E. Fourn.) Herter – Z; = *Andropogon barbinodis* Lagasca y Segura – HC; > *Bothriochloa barbinodis* (Lagasca y Segura) Herter var. *perforata* (Trinius ex E. Fourn.) Gould; > *Andropogon perforatus* Trinius ex E. Fourn.]

* ***Bothriochloa ischaemum*** (Linnaeus) Keng ***var. songarica*** (Ruprecht ex Fischer & C.A. Meyer) Celarier & Harlan, King Ranch Bluestem. Cp (SC): disturbed places; rare, introduced from western North America. Reported for SC (Kartesz 1999). [= K, Z; < *B. ischaemum* – FNA]

* ***Bothriochloa laguroides*** (Augustin de Candolle) Herter ***ssp. torreyana*** (Steudel) Allred & Gould, Silver Bluestem. Cp (GA, SC), Pd (GA): disturbed areas; rare, introduced from {}. 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 bladhii* (Retzius) S.T. Blake, Australian Bluestem, is reported from e. TN (according to specimen cited by FNA and Z) and FL. [= FNA, K, Z] {synonymy incomplete}

* *Bothriochloa pertusa* (Linnaeus) A. Camus, Pitted Bluestem. Introduced at scattered sites in e. North America, including FL, LA, MD, and MS (FNA, Kartesz 1999). [= FNA, K, Z] {not keyed at this time; synonymy incomplete}

Bouteloua Lagasca y Segura (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. Mt (GA, VA), Pd (GA): dry rocky slopes and bluffs over limestone or serpentine, limestone glades; uncommon. July-September. S. CT west to MT, south to VA, e. TN, nw. GA, AL, panhandle FL, 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 Georgia (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]

* ***Bouteloua dactyloides*** (Nuttall) J.T. Columbus, Buffalo Grass. Mt (VA), Pd, Cp (GA): disturbed areas; rare, introduced 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. Cp (SC): disturbed areas; rare, introduced from western 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. Cp (GA, SC): disturbed areas; rare, introduced from western North America. Reported for SC and GA (Kartesz 1999). [= K, Y; < *Bouteloua hirsuta* – F, HC; = *Bouteloua hirsuta* ssp. *hirsuta* – FNA]

Brachiaria

(see *Urochloa*)

Brachyelytrum Palisot de Beauvois (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: 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; [plants of the 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; [plants widely distributed in our area] ....***B. erectum***

Brachyelytrum aristosum (Michaux) Trelease in Branner & Coville, Northern Shorthusk. Mt (GA, NC, VA): moist forests, mostly at moderate to high elevations, such as northern hardwoods and spruce-fir; rare (GA Special Concern, NC Watch List). July-August. Fairly widespread in ne. North America, south in the mountains to sw. NC and n. GA. In MI, *B. septentrionale* 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. [= 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]

Brachyelytrum erectum (Schreber ex Sprengel) Palisot de Beauvois, Common Shorthusk. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): mesic forests, in the Mountains at lower elevations than *B. septentrionale)*; common (uncommon in Piedmont, rare in Coastal Plain). June-August. MA, NY, OH, MI, and s. WI south to FL and TX. [= K, Y, Z; < *B. erectum* – RAB, G, HC, S, W (also see *B. septentrionale*); = *B. erectum* var. *erectum* – C, F]

Brachypodium Palisot de Beauvois

* ***Brachypodium sylvaticum*** (Hudson) Palisot de Beauvois *ssp.* ***sylvaticum***, Slender False Brome. Pd (VA): roadsides and yards; rare, introduced from Europe. [= FNA; < *B. sylvaticum* – HC, K]

Briza Linnaeus (Quaking Grass)

References: Tucker (1996)=Z.

* ***Briza maxima*** Linnaeus, Greater Quaking Grass. Cp (GA): disturbed areas; rare, introduced. Reported in e. GA (Jones & Coile 1988). [= K] {not keyed at this time; synonymy incomplete}
* ***Briza minor*** Linnaeus, Lesser Quaking Grass. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): fields, disturbed areas; common, introduced from Europe. April-June. [= RAB, C, F, G, GW, HC, K, S, Z]

* *Briza media* Linnaeus, Perennial Quaking Grass, reported for scattered locations in PA (Rhoads & Klein 1993), MD, DE, and AL (Kartesz 1999). [= K] {not keyed at this time; synonymy incomplete}

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 (in prep.).

1 Lemmas compressed and strongly keeled (the whole spikelet thus strongly laterally flattened); first glume 3-9-nerved; [section *Ceratochloa*] ..... ***B. 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 *Pnigma*] ..... ***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) ..... ***B. hordeaceus ssp. hordeaceus***
      4 Panicle relatively open, the lateral branches erect, ascending, or spreading, the pedicels > 15 mm long (longer than the spikelets).
        5 Margins of the lemmas involute in fruit, wrapping around the grain, exposing the rachilla.....***B. secalinus***
        5 Margins of the lemmas gaping, overlapping in fruit.
          6 Panicle branches erect or ascending, relatively stiff and straight ..... ***B. racemosus***
          6 Panicle branches spreading (at least the lower), either relatively stiff and straight, or flexuous and lax.
            7 Panicle branches stiff; lemma awns 5-12 mm long, straight.....***B. commutatus***
            7 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).
    8 Longer lemma awns 10-60 mm long; plants annual; [introduced species of disturbed habitats]; [section *Genea*].
      9 Panicle dense, spikelike.....***B. rubens***
      9 Panicle open, not spikelike.
        10 First glume 13-20 mm long; second glume 20-30 mm long; lemma awns 35-60 mm long..... ***B. rigidus***
        10 First glume 5-14 mm long; second glume 8-17 mm long; lemma awns 10-30 mm long.
          11 First glume 7-14 mm long; second glume 9-17 mm long; lemma awns 18-30 mm long.....***B. sterilis***
          11 First glume 5-7 mm long; second glume 8-11 mm long; lemma awn (7-) 10-17 mm long ..... ***B. tectorum***
    8 Longer lemma awns 1-6 (-8) mm long; plants perennial; [native and introduced species, collectively of disturbed and natural habitats].
      12 Plants with creeping rhizomes, forming clonal colonies; both surfaces of leaves glabrous or glabrescent; [section *Bromopsis*]..... ***B. inermis***
      12 Plants not strongly rhizomatous, the stems solitary or tufted; surfaces of leaf blades usually pubescent (sometimes sparsely so).
        13 Pedicels erect or ascending, mostly shorter than the spikelet; leaves 2-3 mm wide; [introduced, of disturbed habitats]; [section *Bromopsis*] .....***B. erectus***
        13 Pedicels ascending at first, later arching-drooping, mostly longer than the spikelet; leaves 4-15 mm wide; [native, mostly of forests]; [section *Pnigma*].
          14 Lemmas glabrous (or very minutely pubescent) on the back, hairy along the lower margins with long hairs.....***B. ciliatus***
          14 Lemmas uniformly hairy over the entire back-surface (or rarely entirely glabrous).
            15 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***
            15 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.
              16 Underleaf surfaces with a conspicuous satiny sheen (when fresh); summit of sheath opposite the ligule with a conspicuous tuft of hairs..... ***B. nottowayanus***

16 Underleaf surfaces lacking a conspicuous satiny sheen; summit of sheath opposite the ligule lacking a conspicuous tuft of hairs..... ***B. pubescens***

* ***Bromus catharticus*** Vahl, Rescue Grass. Cp, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): disturbed areas; common, native of South America. April-June. [= RAB, F, G, HC, K, W, X, Y; *? Bromus willdenowii* Kunth – C; = *Bromus unioloides* Kunth – S]

Bromus ciliatus Linnaeus, Fringed Brome. Mt (NC, VA): seepage areas, edges of fens, moist areas near high elevation creeks, grassy balds, high elevation woodlands, mostly over amphibolite or other mafic rocks; rare (NC Rare, VA Rare). July-August. Widespread in n. North America: 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, G, HC, S, W, X, Y; > *Bromus ciliatus* var. *ciliatus* – F, K; = *Bromopsis ciliata* (Linnaeus) Holub]

* ***Bromus commutatus*** Schrader, Hairy Chess, Meadow Brome. Pd, Mt (GA, NC, SC, VA), Cp (NC, SC, VA): disturbed areas; common, 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, HC, K, S, X, Y; < *Bromus commutatus* – RAB (also see *Bromus racemosus*); < *Bromus racemosus* – G, W]

* ***Bromus erectus*** Hudson, Short-branched Brome. Mt, Pd (VA): disturbed areas; rare, native of Europe. [= C, F, G, HC, K, S, X; = *Bromopsis erecta* (Hudson) Fourr.]

* ***Bromus hordeaceus*** Linnaeus *ssp. **hordeaceus***, Soft Chess, Lopgrass. Mt (NC, VA), Pd (VA), Cp (SC, VA): disturbed areas; rare, native of Europe. July. [= K, X; *? Bromus mollis* Linnaeus – RAB, F, G, HC, misapplied; < *Bromus hordeaceus* – C, Y]

* ***Bromus inermis*** Leysser, Smooth Brome, Hungarian Brome. Cp (NC, SC, VA), Mt (NC, VA), Pd (VA): disturbed areas; rare, native of Europe. June-July. [= RAB, C, G, HC, S, W, 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. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas; common, native of Asia. May-June. [= RAB, C, G, K, S, W, X, Y; > *Bromus japonicus* var. *japonicus* – F, HC; > *Bromus japonicus* var. *porrectus* Hackel – F, HC]

Bromus kalmii A. Gray, Kalm Brome. Mt (VA): shale woodlands and barrens; rare (VA Rare). 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, G, HC, K, X]

Bromus latiglumis (Shear) A.S. Hitchcock, Riverbank Brome, Auricled Brome, Hairy Woodbrome, Flanged Brome. Mt (NC, VA), Pd (VA): alluvial soils along rivers; rare (NC Watch List). 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, G, HC, K, 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. Pd (NC, VA), Cp, Mt (VA): moist forests, especially along small stream bottoms; rare (NC Watch List). 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, HC, K, X; < *Bromus purgans* Linnaeus – RAB; < *Bromus latiglumis* – Y; = *Bromopsis nottowayana* (Fernald) Holub]

Bromus pubescens Muhlenberg ex Willdenow, Common Eastern Brome, Canada Brome. Mt, Pd (GA, NC, SC, VA), Cp (GA, VA): mesic forests, generally on rocky slopes, common. May-August. Widespread in e. North America: s. Ontario west to Alberta, south to FL and AZ. [= C, K, W, X, Y; < *Bromus purgans* Linnaeus – RAB, S, misapplied (also see *Bromus latiglumis* and *Bromus nottowayanus*); = *Bromus purgans* Linnaeus – F, G, 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. Pd, Cp, Mt? (NC, SC, VA): 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 1997): lemmas 6.5-8 mm long (vs. 8-11 mm long in *B. commutatus*), anthers mostly 1.5-3 mm long (vs. mostly 1-1.5 mm long), spikelets 10-16 mm long (vs. 15-28 mm long), lowest rachilla segment mostly 0.7-1 mm long (vs. mostly 1.3-1.7 mm). [= C, F, HC, K, X; < *Bromus commutatus* – RAB; < *Bromus racemosus* – G, W (also see *Bromus commutatus*)]

* ***Bromus rigidus*** Roth, Ripgut Brome, Ripgut Grass. Cp (NC, SC, VA), Pd (GA, NC): disturbed areas; rare, native of Mediterranean Europe. April. [= RAB, C, F, G, HC, K; *? Bromus diandrus* Roth – Y; *? Bromus diandrus* var. ?? – Z]

* ***Bromus rubens*** Linnaeus, Foxtail Chess, Red Brome. Cp (SC, VA): disturbed areas; rare, introduced from Mediterranean Europe. Specimens in our area come from areas around wool-combing plants, and were likely introduced on wool from w. United States, where this European species is well-established. [= C, G, K, X; *? Bromus madritensis* Linnaeus – F, misapplied; = *Bromus madritensis* ssp. *rubens* (Linnaeus) Husnot]

* ***Bromus secalinus*** Linnaeus, Cheat, Common Chess, Ryebrome. Pd, Cp, Mt (GA, NC, SC, VA): disturbed areas; common, native of Europe. May-June. [= RAB, C, F, G, HC, K, S, W, X, Y]

* ***Bromus sterilis*** Linnaeus, Barren Brome, Poverty Brome, Cheatgrass. Pd (NC, VA), Mt, Cp (VA): disturbed areas; rare, native of southern Europe. May-June. [= RAB, C, F, G, HC, K, S, W, X, Y, Z]

* ***Bromus tectorum*** Linnaeus, Downy Brome, Downy Chess, Downy Cheat, Junegrass, Cheatgrass. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): disturbed areas; common, native of Europe. April-June. [= RAB, C, F, G, HC, K, S, W, X, Y; ? *Bromus tectorum* ssp. *tectorum* – Z]

* ***Bromus arvensis*** Linnaeus has been reported as introduced for nc. GA (Jones & Coile 1988) and for VA, MD, PA, and NJ (Kartesz 1999). {investigate} [= C, K] {not keyed at this time}
* *Bromus briziformis* Fischer & C.A. Meyer. Reported as an introduction in ne. North America, south to MD, NJ, PA, DE (Kartesz 1999). [= K; = *B. brizaeformis* – C, orthographic variant] {not keyed at this time}
* ***Bromus carinatus*** Hooker & Arnott. Reported by Jones & Coile (1988) for nc. GA. [= C, K] {not keyed at this time}
* *Bromus madritensis* Linnaeus. Reported introduced in VA and MD (Kartesz 1999). {investigate} [= K] {not keyed at this time}
* *Bromus ramosus* Hudson. Introduced. Reported for DC and MS (Kartesz 1999). [= K] {not keyed at this time}
* *Bromus squarrosus* Linnaeus. Introduced. Reported for KY and NJ (Kartesz 1999). [= K] {not keyed at this time}

Buchloe Engelmann (Buffalo Grass)
(see *Bouteloua*)

Calamagrostis Adanson (Reed-grass)

A genus of about 230 species, north and south temperate. References: Marr, Hebda, & Greene in FNA (in prep.); Tucker (1996)=Z; Greene (1980).

1 Awn sharply bent; callus hairs 1/2 or less the length of the lemma; [subgenus *Ankylatherae*].
  2 Plant densely tufted, delicate, the culms 30-60 cm tall, with 2-3 nodes; leaves 1-2 mm wide, involute; callus hairs about 1 mm long (< ½ the length of the lemma).....***C. cainii***
  2 Plant rhizomatous or loosely tufted, coarse, the culms 60-120 cm tall, with 3-5 nodes; leaves 4-8 mm wide, flat; callus hairs about 2 mm long (< ½ the length of the lemma) .....***C. porteri ssp. porteri***
1 Awn straight; callus hairs 3/4 as long as to equal to the lemma.
  3 Panicle loose, spreading, 3.5-6 cm wide; callus hairs 2-3 mm long (about ¾ the length of the lemma); [subgenus *Calamagrostis*].....***C. canadensis var. canadensis***
  3 Panicle dense, erect, 1.5-4 cm wide; callus hairs 3-4 mm long (about equal to the lemma); [subgenus *Orthatherae*].....
  .....***C. cinnoides***

Calamagrostis cainii A.S. Hitchcock, Cain's Reed-grass. Mt (NC): high elevation rocky summits; rare (US Species of Concern, NC Endangered). 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. Mt (GA, NC, VA): wet meadows along streams, high elevation openings, such as grassy balds and cliff bases; uncommon (NC Rare). 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, Z; > *C. canadensis* var. *robusta* Vasey – F]

Calamagrostis cinnoides (Muhlenberg) W.P.C. Barton, Nuttall's Reed-grass. Mt (GA, NC, SC, VA), Cp, Pd (NC, SC, VA): savannas, bogs, and other wet sites; common. 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 *C. cinnoides* is suggested for nomenclatural reasons (Kartesz 1999). [= RAB, C, F, G, GW, HC, S, W, Z; = *C. coarctata* Torrey ex Eaton – K]

Calamagrostis porteri A. Gray *ssp. **porteri***, Porter's Reed-grass. Mt (GA, NC, SC, VA), Pd (VA): dry to dry-mesic forests, forest edges, cliff bases; uncommon, rare in NC (GA Special Concern, NC Rare). NY to AL, in the Appalachians, with disjunct populations s. MO and w. AR; it was first reported from NC by Ware (1973). 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). [= K; = *C. porteri* – C, HC, W; *? C. porteri* – G, Z]

Calamagrostis canadensis (Michaux) Palisot de Beauvois *var. **macouniana*** (Vasey) Stebbins. Reported for VA (FNA). Reported south to NJ and KY only (Kartesz 1999). [= F, FNA, G, HC, K; < *C. canadensis* – C, Z; = *C. macouniana* (Vasey) Vasey] {not keyed at this time}

Calamagrostis porteri A. Gray ssp. *insperata* (Swallen) C.W. Greene, ranges east to KY and TN (Kartesz 1999). [= K; = *C. insperata* Swallen – C, HC] {not keyed at this time}

Calamagrostis stricta (Timm) Koeler ssp. *inexpansa* (A. Gray) C.W. Greene ranges south to n. WV (Preston and Randolph counties). [= K; < *C. stricta* – C; *? C. neglecta* (Ehrhart) Gaertner, Mey., & Scherb. var. *neglecta* – F] {not keyed at this time}

Calamovilfa (A. Gray) Hackel ex Scribner & Southworth (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 (1966)=Z. Key based in part on Thieret in FNA (in prep.).

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; [of the 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 6-7.4 mm long; glumes acute to acuminate, usually arcuate; lemmas 5.5-7 mm long, usually arcuate; [of river scour areas in the rocky inland parts of the South]..... ***[C. arcuata]***
  2 Spikelets 4-5.8 mm long; glumes acute, straight; lemmas 4-5.4 mm long, straight; [of pineland habitats of the Coastal Plain of South Carolina northwards ..... ***C. brevipilis***

Calamovilfa brevipilis (Torrey) Scribner, Pinebarren Sandreed. Cp (NC, SC, VA), Pd (NC): savanna-pocosin ecotones, sandhill seepage bogs, pocosins; rare (NC Watch List, SC Rare, VA Rare). 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 arcuata K.E. Rogers occurs in Morgan and Cumberland counties, TN, in the Cumberland Plateau, and in AL. [= FNA, K]

Calamovilfa curtissii (Vasey) Scribner of FL is a closely related sibling species of *C. brevipilis*. It occurs in the FL Panhandle and e. peninsular FL. [= FNA, GW, HC, K, S, Z]

Catapodium Link 1827

References: Soreng et al. (2003)=Z.

* *Catapodium rigidum* (Linnaeus) Dony, native to Europe, is known from collections from wool-combing mills in South Carolina; it is probably not established. [= Z; = *Desmazeria rigida* (Linnaeus) Tutin – K; = *Scleropoa rigida* (Linnaeus) Grisebach]

Cenchrus Linnaeus (Burgrass, Sandspur)

A genus of about 16 species, primarily tropical and subtropical. References: Stieber & Wipff in FNA (2003a); Crins (1991)=Z.

{vegetative characters} {VA distribution of *C. tribuloides*}

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 bristles..... ***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).
3 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***
3 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.
4 Spines slender, 45-75, 3.5-7 mm long; spikelets 6-8 mm long..... ***C. longispinus***
4 Spines stout, 6-10 (-40), 2-5 mm long; spikelets 3.5-6 mm long ..... ***C. spinifex***

Cenchrus echinatus Linnaeus, Southern Sandspur, Bristly Sandspur, Hedgehog Grass. Cp (GA, NC, SC), Pd (GA, SC): fields, roadsides, disturbed areas; common (uncommon in NC). June-October. NC (and DC?) south to FL, west to CA, south into the tropical America. [= RAB, C, HC, K, S, Z]

Cenchrus longispinus (Hackel) Fernald, Northern Sandspur, Common Sandspur. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas, lawns; common (uncommon in Mountains). 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, misapplied]

* ***Cenchrus myosuroides*** Kunth. Cp (SC): roadsides, disturbed areas; rare, introduced from 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, Z]

Cenchrus spinifex Cavanilles, Coastal Sandspur. Cp (GA, NC, SC, VA), Pd (GA, SC, VA), Mt (VA): fields, roadsides, disturbed areas; common (rare in NC and VA). July-October. VA south to FL, west to AR and KS, south into tropical America. [= FNA, K; > *C. incertus* M.A. Curtis – RAB, C, F, G, HC, S, Z]

Cenchrus tribuloides Linnaeus, Dune Sandspur. Cp (GA, NC, SC, VA), Pd*, Mt* (VA): dunes, sandy fields, sandy woodlands in the outer Coastal Plain; common. August-October. NY (Long Island) south to FL, west to TX, south into tropical America. This is the sandspur so familiar and disliked by beach-goers in our area. [= RAB, C, F, FNA, HC, K, S, W, Z]

Cenchrus brownii Roemer & J.A. Schultes. Reported for NC (Kartesz 1999) and GA (FNA). {investigate} [= FNA, K] {not keyed at this time; add to synonymy}

Cenchrus gracillimus Nash. Reported for sc. GA by Jones & Coile (1988) and FNA. [= FNA, K] {not keyed at this time; add to synonymy}

Chasmanthium Link (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..... ***Ch. 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] ..... ***Ch. 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)] ..... ***[Ch. 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..... ***Ch. laxum***
4 Collar (junction of leaf and sheath) pilose; leaves 6-12 mm wide.
5 Inflorescence with divergent branches; [in outer Coastal Plain calcareous sites from SC southwards] .... ***Ch. sessiliflorum* var. *1***
5 Inflorescence with appressed branches; [more widespread in our area]..... ***Ch. sessiliflorum* var. *sessiliflorum***

Chasmanthium latifolium (Michaux) Yates, River Oats, Fish-on-a-pole. Pd, Mt, Cp (GA, NC, SC, VA): riverbanks, streambanks, bottomland forests, seepages and glades over mafic or calcareous rock, usually in nutrient-rich soils; common (uncommon in Coastal Plain and Mountains). June-October. Widespread in se. North America, north to NJ, OH, IL, and KS. [= C, FNA, GW, K, W, Z; = *Uniola latifolia* Michaux – RAB, F, G, HC, S]

Chasmanthium laxum (Linnaeus) Yates, Slender Spikegrass. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): savanna-pocosin ecotones, sandhill-pocosin ecotones, moist hardwood swamps, other moist habitats; common (rare in Mountains). June-October. Widespread in se. North America, north to s. NY, KY, and OK. See *Ch. 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. Cp (GA, NC, SC): blackwater swamp forests; rare (NC Rare, SC Rare). 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 sessiliflorum (Poiret) Yates *var. **1***, Coastal Hammock Longleaf Spikegrass. Cp (GA, SC): calcareous hammocks; rare. 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. Cp (GA, NC, SC, VA), Pd (GA, SC): moist hardwood forests, swamps, other moist habitats; rare (NC Watch List, VA Watch List). August-October. Widespread in se. North America, north to se. VA, TN, AR, and OK. This species and *Ch. 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]

Chasmanthium ornithorhynchum (Steudel) Yates, Birdbill Spikegrass. 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]

Chloris Swartz (Finger-grass, Chloris)
(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 ..... ***Ch. verticillata***
1 Inflorescence digitate, the panicle branches in a single verticel at the apex of the culm; annual; lemma conspicuously long-ciliate; spikelets imbricate ..... ***Ch. virgata***

* ***Chloris verticillata*** Nuttall, Windmill-grass. Mt (VA), {SC}: disturbed areas, bottomland fields; rare, introduced from further west. [= C, F, G, HC, K]
* ***Chloris virgata*** Swartz, Feather Finger-grass, Showy Chloris. Pd (GA, NC, SC, VA), Cp (GA): disturbed areas; rare, introduced from tropical America. [= RAB, C, F, G, HC, K]

* ***Chloris barbata*** Sw. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, introduced from {}. [= K] {not keyed}
* ***Chloris canterei*** Arech. *var.* ***grandiflora*** (Roseng. & Izag.) D.E. Anderson. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, introduced from Paraguay. [= K; < Ch. cantérai – HC] {not keyed}
* ***Chloris cucullata*** Bisch. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, introduced from {}. [= K] {not keyed}
* ***Chloris divaricata*** R. Brown. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, introduced from {}. [= K] {not keyed}
* ***Chloris gayana*** Kunth, Rhodes Grass. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, introduced from Africa. [= F, HC, K, S] {not keyed}
* ***Chloris pectinata*** Bentham. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, introduced from {}. [= K] {not keyed}
* ***Chloris truncata*** R. Brown, Stargrass. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, introduced from Australia. [= HC, K] {not keyed}
* ***Chloris ventricosa*** R. Brown. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, introduced from Australia. Also reported for VA (Hitchcock & Chase 1950; Kartesz 1999). [= HC, K] {not keyed}

Chrysopogon Trinius (Goldbeard)

A genus of about 26 species, tropical and subtropical, all species except *Ch. 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 (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)
(also see *Limnodea*)

A genus of about 4 species, of temperate Eurasia, North America, and South America. References: Brandenburg, Blackwell, & Thieret (1991); Tucker (1996)=Z; Brandenburg & Thieret (2000).

1 Spikelets (3.5-) 4-6 (-7.5) mm long; glumes firm, subherbaceous, rather dull, hyaline only narrowly and marginally, the second 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 second glume 1-nerved (very rarely 3-nerved) ..... ***C. latifolia***

Cinna arundinacea Linnaeus, Common Woodreed, Sweet Woodreed. Cp, Pd, Mt (GA, NC, SC, VA): bottomland forests, rocky bars in rivers, other low, wet habitats; common. August-October. New Brunswick and MN south to south to GA and TX. [= RAB, C, G, GW, K, S, W, Z; > *C. arundinacea* var. *inexpansa* Fernald & Griscom – F, HC]

Cinna latifolia (Treviranus ex Goepp.) Grisebach, Drooping Woodreed, Slender Woodreed. Mt (NC, VA): moist forests at high elevations; rare (NC Watch List, VA Rare). 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, G, HC, K, W, Z]

Coelorachis Brongniart (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 (GA): open woodlands and roadsides, probably in areas formerly prairie-like and fire-maintained, perhaps now extirpated in our area; rare (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 (GA, NC, SC, VA), Pd (GA): limesink ponds (dolines), depression meadows, clay-based Carolina bays, wet savannas, always in places with a seasonally high water-table; rare (NC Watch List, VA Rare). 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 (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 (GA): pond margins; rare. Southeastern Coastal Plain endemic: sw. GA (Mitchell County) (Sorrie 1998b) west to s. AL, and in the Florida peninsula. [= FNA, K; = *Manisuris tuberculosa* Nash – GW, HC, S; = *Mnesithea tuberculosa* (Nash) Koning & Sosef – Z]

Coix Linnaeus

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]

Cortaderia Stapf (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, introduced from South America. This grass is a popular ornamental, rarely escaping. [= RAB, FNA, HC, K]

Ctenium Panzer (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 of our area]..... ***Ct. aromaticum***
1 Spikelets with very few or no glands on the back of the second glume; plant rhizomatous (the rhizomes slender and scaly); [restricted to se. GA southwards]..... ***Ct. floridanum***

Ctenium aromaticum (Walter) Wood, Toothache Grass, Orange Grass. Cp (GA, NC, SC, VA): wet savannas, pocosin-savanna ecotones, seepage bogs, sandhill-pocosin ecotones, sandhill seeps; common (VA Rare). 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 (GA): dry pinelands, sandhills, upper ecotones of pineland pools; rare (GA Special Concern). 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 (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, Pd, Mt (GA, NC, SC, VA): lawns, gardens, roadsides, pastures, fields, disturbed areas; common, introduced from Eurasia. May-October. [= FNA; < *C. dactylon* – RAB, C, F, G, HC, K, W; < *Capriola dactylon* (Linnaeus) Kuntze – S]

Cynosurus Linnaeus 1753 (Dog's-tail, Dogtail Grass)

References: 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 Dog's-tail. Mt (NC), {VA}: lawns, roadsides; rare, introduced from Eurasia. June-July. [= RAB, C, F, G, HC, K, Z]
* ***Cynosurus echinatus*** Linnaeus, Rough Dog's-tail. Cp (NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA): lawns, roadsides; rare, introduced from Eurasia. May-June. [= RAB, C, F, HC, K, Z]

Dactylis Linnaeus 1753 (Orchard Grass)

References: Tucker (1996)=Z.

* ***Dactylis glomerata*** Linnaeus, Orchard Grass, Cock's-foot. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): pastures, fields, woodland edges, roadsides; common (less common in Coastal Plain, especially in NC and SC), introduced from 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, G, HC, S, W; > *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 (Crowfoot Grass)

* ***Dactyloctenium aegyptium*** (Linnaeus) Willdenow, Crowfoot Grass. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): lawns, roadsides, disturbed areas; common, introduced from Old World tropics. June-November. [= RAB, C, F, G, HC, K, S]

* *Dactyloctenium radulans* (R. Brown) Palisot de Beauvois is introduced in SC (Kartesz 1999). {investigate} [= K] {not keyed at this time}

Danthonia Augustin de Candolle (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. Mt, Pd (GA, NC, SC, VA), Cp (VA): grassy balds, thin soils around rock outcrops, woodlands; common (uncommon in upper Piedmont only). June-August. Fairly widespread in e. North America, primarily Appalachian, from s. Canada to SC and TN. [= RAB, C, F, FNA, G, HC, K, S, W]

Danthonia epilis Scribner, Bog Oat-grass. Cp (NC, SC, VA), Mt (GA, NC, VA?), Pd (NC): peaty bogs in the Coastal Plain and Mountains, seeps around rock outcrops in the Piedmont and Mountains, granitic domes; rare (GA Special Concern, NC Watch List, VA Watch List). 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, Pd, Mt (GA, NC, SC, VA): 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). 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]

Danthonia spicata (Linnaeus) Palisot de Beauvois ex Roemer & J.A. Schultes, Poverty Oat-grass. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): dry woodlands, rock outcrops, shale barrens; common. May-July. Newfoundland and British Columbia south to FL and NM. [= RAB, C, FNA, G, HC, K, S, W; > *D. spicata* var. *longipila* Lamson-Scribner & Merrill – F; > *D. spicata* var. *spicata* – F; < *D. allenii* Austin – F]

Deschampsia Palisot de Beauvois (Hairgrass)

A genus of about 40 species, north and south temperate. References: Tucker (1996)=Z.

1 Awn 2-3 mm long, straight or nearly so, scarcely (or not at all) exserted beyond the tips of the glumes; lemmas smooth; leaf blades flat or folded at the midvein (V-shaped in cross-section); ligule 3-10 (-17) mm long; [section *Deschampsia*]..... ..... ***D. cespitosa*** *ssp.* ***glauca***
1 Awn 4-8 mm long, geniculate, exserted beyond the tips of the glumes; lemmas minutely scabrous; leaf blades involute, appearing filiform (rounded in cross-section); ligule 0.5-3 (-5) mm long; [section *Avenaria*] ..... ***D. flexuosa*** *var.* ***flexuosa***

Deschampsia cespitosa (Linnaeus) Palisot de Beauvois *ssp.* ***glauca*** (Hartman) Hartman, Tufted Hairgrass. Mt (NC, VA): thin soil of rock outcrops or barrens over calcareous, mafic, and ultramafic rocks (such as serpentinized olivine, amphibolite, limestone, and dolostone); rare (NC Rare, VA 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, 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. [= K; = *D. caespitosa* var. *glauca* (Hartman) Lindman f. – RAB, F; < *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 flexuosa (Linnaeus) Trinius *var.* ***flexuosa***, Common Hairgrass, Wavy Hairgrass. Mt (GA, NC, SC, VA), Pd, Cp (NC, VA): grassy balds, high elevation rocky summits, rocky or sandy woodlands; common (uncommon in Piedmont and Coastal Plain) (SC Rare). April-August. Circumboreal, ranging south in North America to n. GA, OH, WI, and MN; disjunct in AR and OK, and in Mexico. [= F, K; < *D. flexuosa* – RAB, C, G, HC, W, Z; < *Aira flexuosa* Linnaeus – S]

* ***Deschampsia elongata*** (Hooker) Munro, Slender Hairgrass. Cp (SC): waste areas near wool-combing mills; rare, perhaps only a waif, native of w. North America. [= HC, K] {not keyed}

Desmazeria Dumortier
(see *Catapodium*)

Diarrhena Palisot de Beauvois (Beakgrain)

A genus of about 4 species of perennial grasses of e. North America and e. Asia. References: 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. Mt (GA, NC, VA): rich moist forests, usually over calcareous rocks; rare (NC Rare, VA Watch List). 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. [= K, Z; = *Diarrhena americana* var. *americana* – C, G; < *Diarrhena americana* – F, HC, W (also see *Diarrhena obovata*); < *Diarina festucoides* Rafinesque – S (also see *Diarrhena obovata*]

Diarrhena obovata (Gleason) Brandenburg, Western Beakgrain. Pd (VA): alluvial forests; rare (VA Rare). July-August; August-October. Sw. PA and IN west to SD, KA, south to w. VA, nc. TN, and ne. TX. First reported for our area 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; < *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.

"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).

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. 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.

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.

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 2.1-3.2 mm long.
      4 Larger culm blades 13-25 mm wide ..... **Key C**
      4 Larger culm blades < 13 mm wide.
        5 Culm nodes (at least the lower) bearded ..... **Key D**
        5 Culm nodes not bearded, the lowermost sometimes puberulent or sparsely hairy ..... **Key E**
    3 Spikelets 0.8-2.0 mm long.
      6 Lower culm internodes variously hairy ..... **Key F**
      6 Lower culm internodes glabrous ..... **Key G**

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 pilose; spikelets 1.1-1.6 mm long ..... ***D. strigosum*** *var.* ***strigosum***

10 Blades glabrous, or sparsely pilose only near the adaxial base; spikelets 1.4-1.8 mm long ..... ***D. strigosum*** *var.* ***glabrescens***

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; blades 10-28 cm long; spikelets 2.4-3.6 mm long; first glume 1.2-1.8 mm long..... ***D. clandestinum***

7 Sheaths glabrous, pubescent, or sparsely pilose; blades 7-18 cm long; spikelets 2.9-4.1 mm long; first glume 1.5-2.2 mm long.

8 Larger blades 15-32 mm wide, 4-7× as long as wide, basally cordate; sheaths glabrous to sprasely pilose ..... ***D. latifolium***

8 Larger blades 10-20 mm wide, 6-9× as long as wide, basally rounded; sheaths pubescent..... ***[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 7-14 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 2.2-3.2 mm long, 1.1-1.3 mm wide; first glume 0.7-1.4 (-1.8) 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 scabrous but not hairy.
7 Panicle rachis smooth, pellucid-punctate; first glume 0.3-0.6 (-0.8) mm; 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, not pellucid-punctate; first glume 0.7-1.1 mm long; larger leaves 7-12 cm long, 6-9 mm wide; ligule 0.3-0.6 mm long; lowest elongate culm internode < 1.7 mm in diameter; lowest nodes usually retrorsely bearded ..... ***D. species 9 (= cryptanthum)***
6 Ligule entirely of white hairs; peduncle variously hairy or glabrous, but not scabrous.
8 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***
8 Culms rarely exceeding 1 m, without a viscid band below the nodes; blades various.
9 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***
9 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.
10 Culm internodes glabrous to sparsely pilose; culm nodes bearded with long retrorse hairs; blade surfaces glabrous to velvety-pubescent ..... ***D. dichotomum* group**
10 Culm internodes, at least the lower, strigose, pilose, or villous; culm nodes bearded with ascending or spreading hairs; blade surfaces glabrous or variously hairy.
11 Lower nodes bearded with erect-ascending, soft, and long hairs; mid-culm blades usually 20× or more as long as wide.
12 Spikelets 2.9-4.0 mm long, fusiform to elliptic, acute, basally constricted; first glume 1.4-2.6 mm long..... ***D. fusiforme***
12 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.

13 Spikelets 1.5-2.2 mm long; first glume 0.6-0.8 mm long; blades to 8 cm long, usually involute..... ***D. aciculare***
13 Spikelets 2.1-3.1 mm long; first glume 0.8-1.5 mm long; blades to 12 cm long, usually flat except at tip.....***D. angustifolium***
11 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.
14 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***
14 Blades not noticeably stiff nor longitudinally ribbed, pubescent or strigose underneath, glabrous above or with a few long hairs near the base.
15 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***
15 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***

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 Lowermost internodes crisp-puberulent; larger culm blades 4-8 (-11) cm long, 5-10 (-12) mm wide, broadest near the base, spreading from the culm..... ***D. commutatum var. ashei***
4 Lowermost internodes glabrous to puberulent to sparsely pilose; larger culm blades 6-14 cm long, 6-13 mm wide, broadest at or just below the middle, erect or erect-spreading, narrowed below to a moderately subcordate base ..... ***D. boreale***
2 Blades tapering to the base, 2-12 mm wide.
5 Ligule a stramineous to light brown membrane, with or without terminal ciliations.
6 Panicle rachis smooth, pellucid-punctate; first glume 0.3-0.6 (-0.8) mm long; 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***
6 Panicle rachis scabrous, not pellucid-punctate; first glume 0.7-1.1 mm long; larger leaves 7-12 cm long, 6-9 mm wide; ligule 0.3-0.6 mm long; lowest elongate culm internode < 1.7 mm in diameter; lowest nodes usually retrorsely bearded ..... ***D. species 9 (= cryptanthum)***
5 Ligule of short white hairs or absent.
7 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***
7 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.
8 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.
9 Spikelets 2.9-4.0 mm long, fusiform to elliptic, acute, basally constricted; first glume 1.4-2.6 mm long.....***D. species 8 (=fusiforme)***
9 Spikelets 1.5-3.1 mm long, obovate to elliptic-obovate, obtuse to sub-acute, not constricted basally; first glume 0.6-1.5 mm long.
10 Spikelets 1.5-2.2 mm long; first glume 0.6-0.8 mm long; blades to 8 cm long, usually involute ..... ***D. aciculare***
10 Spikelets 2.1-3.1 mm long; first glume 0.8-1.5 mm long; blades to 12 cm long, usually flat except at tip .....***D. angustifolium***
8 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.
11 Spikelets 2.9-3.8 mm long, broadly elliptic, rounded at the summit, with broad and thick nerves..... .....***D. oligosanthes*** *var.* ***scribnerianum***

11 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.
12 Culm internodes and sheaths glabrous or sparsely pilose.
13 Spikelets obpyriform when viewed dorsally, strongly plano-convex when viewed laterally; first glume and base of second glume usually strongly reddish-purple ..... ***D. species 2 (=webberianum)***
13 Spikelets variously shaped but not obpyriform when viewed dorsally, biconvex to elliptic when viewed laterally; first and second glumes various.
14 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***
14 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
12 Culm internodes crisp-puberulent (sparsely so in *D. species 2 (=webberianum)*; sheaths puberulent or glabrous.
15 Spikelets elliptic, sub-acute to pointed, greenish or faintly purple-tinged basally ..... ***D. commutatum var. ashei***
15 Spikelets strongly plano-convex when viewed laterally, obpyriform when viewed dorsally, broadly rounded, usually markedly reddish-purple basally.
16 Fertile lemma and palea papillose; spikelets 2.2-2.6 mm long; lower culm blades 6-12 mm wide, glabrous..... ***D. species 2 (=webberianum)***
16 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..... ***D. acuminatum* group**
2 Ligule with a distinct ring of short hairs in front of the long hairs.
3 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***
3 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.
4 Culm leaves basally crowded, ascending, usually matted or cushion-forming, larger than the mid and upper culm blades.
5 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***
5 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.
6 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.
7 Blades 1.5-4 (-5) cm long; spikelets 0.9-1.2 mm long..... ***D. chamaelonche***
7 Blades 4-12 (-20) cm long, some at least 7 cm long; spikelets 1.2-1.5 mm long ..... ***[D. dichotomum* var. *glabrifolium]***
6 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.
8 Spikelets pubescent, 1.5-2.1 mm long; blade surfaces glabrous..... ***D. strigosum* var. *leucoblepharis***
8 Spikelets glabrous, 1.1-1.8 mm long; blade surfaces pubescent or glabrous.
9 Blades pilose; spikelets 1.1-1.6 mm long ..... ***D. strigosum* var. *strigosum***
9 Blades glabrous, or sparsely pilose only near the adaxial base; spikelets 1.4-1.8 mm long ..... ***D. strigosum* var. *glabrescens***
4 Culm leaves not basally crowded, the lowest leaves spreading and rosette-forming, usually smaller than the culm leaves.
10 Blades of mid-culm leaves typically long and stiff, acuminate, linear or narrowly lanceolate, often involute, only 2-5 mm wide when < 8 cm long..... ***D. aciculare***
10 Blades of mid-culm leaves lanceolate, thin or firm but not stiff, usually > 5 mm when > 8 cm long.
11 Internodes crisp-puberulent.

12 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***
12 Ligule < 0.5 mm long; first glume obtuse to truncate; spikelets obovate when viewed dorsally, plano-convex when viewed laterally, strongly nerved.
13 Spikelets 1.5-1.8 mm long; first glume 0.5-0.8 mm long; lower culm blades 2-5 mm wide ..... ***D. portoricense***
13 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)***
11 Internodes variously hairy but not crisp-puberulent.
14 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.
15 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***
15 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***
14 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.
16 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***
16 Blade margins coarsely papillose-ciliate throughout; spikelets 1.1-2.1 mm long; autumnal form branching from the base.
17 Spikelets pubescent, 1.5-2.1 mm long; blade surfaces glabrous ..... ***D. strigosum*** *var*. ***leucoblepharis***
17 Spikelets glabrous, 1.1-1.8 mm long; blade surfaces pubescent or glabrous.
18 Blades pilose; spikelets 1.1-1.6 mm long ..... ***D. strigosum*** *var*. ***strigosum***
18 Blades glabrous, or sparsely pilose only near the adaxial base; spikelets 1.4-1.8 mm long ..... ***D. strigosum*** *var*. ***glabrescens***

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 papillose-pubescent; blades 1-2 (-3) mm wide; panicle 2-3 cm wide; first glume 0.8-1.0 mm long, acute; culms to 4 dm tall ..... ***D. species 5 (=neuranthum)***
5 Spikelets glabrous; blades 3-8 mm wide; first glume 0.3-1.1 mm long, truncate to acute; 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 pilose; spikelets 1.1-1.6 mm long ..... ***D. strigosum var. strigosum***
16 Blades glabrous, or sparsely pilose only near the adaxial base; spikelets 1.4-1.8 mm long ..... ***D. strigosum var. glabrescens***

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 Longer hairs of ligule 2-3 mm long; spikelets 1.1-1.5 mm long; blades often tinged with purple, the larger 4-8 cm long..... ***D. longiligulatum***
4 Longer hairs of ligule 3-5 mm long; spikelets 1.4-1.6 mm long; blades often yellowish-green, the larger 5-10 cm long..... ***D. acuminatum var. lindheimeri***
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.
9 Culms 15-60 cm tall and < 1.5 mm thick; panicle broadly ovoid, 5-8 cm long and > 1/2 as wide..... ***D. acuminatum var. acuminatum***
9 Culms 40-70 (-80) cm tall, the larger usually > 60 cm long and > 2 mm thick; panicle contracted, 8-11 cm long and < ½ as wide..... ***D. acuminatum var. thurowii***
8 Sheaths and internodes of vernal culms glabrous, or papillose-pilose to hispid with ascending straight hairs 1-3 mm long; blades appressed-pilose to puberulent abaxially, but not velvety.
10 Peduncle, panicle axis, and often middle and upper internodes glabrous; sheaths, at least near mid-length, lacking hairs or papillae; larger blades 4-8 mm wide, glabrous abaxially; spikelets 1.3-1.6 mm long.....

.....***D. acuminatum*** *var.* ***lindheimeri***

10 Peduncle, panicle axis, and internodes pubescent to pilose; sheaths papillose-pilose to hispid, the hairs tending to break off but leaving evident papillae; larger blades 6-10 mm wide, short-pilose to glabrate abaxially; spikelets 1.5-2.0 mm long.....***D. acuminatum*** *var.* ***fasciculatum***

Key to the *Dichanthelium dichotomum* Group

1 Lower cauline nodes glabrous or puberulent, but not bearded.
- 2 Spikelets glabrous.
  - 3 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]***
  - 3 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.
    - 4 Fertile lemma and palea densely papillose; culms weak, soon sprawling over other vegetation.....***D. lucidum***
    - 4 Fertile lemma and palea smooth, with few or no papillae; culms stiffer, erect to ascending.
      - 5 Spikelets 0.9-1.5 mm long; vernal blades 1-4 mm wide.
        - 6 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***
        - 6 Spikelets 1.2-1.5 mm long; blades 1-12 (-20) cm long; autumnal plants not cushion-forming.
          - 7 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***
          - 7 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]***
      - 5 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*).
        - 8 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***
        - 8 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.
          - 9 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-exerted with ascending branches; fresh foliage bluish-glaucous.....***D. caerulescens***
          - 9 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 exerted with spreading branches; fresh foliage not bluish-glaucous.
            - 10 Vernal cauline blades spreading to deflexed, flexuous; [of wet-mesic to dry woods and thickets] .....***D. dichotomum*** *var.* ***dichotomum***
            - 10 Vernal cauline blades stiffly erect; [of wet pine savannas and open swamps].....***D. dichotomum*** *var.* ***roanokense***
- 2 Spikelets pubescent.
  - 11 Spikelets 1.2-1.7 mm long; fertile lemma and palea smooth; culms erect.
    - 12 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]***
    - 12 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.
      - 13 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***
      - 13 Blades 2-7 mm 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 (1.5-) 1.7-2.7 mm long, if shorter than 1.8 mm then fertile lemma and palea densely papillose; culms soon sprawling.
    - 14 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***
    - 14 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***

1 Lower cauline nodes bearded, the hairs usually retrorse.
- 13 Spikelets glabrous.

14 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.
15 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. sp. 10 (=curtifolium)***
15 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***
14 Spikelets 1.4-2.3 mm long; vernal cauline blades 5-12 cm long and 3-15 mm wide; internodes and sheaths glabrous.
16 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 ..... ***D. dichotomum*** *var.* ***dichotomum***
16 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 ..... ***D. dichotomum*** *var.* ***ramulosum***
13 Spikelets pubescent.
17 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. sp. 10 (=curtifolium)***
17 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.
18 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-) 1.8-2.1 mm long; [of dry rocky or sandy basic soil and barrens] ..... ***D. annulum***
18 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].
19 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***
19 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.
20 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***
20 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***

Dichanthelium aciculare (Desvaux ex Poiret) Gould & Clark, Needle Witch Grass. Cp, Pd (GA, NC, SC, VA): sandy woods and fields; common in Coastal Plain, uncommon in Piedmont. 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. See note at end of descriptions regarding *Panicum chrysopsidifolium*. [= *Panicum aciculare* Desvaux ex Poiret – RAB, F, G; < *P. aciculare* – C; = *D. aciculare ssp. aciculare* – FNA; > *P. aciculare* – HC, S; > *P. bennettense* M.V. Brown – HC, S; < *D. aciculare* – K, Z]

Dichanthelium acuminatum (Swartz) Gould & Clark. *var.* ***acuminatum***, Woolly Witch Grass. Cp, Pd (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; < *D. acuminatum* ssp. *acuminatum* – FNA; > *P. lanuginosum* – HC, S; >< *D. acuminatum* var. *acuminatum* – K, Z; >< *D. acuminatum* var. *implicatum* (Scribner) Gould & Clark – K, Z; < *P. acuminatum* Swartz var. *acuminatum* – X]

Dichanthelium acuminatum (Swartz) Gould & Clark *var.* ***fasciculatum*** (Torrey) Freckmann, Slender-stemmed Witch Grass. Mt, Pd, Cp (GA, NC, SC, VA): open or cut-over woods, thickets, fields, meadows, and shores, frequently on disturbed soils; frequent (less common in the Coastal Plain). May-August. Newfoundland south to FL, west to CA, north to s. British Columbia. Typically much less pilose than var. *acuminatum*, the hairs usually papillate. See note at end of descriptions regarding *Panicum glutinoscabrum*. [= 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; > *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. 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, Cp, Mt (GA, NC, SC, VA): open or cut-over woods, thickets, fields, meadows, and shores, often on wet soils; uncommon in Piedmont, rare in Coastal Plain and Mountains. May-September. Nova Scotia west to Manitoba, 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; < *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 acuminatum (Swartz) Gould & Clark var. ***thurowii*** (Scribner & J.G. Smith) Gould & Clark, Thurow's Witch Grass. Cp (GA): in dry open woods, woodland edges, dry prairies, brushy pastures; occasional (possibly rare in GA). May?-October? Occasional from GA to AR and e. TX. [= K, Y, Z; < *D. acuminatum* (Swartz) Gould & Clark. ssp. *acuminatum* – FNA; = *Panicum thurowii* Scribner & J.G. Smith – HC, S]

Dichanthelium angustifolium (Elliott) Gould, Narrow-leaved Witch Grass. Cp, Pd, Mt (GA, NC, SC, VA): sandy pinelands and fields; common in Coastal Plain and Piedmont, rare in mountains. 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 arenicoloides*, here included in *D. angustifolium*. 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 (GA, NC, VA), 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 (NC Significantly Rare, VA Rare List). 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, Mt (GA, NC, VA): open woods and grassy slopes, usually in moist soil; rare (NC Watch List, VA Watch List). April-September. Newfoundland and Ontario 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, Mt, Cp (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; > *P. boscii* var. *molle* (Vasey) Hitchcock & Chase – F, HC, S]

Dichanthelium caerulescens (Hackel ex Hitchcock) Correll, Blue Witch Grass. Cp (NC, VA): marshes, swamps, wet pinelands, maritime grasslands, damp sandy soil; rare (NC Watch List, VA Watch List). 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; occasional to rare (VA Watch List). 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, Pd, Cp (GA, NC, SC, VA): shaded to filtered woodlands, ditches and low areas, and often in moist sandy soil; common (uncommon in Coastal Plain). May-October. Nova Scotia and Québec south to n. FL, west to IA, KA, and TX. [= FNA, K, Z; = *Panicum clandestinum* Linnaeus – RAB, C, F, G, HC, S, X]

Dichanthelium columbianum (Scribner) Freckmann, American Witch Grass. Pd, Cp (GA, NC, SC, VA), Mt (NC, VA): dry to moist thin woods and open ground, usually in sandy soil; uncommon. June-October. S. ME, s. Ontario, and WI south to GA, TN, and IL. [= *Panicum columbianum* Scribner – RAB, C, G; > *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, Pd, 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; < *D. commutatum* – K]

Dichanthelium commutatum (Schultes) Gould *var.* ***commutatum***, Variable Witch Grass. Cp, Mt, 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. [< *Panicum commutatum* Schultes – RAB, C; > *P. commutatum* var. *commutatum* – F, G; > *P. commutatum* – HC, S; > *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, Pd (GA, NC, SC, VA): moist or dry sandy soils of pinelands; common in the Coastal Plain, uncommon in the Piedmont (VA Rare List). 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, Mt, Cp (GA, NC, SC, VA): dry soils of grasslands and open woods, often on disturbed soils of roadsides and ditches; common (rare in Coastal Plain). May-September. Newfoundland and MN south to GA and TX. [= FNA, K, Z; = *Panicum depauperatum* Muhlenberg – RAB, C, HC, S; > *P. depauperatum* var. *depauperatum* – F, G; > *P. depauperatum* var. *psilophyllum* Fernald – F, G]

Dichanthelium dichotomum (Linnaeus) Gould *var.* ***dichotomum***, Forked Witch Grass. Cp, Pd, Mt (GA, NC, SC, VA): wet-mesic to dry woods, thickets, and woodland openings; common throughout. 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; *P. dichotomum* var. *barbulatum* (Michaux) Wood – F; = *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; occasional to frequent in Coastal Plain, rare in Piedmont and Mountains. 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, Pd, Mt (GA, NC, SC, VA): floodplain forests, swamps, openings, and borders of streams and ponds, and occasionally in dry upland woods; widespread. May-October. MA and MI south to FL and TX. [= Q; < *Panicum dichotomum* Linnaeus – RAB, C, GW; = *P. microcarpon* Muhlenberg ex Elliott – F, HC, S; = *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 (GA, NC, SC, VA): wet pine savannas, swamp openings, and wet peaty meadows; uncommon (NC Watch List). 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, Pd (GA, NC, SC, VA): wet to mesic peaty, sandy, or mucky soils, often in open pinelands or with sphagnum; common in Coastal Plain, rare in Piedmont and Mountains. 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 (NC Watch List). 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 (NC Significantly Rare, VA Watch List). 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 (GA, NC): pond-cypress savannas and limesink depressions; rare (US Candidate, NC Endangered). 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; < ***P. 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): open or shady well-drained forests; rare (NC Watch List). Late May-September. ME south to n. GA, west to WI and MS. [= FNA; = *Panicum latifolium* Linnaeus – RAB, C, F, G, HC, S; = ***D. latifolium*** (Linnaeus) Gould & Clark – K, Z, a later combination]

Dichanthelium laxiflorum (Lamarck) Gould, Open-flower Witch Grass. Cp, Pd, 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]

Dichanthelium leucothrix (Nash) Freckmann, Roughish Witch Grass. Cp, Pd (GA, NC, SC, VA): wet sandy, peaty, or mucky soil of pinelands; occasional in Coastal Plain, rare in Piedmont (VA Watch List). 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, Mt (GA, NC, SC?, VA): dry open woods; rare (NC Watch List). 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; > ***P. linearifolium*** var. *werneri* (Scribner) Fernald – F, G; > ***P. linearifolium*** – HC; > ***P. werneri*** Scribner – HC]

Dichanthelium longiligulatum (Nash) Freckmann, Long-ligule Witch Grass. Cp, Pd (GA, NC, SC, VA): limesink ponds, depression meadows, cypress savannas, pine savannas, bogs, swamps; frequent in Coastal Plain, rare in Piedmont. 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, Pd, Mt (GA, NC, SC, VA): wet meadows, sphagnous swamps, bogs, wet woods, sphagnous streamhead pocosins, baygalls; frequent (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. [= 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 (NC, SC, VA): wet savannas, meadows, borders of pocosin shrub swamps, thickets; occasional in Coastal Plain (VA Watch List). 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; < ***D. dichotomum*** var. *dichotomum* – K, Z; < ***P. dichotomum*** var. *mattamuskeetense* (Ashe) Lelong – X]

Dichanthelium meridionale (Ashe) Freckmann, Matting Witch Grass. Pd, Cp, Mt (GA, NC, SC, VA): dry to damp sand of shores and woods; occasional. May-October. Sw. Nova Scotia 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; > ***P. albemarlense*** Ashe – HC, S; < ***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, Pd (GA, NC, SC, VA): sandy fields and open woods; occasional in Coastal Plain, rare in Piedmont (VA Watch List). 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, Pd (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 (NC Watch List). April-November. Sw. ME to s. British Columbia, 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 (GA, NC, SC, VA): dry to damp sandy woods and fields; uncommon (VA Watch List). May-October. MA and MN south to FL and TX, also in n. Mexico. See note under ***D. ovale*** var. *ovale*. [= 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; rare (NC Watch List, VA Rare List). 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. Also see note under *D. consanguineum*, and note at end of descriptions regarding *Panicum malacon* (placed in synonymy here). [= 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, Mt, Cp (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). June-October. VA to s. IL, south to GA and e. TX. [= FNA; = *Panicum polyanthes* Schultes – RAB, C, F, G, GW, HC, S; = ***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; frequent in North Carolina, uncommon in South Carolina. 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, Pd (GA, NC, SC, VA): dry sandy or rocky thin woods and openings, sometimes in moist soils; common (VA Watch List). May-October. DE 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, Pd (GA, NC, SC, VA): moist, low, open or shaded woodlands, often along streams or ditches; common in Coastal Plain, uncommon in Piedmont (VA Watch List). 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, Pd, 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. [= FNA, K, Z; = *Panicum scoparium* Lamarck – RAB, C, F, G, GW, HC, S]

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 in Coastal Plain, uncommon in Piedmont (VA Watch List). 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 5 (=neuranthum), Nerved Witch Grass. Cp (GA, NC): maritime wet grasslands and wet savannas near the coast; rare (GA Special Concern, NC Significantly Rare). May-September. Disjunctly in se. NC, se. SC, GA, FL, s. MS, TX, Bahamas, Cuba, and Belize. Treated as *D. aciculare* ssp. *neuranthum* in FNA, but distinctive morphology and habitat argue for recognition as a species. Can occur with the similar-appearing *D. caerulescens*, from which it differs by having spikelets that are longer (1.8-2.0 mm vs. 1.4-1.8), rounded 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 throughout the range. As FNA provides no synonymy, it is possible that its concept of *"neuranthum"* includes entities treated separately here, or entities outside the range of this flora. [= *Panicum neuranthum* Grisebach – RAB, HC, S; = *D. aciculare* (Desvaux ex Poiret) Gould & Clark ssp. *neuranthum* (Grisebach) Freckmann & Lelong – FNA; < *D. aciculare* – K, Z]

***Dichanthelium species 9* (=*cryptanthum*)**, Hidden-flowered Witch Grass. Cp (NC, SC): wet meadows and ditches, streamside openings (NC Significantly 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 in Coastal Plain, 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, Pd, Mt (GA, NC, SC, VA): moist or dry thin woods, meadows, and ditches, often in dry sandy soil; common. May-October. MA, VT, OH, and KA south to FL and TX, also in Mexico. [= FNA, K, Z; = *Panicum sphaerocarpon* Elliott – RAB, C; > *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 (GA): edges of cypress swamps, in sphagnous bogs, moist shady places; poorly known and possibly very rare. May-October. GA (Chatham County) 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, Cp, Mt (GA, NC, SC, VA): wet sands and peats of bogs, savannas, meadows, and shores; rare (NC Watch List, VA Watch List). 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): low, open sandy pinelands and hammocks. May-October. S. GA and FL west to LA; also in West Indies, Belize. Included in synonymy with *Panicum strigosum* by RAB, but no specimen from the Carolinas has been found. [= K; = *D. strigosum* ssp. *glabrescens* (Grisebach) Freckmann & Lelong – FNA; < *Panicum strigosum* Muhlenberg – GW; = *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, Mt (GA, NC, SC): sandy, acidic soils of pinelands; occasional in Coastal Plain, 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): in moist soils of pine flatwoods, savannas, and pocosins, also in boggy situations; uncommon (VA Rare List). 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 – RAB, C, F, G, GW, HC, S; = *D. strigosum* ssp. *strigosum* – FNA; = *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, Pd, Mt (GA, NC, SC, VA): wet peaty or sandy soil pineland savannas, flatwoods, bogs, and meadows; common in Coastal Plain, occasional 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, Pd, Mt (GA, NC, SC, VA): dry sandy soil of open woods and prairies; frequent (VA Watch List). 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; = *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 (GA, NC, SC, VA): limesink ponds and meadows, cypress savannas, pine savannas, bogs; uncommon (VA Watch List). 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, Cp, Mt (GA, NC, SC, VA): floodplain forests, thickets, bottomlands, and swamps, often on alluvial deposits; frequent in Piedmont, occasional in Coastal Plain, uncommon in Mountains. 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; = *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 Alberta, 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, ranges from the FL Panhandle and s. AL west to MS. [= Q; = *Panicum nudicaule* Vasey]

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, ME south to PA, west to SD; Nova Scotia to Saskatchewan. [= FNA, K, Z; = *Panicum xanthophysum* A. Gray – C, F, G, HC]

Panicum chrysopsidifolium Nash is treated variously by the cited sources. According to Z, who examined an isotype collection and found the ligule to be 2.5 mm long, it belongs to *D. acuminatum* var. *acuminatum*. Plants referred to by HC all have ligules < 1 mm long, and apparently belong to the *D. aciculare* complex. These plants are described as having densely villous nodes, internodes, sheaths, and blades; the blades 5-10 cm long and 3-5 mm wide; and spikelets 1.9-2.2 mm long, obovate, and villous. HC gives a range of se. VA to FL, west to TX, along the Coastal Plain in sandy oak or pine woods. This entity needs further scrutiny.

Panicum glutinoscabrum Fernald is an entity known only locally from "boggy spots" in southeastern Virginia. It is treated as a full species by F, but is placed in synonymy with *Dichanthelium scoparium* (Lamarck) Gould by FNA; with *D. acuminatum* (Swartz) Gould & Clark var. *acuminatum* by Z; with *P. lanuginosum* Elliott var. *fasciculatum* (Torrey) Fernald by C; and with *P. huachucae* Ashe var. *fasciculatum* (Torrey) Hubb. by HC. *Panicum glutinoscabrum* is 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 concedes that "I am not able to render a decision on the poorly known *P. glutinoscabrum* Fernald, but I suggest that it is a hybrid between a member of the *D. acuminatum* complex and *D. scoparium* (Lam.) Gould - the latter contributing the genes for height and viscid sheaths."

Panicum malacon Nash, here placed in synonymy with *Dichanthelium ovale* var. *ovale*, needs additional study. It is distinguished by HC and S as having spikelets 3-3.2 mm long with a first glume situated conspicuously below the second glume and sterile lemma, half or more as long as the spikelet; and leaves 3-5 mm wide, puberulent beneath, and puberulent to glabrous above. The leaf width and puberulence characters are not consistent with descriptions of *D. ovale*, and the placement of *P. malacon* within *D. ovale* by current treatments (including this one) may be in error. The description of *P. malacon* in RAB differs greatly from that of HC and S, and falls well outside the range of *D. ovale* characters. In RAB, *P. malacon* is described as having spikelets 3.5-4 mm long, and leaves 5-14 mm wide. This description may be based on specimens from the Sandhills of SC at NCU identified as *P. malacon* and matching the RAB description. These specimens appear to be misidentified collections of *D. oligosanthes* var. *oligosanthes*.

Digitaria Haller (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 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***

3 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.

4 Lower sheaths glabrous; second glume 0.75-1× as long as the first glume; fertile lemma dark brown or black at maturity.

5 Hairs of the spikelet not minutely capitate; second glume ca. 0.75 as long as the first glume; spikelets averaging 1.5 mm long..... ***D. violascens***

5 Hairs of the spikelet minutely capitate; second glume ca. 1× as long as the first glume; spikelets averaging 2.0 mm long ..... ***D. ischaemum***

4 Lower sheaths pilose; second glume 1/3-3/5 (to 4/5 in *D. ciliaris*) as long as the first glume; fertile lemma white, tan, or grayish-brown at maturity.

6 Spikelets 1.5-1.8 mm long, villous with crinkled hairs; pedicels glabrous, terete in cross-section ..... ***D. serotina***

6 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*].

7 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***

7 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.

8 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***

8 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 (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 (GA, NC, SC, VA), Pd, 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, Pd (GA, NC, SC, VA): sandy fields and roadsides; common (VA Rare). 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, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common. 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]

* ***Digitaria ischaemum*** (Schreber) Muhlenberg, Smooth Crab Grass. Cp, Pd, Mt (GA, NC, SC, VA): fields, lawns, disturbed areas; common, introduced from 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; > *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, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common. July-October. [= RAB, FNA, C, G, K, W, Z; = *D. sanguinalis* var. *sanguinalis* – F, HC; *Syntherisma sanguinalis* (Linnaeus) Dulac – S]

Digitaria serotina (Walter) Michaux, Dwarf Crab Grass. Cp (GA, SC, VA): sandy woodlands; rare (VA Rare). October. [= RAB, C, F, FNA, G, GW, HC, K; = *Syntherisma serotina* Walter – S]

Digitaria villosa (Walter) Persoon. Cp (GA, NC, SC, VA), Pd, Mt (GA, NC, SC): sandy fields, roadsides; common (VA Watch List). September-October. [= HC, K; = *D. filiformis* var. *villosa* (Walter) Fernald – RAB, C, F, FNA, G, X; = *Syntherisma villosa* Walter – S]

* ***Digitaria violascens*** Link. Cp (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 horizontalis* Willdenow, Jamaican Crabgrass, is reported for SC on the basis of a specimen at NCU (Kartesz 1999). {check specimen} [= FNA, K] {not keyed at this time}

Digitaria insularis (Linnaeus) Mez ex Ekman. AL, FL, MS. [= K] {not keyed at this time}

Dinebra Jacquin (Viper Grass)

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 (Saltgrass)

A genus of about 5 species, of North, Central, and South America, and Australia. References: Barkworth in FNA (2003a).

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.

Distichlis spicata (Linnaeus) Greene, Saltgrass, Spike Grass. Cp (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 Nova Scotia and Prince Edward Island 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 (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, Pd (GA, NC, SC, VA), Mt (GA, SC, NC): fields, ditches, disturbed wet areas; uncommon, introduced from 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. {GA, NC, SC, VA} July-October. [= C, G; < *E. crusgalli* – RAB, GW (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***. {AL, MS, FL} 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. Cp (NC), {VA}: disturbed areas; rare, introduced from Asia. July-October. [= F, FNA, K; < *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. {GA, NC, SC, VA} July-October. [= C, FNA, K; < *E. crusgalli* – RAB, GW; = *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 (NC): interdune wetlands. July-October. [= C, FNA, K; < *E. crusgalli* – RAB, GW; > *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 (GA, NC, SC, VA), Pd (GA): marshes; common. July-October. MA south to FL, west to TX on the outer Coastal Plain; also inland from OH west to WI, south to MO and AR. [= RAB, C, F, FNA, GW, HC, K, S, W]

Eleusine Gaertner (Yard Grass)

References: Hilu in FNA (2003a). Key based on FNA.

1 Ligule pubescent ..... ***E. coracana ssp. africana***
1 Ligule membranaceous, ciliate to erose ..... ***E. indica***

* ***Eleusine coracana*** (Linnaeus) Gaertner *ssp. **africana*** (Kennedy & O'Byrne) Hilu & de Wet, Finger Millet. Cp (SC): disturbed areas; rare, introduced from 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, Pd, Mt (GA, NC, SC, VA): lawns, roadsides, gardens, disturbed areas; common, introduced from Old World. [= RAB, C, F, FNA, G, HC, K, S, W]

* ***Eleusine tristachya*** (Lamarck) Lamarck, is introduced from South America in scattered states in e. United States, including VA, NJ (Hilu 1980) and AL (Small 1933). [= FNA, K, S] {not keyed at this time}

Elionurus Humboldt & Bonpland ex Willdenow (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 (GA): wet savannas; rare (GA Special Concern). 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 in FNA (in prep.); Campbell (2000); Church (1967); Tucker (1996)=Z; Barkworth (1997)=X. This treatment largely follows Barkworth & Campbell in FNA (in prep.).

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, Pd (NC, VA), Cp? (SC?): moist forests; rare (NC Watch List, VA Rare). [= FNA; < *E. canadensis* – RAB, C, F, G, GW, K, W]

Elymus glabriflorus (Vasey) Scribner & Ball *var.* ***australis*** (Scribner & C.R. Ball) J.J.N. Campbell, Southeastern Wild-rye. {Cp, Pd, Mt (GA, NC, SC, VA): } [< *E. glabriflorus* – FNA; < *E. virginicus* – RAB, C, GW, W; < *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, Pd, Mt (GA, NC, SC, VA): } [< *E. glabriflorus* – FNA; < *E. virginicus* – RAB, C, GW, W; < *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; < *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, Pd (GA, NC, SC, VA): moist forests, dry forests especially over more fertile soils; common. [= K; < *Hystrix patula* Moench – RAB, G; < *Elymus hystrix* – C, FNA; = *Hystrix patula* var. *patula* – F; < *Hystrix hystrix* (Linnaeus) Millspaugh – S]

Elymus macgregorii R. Brooks & J.J.N. Campb., Early Wild-rye. Pd (GA, NC, VA), Mt, Cp (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; < *E. virginicus* var. *virginicus* – F, G, K, S]

* ***Elymus repens*** (Linnaeus) Gould, Quackgrass, Dog-grass, Witchgrass. Mt, Pd, Cp (NC, VA): roadsides, disturbed areas, pastures; uncommon, probably introduced from Europe (sometimes considered to be partially native along the coast). June-August. [= K, X; = *Elytrigia repens* (Linnaeus) Nevski – C, Z; = *Agropyron repens* (Linnaeus) Palisot de Beauvois – RAB, G, HC, S, W; > *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), Pd (GA, NC, SC, VA), Cp (SC?, VA): moist forests; uncommon (NC Watch List). [= RAB, C, F, FNA, G, GW, K, S, W]

Elymus trachycaulus (Link) Gould ex Shinners *ssp.* ***trachycaulus***, Slender Wheatgrass. Mt (NC, VA): glades and barrens, over serpentine, etc.; rare (VA Rare). [= K; < *Agropyron trachycaulum* (Link) Malte ex H.F. Lewis – RAB, W; < *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 villosus Muhlenberg ex Willdenow, Downy Wild-rye. Mt, Pd, Cp (NC, SC, VA), {GA}: moist forests; uncommon. And reported for PA by Rhoads & Klein (1993). [= RAB, C, F, FNA, G, GW, K, W; = *E. striatus* Willdenow – S]

Elymus virginicus Linnaeus *var.* ***halophilus*** (Bicknell) Wiegand, Salt-marsh Wild-rye. Cp (NC, VA): brackish marshes, maritime forests and hammocks; uncommon (VA Watch List). [= 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; < *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; < *E. virginicus* var. *virginicus* – K; < *E. virginicus* var. *virginicus* – S]

Elymus virginicus Linnaeus *var.* ***virginicus***, Common Eastern Wild-rye, Terrell Grass. Mt, Pd, Cp (NC, SC, VA): moist forests; common. [= FNA; < *E. virginicus* – RAB, C, GW, W; < *E. virginicus* var. *virginicus* – F, G, K; < *E. virginicus* var. *virginicus* – S; *? E. striatus* Willdenow – S]

Elymus curvatus Piper, Awnless Wild-rye, east to c. TN and KY. [= 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 semicostatus*** (Nees ex Steudel) Melderis. Pd (GA): disturbed areas; rare, introduced. Reported for c. GA by Jones & Coile (1988), as *Agropyron semicostatum* Nees ex Steudel. [= FNA, K; = *Agropyrum semicostatum* Nees ex Steudel] {synonymy incomplete}

Elymus svensonii G.L. Church, Svenson's Wild-rye. Nc. KY south to c. TN; disjunct westwards in e. MO, and c. AR. [= FNA, K]

Elymus trachycaulus (Link) Gould ex Shinners ssp. *subsecundus* (Link) A. & D. Löve, Bearded Wheatgrass, in MD, WV, and KY (Kartesz 1999). [= 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]

Elymus wiegandii Fernald, Northern Riverbank Wild-rye. South to sc. PA and NJ. [= C, F, FNA, K; < *E. canadensis* – G]

Elytrigia Desvaux (Quackgrass)

(see *Elymus, Pascopyrum*)

Enteropogon Nees

* ***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. Cp (GA, SC), Pd? (GA?): disturbed areas; rare, introduced the 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 (GA, SC): disturbed areas; rare. 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 (SC): waste areas near wool-combing mills; rare, introduced from Mediterranean Europe. Also reported for e. TN (Chester et al. 1993). [= FNA, HC, K, Z]

Eragrostis capillaris (Linnaeus) Nees, Lacegrass. Mt, Pd, Cp (GA, NC, SC, VA): fields, roadsides, disturbed areas; common (uncommon in Piedmont, rare in Coastal Plain). July-October. ME and WI south to GA and TX. [= RAB, C, F, FNA, G, HC, K, S, W, Z]

* ***Eragrostis cilianensis*** (Allioni) Vignolo ex Janchen, Stinkgrass. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): fields, disturbed areas; common, introduced from Europe. July-October. [= RAB, C, FNA, G, HC, K, S, W, Z; *? E. megastachya* (Koel.) Link – F]

Eragrostis ciliaris (Linnaeus) R. Brown *var. **ciliaris***. Cp (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 (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, Pd, Mt (GA, NC, SC, VA): roadsides; common, introduced from 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, Z; > *E. curvula* var. *conferta* Stapf]

Eragrostis elliottii S. Watson, Elliott's Lovegrass. Cp (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), Pd (NC, VA), Cp (VA), {GA}: disturbed areas; uncommon (NC Watch List). September. MA and MN south to FL and AR. [= RAB, C, FNA, G, GW, K, S, W, Z; > *E. frankii* var. *frankii* – F, HC]

Eragrostis hirsuta (Michaux) Nees, Bigtop Lovegrass. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common (uncommon in Mountains). 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, 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, Pd (GA, NC, SC, VA), Mt (NC, VA): marshes, shores; uncommon. September. Throughout most of North America, south to South America. [= RAB, C, F, FNA, G, GW, HC, K, S, W, Z]

Eragrostis intermedia A.S. Hitchcock, Plains Lovegrass. Cp, Pd (GA), {NC, SC, VA}. Reported for scattered locations as far east as NC, SC, VA (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 (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 (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. Cp (SC): waste areas near wool-combing mills; rare, introduced from . 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 minor*** Host, Little Lovegrass. Pd (GA, NC, SC, VA), Mt (NC, SC, VA), Cp (VA): disturbed areas; uncommon, introduced from Europe. July-September. [= C, FNA, K, Z; *? E. poaeoides* Palisot de Beauvois ex Roemer & J.A. Schultes – RAB, F, G, HC, W; *? E. eragrostis* (Linnaeus) Palisot de Beauvois – S]

Eragrostis pectinacea (Michaux) Nees ex Steudel *var.* ***pectinacea***, Carolina Lovegrass. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common (VA Watch List). ME and WA south to Central America and West Indies. [= FNA, K, Z; < *E. pectinacea* – C, GW, W; = *E. pectinacea* – F, HC, S; > *E. pectinacea* – G; > *E. diffusa* Buckley – G]

* ***Eragrostis pilosa*** (Linnaeus) Palisot de Beauvois *var.* ***pilosa***. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, introduced from 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, Z]

Eragrostis refracta (Muhlenberg) Scribner, Coastal Lovegrass. Cp (GA, NC, SC, VA), Pd (NC, SC, VA): pinelands, savannas, woodlands, marshes; common (uncommon in Piedmont). 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 *var.* ***oxylepis*** (Torrey) S.D. Koch, Red Lovegrass. Cp (GA, NC, SC, VA): sandy roadsides, coastal dunes, and disturbed areas; rare, introduced from sw. United States. First reported for SC by Nelson & Kelly (1997). [= *E. oxylepis* (Torrey) Torrey – GW, HC; = *E. secundiflora* ssp. *oxylepis* S.D. Koch – FNA, K, Z; < *E. secundiflora* – S]

Eragrostis spectabilis (Pursh) Steudel, Purple Lovegrass, Tumblegrass. Cp, Pd, Mt (GA, NC, SC, VA): 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, Z; > *E. spectabilis* var. *spectabilis* – F; > *E. spectabilis* var. *sparsihirsuta* Farwell – F; *E. pectinacea*, misapplied]

* ***Eragrostis trichodes*** (Nuttall) Wood. Pd (VA): disturbed areas; rare, introduced from w. North America. [= C, FNA, K, Z; > *E. trichodes* var. *trichodes* – F, HC]

* ***Eragrostis elongata*** (Willdenow) Jacquin f., Long Lovegrass. Cp (SC): waste areas near wool-combing mills; rare, introduced from se. Asia and Australia. [= FNA, K] {not keyed at this time}

* ***Eragrostis leptostachya*** (R. Brown) Steudel, Australian Lovegrass, is reported for NC (Kartesz 1999). {investigate} [= FNA, K] {not keyed at this time}

* *Eragrostis mexicana* (Hornemann) Link ssp. *virescens* (J. Presl) S.D. Koch & Sánchez, reported as an introduction on ballast in MD and FL. [= FNA, K; = *E. virescens* J. Presl – HC]

Eragrostis pectinacea (Michaux) Nees ex Steudel var. *miserrima* (Fournier) J. Reeder, from FL and westwards and southwards, may be in our area. [= FNA, K, Z; = *E. tephrosanthos* J.A. Schultes – HC, S; < *E. pectinacea* – GW]

* ***Eragrostis plana*** Nees, South African Lovegrass. Cp (SC): waste areas near wool-combing mills; rare, introduced from South Africa. [= FNA, K] {not keyed at this time}

* ***Eragrostis setifolia*** Nees, Neverfail. Cp (SC): waste areas near wool-combing mills; rare, introduced from Australia. [= FNA, K] {not keyed at this time}

* ***Eragrostis tef*** (Zuccagni) Trotter, Teff. Cp (SC): waste areas near wool-combing mills; rare, introduced from Africa. This is the grain used in making Ethiopian bread. [= FNA, HC, K] {not keyed at this time}
* ***Eragrostis unioloides*** (Retzius) Nees ex Steudel, Chinese Lovegrass. Cp (GA): rare, introduced from Asia. Reported for s. GA (Jones & Coile 1988, FNA, GW, HC). [= FNA, GW, HC, K, S, Z]

Eremochloa Büse (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 (GA, NC, SC, VA), Pd (GA, NC, SC): lawns, roadsides, sometimes weedy in more natural sites; common, introduced from 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]

Erianthus
(see ***Saccharum***)

Eriochloa Kunth (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 introduced from 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, Mt (VA), Cp (SC): disturbed areas, waste areas around wool-combing mills; rare, introduced from midwestern United States. [= C, F, FNA, G, GW, HC, K, Y, Z]
Eriochloa michauxii (Poiret) A.S. Hitchcock *var.* ***michauxii***, Longleaf Cupgrass. Cp (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): disturbed area (open edge of railroad bed); rare, introduced from 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 keyed at this time; synonymy incomplete}

Eustachys Desvaux (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, introduced from South America. In GA and FL (Kartesz 1999). [= FNA, K, Z; = *Chloris distichophylla* Lagasca y Segura – HC]

Eustachys floridana Chapman, Florida Finger-grass. Cp (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 (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 (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 (GA, SC): sandy fields; rare, introduced from Argentina. June. [= 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 keyed at this time}

Eustachys neglecta (Nash) Nash. Native. Pinelands, sandy fields. N. and peninsular FL, se. AL, and e. TX. [= FNA, K; = *Chloris neglecta* Nash – HC, S] {synonymy incomplete; not keyed at this time}

Festuca Linnaeus (Fescue)
(also see *Vulpia*)

A genus of qbout 350 species, nearly cosmopolitan in temperate regions. References: Darbyshire (1993)=X; Aiken & Darbyshire (1990)=Y; Tucker (1996)=Z; Soreng & Terrell (1998). Key based in part on C and Y.

1 Leaves 0.2-3 mm wide, often involute; [subgenus *Festuca*].
2 Plant loosely tufted, often rhizomatous; basal sheaths disintegrating into fibers; spikelets 6-13 mm long ..... ***F. 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*].
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, introduced from Eurasia. May-June. [= C, 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, Pd, Mt (GA, NC, SC, VA): bottomlands, uplands over mafic rock; common. May-July. PA west to WI and IA, south to SC, c. GA, and e. TX. [= RAB, C, F, G, GW, HC, K, W, Z; *?* *F. shortii* Kunth ex Wood – S, misapplied]

Festuca rubra Linnaeus, Red Fescue. Mt (NC, SC, VA), Pd, Cp (GA, NC, VA): roadsides, fields, disturbed areas, pastures, grassy balds; common. May-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; it is uncertain how they might apply in our area. [= RAB, C, G, HC, S, Y, Z; > *F. rubra* var. *rubra* – F; > *F. rubra* var. *commutata* Gaudin – F; *?* *F. rubra* ssp. *rubra* – K]

Festuca subverticillata (Persoon) Alexeev, Nodding Fescue. Mt, Pd, Cp (GA, NC, SC, VA): moist to wet forests, woodlands, and disturbed areas; common. May-June. ME, Québec, and Manitoba south to FL and e. TX. [= C, K, Y, Z; *?* *F. obtusa* Biehler – RAB, F, G, GW, HC, S, W]

* ***Festuca trachyphylla*** (Hackel) Krajina, Hard Fescue. Pd (GA, NC, VA), Mt (NC, VA), Cp (NC, SC, VA): meadows, pastures, disturbed areas; uncommon, introduced from 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, in the 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 thurberi* Vasey. Introduced in SC. [= K] {not keyed; investigate}
Festuca versuta Beal, Texas Fescue. Native, east to TN. [= K] {not keyed; investigate}

Glyceria R. Brown (Mannagrass)
(also see *Torreyochloa*)

A genus of about 40 species, nearly cosmopolitan. References: Tucker (1996)=Z.

1 Spikelets (10-) 15-40 mm long, linear, subterete, 5-15× as long as wide; [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 2.5-5.3 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 mm beyond the lemma apex).
  - 3 Anthers 0.5-0.8 mm long; lemma mostly 2.5-3.5 mm long..... ***G. arkansana***
  - 3 Anthers 1.0-2.0 mm long; lemma mostly 3.6-5.5 mm long..... ***G. septentrionalis***

1 Spikelets 2.5-8 mm long, ovate to oblong, 1.5-3× as long as wide; [section *Hydropoa*].
- 4 Inflorescence compact (at maturity), the branches stiffly ascending to appressed, the tips never nodding; ligule < 1 mm long.
  - 5 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; [of the Mountains, rarely elsewhere] .... ***G. melicaria***
  - 5 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; [of the Coastal Plain, rarely disjunct inland to the Mountains of VA]..... ***G. obtusa***
- 4 Inflorescence lax and diffuse (at maturity), the branches spreading to somewhat ascending, the tips often nodding or drooping; ligule 1-6 mm long.
  - 6 Veins of the lemma visible, but not raised; lemma 2.3-4.0 mm long; ligule 2-6 mm long.
    - 7 Lemma 2.9-4.0 mm long, projecting conspicuously beyond the palea; spikelets 4-8 mm long, with 5-10 flowers..... ***G. canadensis***
    - 7 Lemma 2.3-2.9 mm long, more-or-less equal to the palea; spikelets 3-5 mm long, with (2-) 3-5 (-6) flowers ... . ***G. laxa***
  - 6 Veins of the lemma prominently raised; lemma 1.4-3.0 mm long; ligule 1-4 mm long.
    - 8 Lemma 1.4-2.1 mm long, usually green; first glume 0.5-1.0 mm long; second glume 0.8-1.3 mm long; culms mostly 5-12 dm tall; leaves 2-5 (-8) mm wide ..... ***G. striata* *var. striata***
    - 8 Lemma 2.5-3.0 mm long, purple or green; first glume 1.2-1.9 mm long; second glume 1.5-2.4 mm long; culms mostly 10-20 dm tall; leaves 5-12 mm wide.
      - 9 Glumes obtuse, subequal (the first 1.2-1.9 mm long, the second 1.5-2.4 mm long); spikelets 4-6.5 mm long, (4-) 5-9-flowered; lemmas purplish, contrasting with the pale glumes; ligule 2-4 (-5) mm long; [of various montane wetlands of VA and possibly NC]..... ***G. grandis* *var. grandis***
      - 9 Glumes acute, unequal (the first 1.4-1.6 mm long, the second 1.8-2.1 mm long); spikelets mostly 3-4 mm long, 2-4-flowered; lemmas dark green (or purplish?); ligule 1.5-3 mm long; [of high elevation seepages in the Great Smoky Mountains of NC and TN]..... ***G. nubigena***

Glyceria acutiflora Torrey. Mt (GA, VA): shallow water and wet mucky soils in mountain ponds, wet pastures; rare (GA Special Concern). 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, G, GW, HC, K, W, Z; = *Panicularia acutiflora* (Torrey) Kuntze – S]

Glyceria arkansana Fernald, Arkansas Mannagrass. Cp (VA): swamps; rare. May-June. IL south to LA and AR; disjunct in se. VA and w. NY. 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]

Glyceria canadensis (Michaux) Trinius, Rattlesnake Mannagrass. Mt (NC, VA), Cp (VA): bogs, seepages, and wet meadows; rare. June-July. Newfoundland west to MN, south to NJ, VA, nw. NC, and IL. [= C, F, G, K, Z; = *G. canadensis* var. *canadensis* – HC, W]

Glyceria grandis S. Watson *var. **grandis***, American Mannagrass. Mt (NC?, VA), Cp (VA): wet, mucky soils of open wetlands; rare. Nova Scotia west to AK, south to VA, IA, NM, and OR. Attributed to w. NC by Tucker (1996). [= K; < *G. grandis* – C, F, G, GW, HC, 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): bogs; rare. June-July. Prince Edward Island 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; = *G. canadensis* (Michaux) Trinius var. *laxa* (Scribner) A.S. Hitchcock – RAB, HC; = *G.* ×*laxa* – C; < *G. canadensis* – GW]

Glyceria melicaria (Michaux) F.T. Hubbard, Northeastern Mannagrass. Mt (GA, NC, VA), Pd (NC): mountain swamp forests and seepages; uncommon (GA Special Concern). June-August. Nova Scotia west to Québec, south to n. GA (Jones & Coile 1988) and KY. [= RAB, C, F, G, GW, HC, K, W, Z; = *Panicularia melicaria* (Michaux) A.S. Hitchcock – S]

Glyceria nubigena W.A. Anderson, Smoky Mountain Mannagrass. Mt (NC): 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 (US Species of Concern, NC 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, HC, K, W, Z]

Glyceria obtusa (Muhlenberg) Trinius, Coastal Mannagrass. Cp (NC, SC, VA), Mt (VA): blackwater swamp forests, wet meadows, freshwater marshes; uncommon. June-September. Nova Scotia south to SC, on or near the Coastal Plain. [= RAB, C, F, G, GW, HC, K, W, Z; = *Panicularia obtusa* (Muhlenberg) Kuntze – S]

Glyceria septentrionalis A.S. Hitchcock, Floating Mannagrass, Eastern Mannagrass. Cp, Pd (GA, NC, SC, VA), Mt (NC, VA): shallow water, wet mucky soils, floodplain sloughs, cypress ponds; uncommon (GA Special Concern). May-June. MA west to MN, south to SC, ne. GA, and TX. [= RAB, F, GW, HC, K, W, Z; < *G. septentrionalis* – C, G (also see *G. arkansana*); = *Panicularia septentrionalis* (A.S. Hitchcock) Bicknell – S]

Glyceria striata (Lamarck) A.S. Hitchcock *var. **striata***, Fowl Mannagrass. Mt, Pd, Cp (GA, NC, SC, VA): wet meadows, seepages, bogs, marshes, swamp forests; common. April-June. Newfoundland west to British Columbia, south to FL and CA. Var. *stricta* (Scribner) Fernald is more northern. [= C, F, G, HC, Z; < *G. striata* – RAB, GW, K, W; = *Panicularia striata* (Lamarck) A.S. Hitchcock – S; = *G. striata* ssp. *striata*]

Gymnopogon Palisot de Beauvois (Beard Grass, Skeleton Grass)

A genus of about 15 species, in temperate and tropical areas of the Americas. References: 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; [of the 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; [of the 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, Pd (GA, NC, SC, VA), Mt (NC, SC, VA): prairies, glades, barrens, dry pinelands and woodlands, dry fields; common (rare in Mountains). August-October. S. NJ west to KY, OH, and MO, south to FL and TX. [= RAB, C, F, G, HC, K, S, W, Z]

Gymnopogon brevifolius Trinius, Pineland Beard Grass. Cp, Pd (GA, NC, SC, VA), Mt (GA): pine savannas, sandhills, dry woodlands, prairies, calcareous glades; common (rare in lower Piedmont) (GA Special Concern, VA Watch List). August-October. S. NJ south to FL, west to LA and AR; disjunct in the Highland Rim of KY and TN. [= RAB, C, F, G, HC, K, S, Z]

Gymnopogon chapmanianus A.S.Hitchcock, Chapman's Beard Grass. Cp (GA): sandhills and other xeric, sandy habitats; rare (GA Special Concern). Se. GA south to FL. [= HC, K, S; > *G. chapmanianus* – Z; *G. floridanus* Swallen – Z]

Hackelochloa Kuntze (Pitscale Grass

* ***Hackelochloa granularis*** (Linnaeus) Kuntze, Pitscale Grass. Cp (GA): disturbed areas; rare, introduced from 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 (Thintail)

References: Tucker (1996)=Z.

* ***Hainardia cylindrica*** (Willdenow) W. Greuter, Thintail. Cp (SC): waste areas around wool-combing mills; rare, introduced from the Old World. April-June. [= K, Z; = *Lepturus cylindricus* (Willdenow) Trinius – RAB; = *Monerma cylindrica* (Willdenow) Cosson & Durieu – HC]

Heteropogon Persoon (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 (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]

Hierochloe R. Brown (Holy Grass, Sweet Grass, Vanilla Grass)

A genus of about 30 species, temperate and boreal in the northern and southern hemispheres. Tucker (1996) and Soreng et al. (2003) propose the inclusion of *Hierochloe* into a more broadly circumscribed *Anthoxanthum*. References: Tucker (1996)=Z; Soreng et al. (2003)=Y.

Hierochloe odorata (Linnaeus) Palisot de Beauvois, Holy Grass, Sweet Grass, Vanilla Grass. Mt (NC, VA): fens, wet calcareous medaows, high elevation pastures and openings; rare (NC Rare). April-May. 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 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. Kartesz (1999) maps the NC occurrence of *Hierochloe* as *H. hirta* ssp. *arctica*; the reasons for this are unknown. {investigate} [= C, F, G, HC; *? H. odorata* ssp. *odorata* – K; *? H. hirta* (Schrank) ssp 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)]

Holcus Linnaeus (Velvet Grass, Soft Grass)

References: Tucker (1996)=Z.

1 Plant not rhizomatous; upper culm internodes velvety-villous; lemma awn recurved ..... ***H. lanatus***
1 Plant strongly rhizomatous; upper culm internodes glabrous; lemma awn straight ..... ***H. mollis***

* ***Holcus lanatus*** Linnaeus, Velvet Grass, Soft Grass, Yorkshire-fog. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): pastures, disturbed areas, roadsides, hedge-rows; common (rare in SC), introduced from Europe. May-October. [= RAB, C, F, G, HC, K, W, Z; = *Notholcus lanatus* (Linnaeus) Nash – S]
* ***Holcus mollis*** Linnaeus, Creeping Soft Grass. Mt (NC): lawns; rare, introduced from Europe. September. This European species is known from scattered sites in e. North America. The species was documented for our area by Clay (1995). [= 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: 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***
  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, Foxtail Barley, Squirreltail Barley. Mt, Pd (VA), Cp (NC, SC): disturbed areas; rare, apparently introduced in our area, introduced from w. United States. May-August. A tetraploid taxon. [= RAB, C, F, G, HC, W, Z; *? H. jubatum* ssp. *jubatum* – K; = *Critesion jubatum* (Linnaeus) Nevski]

* ***Hordeum murinum*** Linnaeus *ssp.* ***leporinum*** (Link) Arcangeli. Pd (GA, NC, VA), Cp (SC, VA): disturbed areas; rare, introduced from Mediterranean Europe. May. A tetraploid taxon. [= 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, Pd, Mt (GA, NC, SC, VA): roadsides, ditches, disturbed areas; common. April-June. Se. NY west to MN, south to n. FL, s. TX, and s. AZ. A diploid taxon. [= RAB, C, F, G, HC, K, S, W, Z; = *Critesion pusillum* (Nuttall) Á. Löve]

* ***Hordeum vulgare*** Linnaeus, Barley. Cp, Pd (NC, SC, VA), Mt (VA): cultivated fields, occasionally persistent as a waif; commonly cultivated, rare as a waif, introduced from 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 8500 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*; > ***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. [= K; *Critesion brachyantherum* (Nevski) Barkworth & D.R. Dewey] {not keyed at this time}

* ***Hordeum depressum*** (Scribner & J.G. Smith) Rydberg. Cp (SC): waste areas around wool-combing mills; rare, introduced from w. North America. A tetraploid taxon. [= HC, K; = *Critesion depressum* (Scribner & J.G. Smith) Á. Löve] {not keyed at this time}

Hystrix Moench
(see *Elymus*)

Imperata Cirillo (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 (GA, SC): grassy roadside; rare, 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 (Junegrass, Koeleria)

A genus of about 60 species, north and south temperate.

Koeleria macrantha (Ledebour) J.A. Schultes, Junegrass, South to DE, MD, PA, KY, and AL (Kartesz 1999). [= K; *K. pyramidata* (Lamarck) Palisot de Beavois – C]

Lachnagrostis Trinius 1820

A genus of about 20 species, of the Southern Hemisphere. References: Soreng et al. (2003); FNA in prep.

* ***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 (Hare's-tail Grass)

A monotypic genus, of the Mediterranean region. References: Tucker (1996)=Z.

* ***Lagurus ovatus*** Linnaeus, Hare's-tail Grass. Cp (NC): on ballast; rare, introduced from Mediterranean Europe. April-June. [= RAB, HC, K, Z]

Leersia Swartz (Cutgrass)

A genus of about 18 species, tropical and warm temperate. References: 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 (GA, NC, SC, VA): clay-based Carolina bays, limesink ponds, lakes, pools, usually in places where periodically or seasonally inundated; uncommon (VA Rare). 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, G, GW, HC, K, Z; = *Homalocenchrus hexandrus* (Swartz) Kuntze – S]

Leersia lenticularis Michaux, Catchfly Cutgrass. Cp (GA, NC, SC, VA): floodplain forests and swamps; uncommon. September-October. Se. VA south to n. FL, west to e. TX, north in the interior to IN and MN. [= RAB, C, F, G, GW, HC, K, Z; = *Homalocenchrus lenticularis* (Michaux) Kuntze – S]

Leersia oryzoides (Linnaeus) Swartz, Rice Cutgrass. Cp, Pd, Mt (GA, NC, SC, VA): marshes, riverbanks, pond-shores; common. August-October. Nova Scotia west to British Columbia, south to FL and CA; also in Europe and e. Asia. [= RAB, C, F, G, GW, HC, K, Z; = *Homalocenchrus oryzoides* (Linnaeus) Pollich – S]

Leersia virginica Willdenow, White Grass, White Cutgrass. Cp, Pd, Mt (GA, NC, SC, VA): floodplain forests, swamps, streambanks; common. August-October. Québec west to MN and SD, south to FL and TX. [= RAB, C, G, GW, HC, K, Z; > *L. virginica* var. *virginica* – F; > *L. virginica* var. *ovata* (Poiret) Fernald – F; = *Homalocenchrus virginicus* (Willdenow) Britton – S]

Leptochloa Palisot de Beauvois (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. Pd (NC): bed of artificial impoundment; rare, adventive from further west. September. Widespread in e. North America, primarily west of the Appalachians (adventive further east), and extending into South America. [= 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 (NC, SC, VA): fresh to brackish marshes, overwash flats, other disturbed brackish habitats; rare (NC Rare, VA Watch List). August-October. Along the coast from s. NH south to SC. This taxon appears to warrant status as a species separate from *L. fascicularis*.

Reported (as *L. fascicularis*) for SC by Nelson & Kelly (1997). [= C, G; < *L. fascicularis* – RAB, GW, HC, S; = *Diplachne maritima* Bicknell – F; < *L. fusca* (Linnaeus) Kunth ssp. *fascicularis* (Lamarck) N. Snow – FNA, K]

Leptochloa panicea (Retzius) Ohwi *ssp.* ***brachiata*** (Steudel) N. Snow, Red Sprangletop. Pd (GA, NC, SC, VA), Cp (NC, SC, VA): disturbed areas; uncommon (VA Watch List). 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, introduced from South America. Belden et al. (2004) discuss the Virginia 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 (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 has been 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 virgata*** (Linnaeus) Palisot de Beauvois, Tropical Sprangletop. Cp (SC): waif at wool-combing mill; rare, introduced, probably not established. [= FNA, HC, K] {not keyed}

Leptoloma
(see *Digitaria*)

Limnodea L.H. Dewey 1894

References: Brandenburg & Thieret (2000)=Z.

* *Limnodea arkansana* (Nuttall) L.H. Dewey. Cp (SC): waste at wool-combing mill, probably not established; rare, introduced from sc. United States. [= HC, K, S, Z; = *Cinna arkansana* (Nuttall) G. Tucker]

Lolium Linnaeus (Rye-grass, Darnel, Fescue)
(also see *Schedonorus*)

References: Darbyshire (1993)=Y; Aiken & Darbyshire (1990)=X; Tucker (1996)=Z. Key based in part on C and X.

1 Inflorescence paniculate (spikelets borne on branches off the central axis)..... ***[see Schedonorus]***
1 Inflorescence spikelike (spikelets sessile on the central axis); [subgenus *Lolium*].
  2 Glumes (12-) 15-25 mm long, subcoriaceous, equalling 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. Cp (GA, NC, SC, VA), Pd, Mt (NC, SC, VA): fields, roadsides, pastures, disturbed areas; common, introduced from Eurasia. April-July. [= C, Z; = *L. multiflorum* Lamarck – RAB, F, G, HC, S; = *L. perenne* ssp. *multiflorum* (Lamarck) Husnot – K; < *L. perenne* – W]

* ***Lolium perenne*** Linnaeus *var. **perenne***, English Rye-grass, Perennial Rye-grass. Cp (GA, NC, SC, VA), Pd, Mt (GA, NC, VA): fields, roadsides, pastures, disturbed areas; uncommon, introduced from Eurasia. April-July. [= C, Z; = *L. perenne* – RAB, F, G, HC, S; = *L. perenne* ssp. *perenne* – K; < *L. perenne* – W]

* ***Lolium temulentum*** Linnaeus, Darnel. Pd (GA, NC, VA), Cp (NC, VA), {SC}: fields, roadsides, pastures, disturbed areas; common, introduced from Eurasia. May-June. [= 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 (Southern Water Grass)

A genus of about 12 species, from s. North America south to tropical South America. References: Tucker (1988)=Z; Judziewicz et al. (2000)=Y.

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). [= Y, Z; < *L. fluitans* – K; < *Hydrochloa carolinensis* Palisot de Beauvois – RAB, GW, HC, S]

Luziola bahiensis (Steudel) Hitchcock. Streams and riverbanks. Apparently native, in AL, FL, MS. See Anderson & Hall (1993). [= HC, K] {not keyed}

* *Luziola peruviana* Gmelin, Peruvian Water Grass. Disturbed wet areas. Apparently an introduction, occurring in disturbed situations. See Anderson & Hall (1993). [= HC, K] {not keyed}

Melica Linnaeus (Melic)

A genus of about 80 species, north temperate, s. Africa and s. South America. References: 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 species, 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 species of the Mountains of NC and VA, northwards and westwards] ..... ***M. nitens***

Melica mutica Walter, Two-flower Melic. Cp, Pd, Mt (GA, NC, SC, VA): forests and woodlands, including coastal fringe and maritime forests; common. April-May. MD west to IN and IL, south to FL and TX. [= RAB, C, F, G, HC, K, S, W, Z]

Melica nitens (Scribner) Nuttall ex Piper, Three-flower Melic. Mt (GA, NC, VA): rocky upland woodlands, barrens, and glades, over calcareous rocks (such as limestone, calcareous shale); rare (NC Rare, VA Rare). May. PA west to s. MN and NE, south to nw. GA and TX. [= RAB, C, F, G, HC, K, W, Z]

Melinis Palisot de Beauvois (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, Pd, Mt (GA): disturbed areas, roadsides; rare, introduced from Africa. 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, Flexible Sasa-grass, Japanese-grass. Pd, Mt, Cp (GA, NC, SC, VA): disturbed areas, colonizing moist, rich soil, especially in floodplains; common, 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 (Wood-millet, Millet-grass)

A genus of 3-4 species, north temperate. References: Tucker (1996)=Z; Fernald (1950b)=Y.

Milium effusum Linnaeus *var.* ***cisatlanticum*** Fernald, American Wood-millet, Millet-grass. Mt (NC, VA): forests at high (or rarely moderate) elevations; rare (NC Rare, VA Watch List). 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. [= K, Y; < ***M. effusum*** – RAB, C, F, G, HC, W, Z]

Miscanthus Andersson (Eulalia)

References: Barkworth in FNA (2003a).

* ***Miscanthus sinensis*** Andersson, Eulalia, Chinese Silver Grass. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): roadsides; common, introduced from 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; > ***M. sinensis*** var. *variegatus* Beal – F, HC; > ***M. sinensis*** var. *zebrinus* Beal – F, HC]

Muhlenbergia Schreber 1789 (Muhly)

A genus of about 160 species, of North America south to Andean South America, and e. and se. Asia. *Muhlenbergia* is a large and diverse genus; the various groups seem very different. References: Pohl (1969); Morden & Hatch (1989); 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 ..... ***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); [subgenus *Podosemum*].
  - 3 Spikelets 1.5-2 mm long, awnless ..... ***[M. uniflora]***
  - 3 Spikelets 2.5-5 mm long (excluding awns), awned or awnless.
    - 4 Lemma awn 0-1.5 (-4) mm long; glumes (1.1-) 2.0-3.3 (-3.6) mm long, 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-) 3-33 mm long; glumes (0.3-) 0.7-1.7 (-2.4) mm long, one or both glumes sometimes awned; spikelets usually purple (when fresh); basal sheaths rarely strongly fibrous.
      - 5 Lemma awn (0-) 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; [of 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; [of 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; [collectively of 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), {NC}: bottomlands and other moist forests; rare (VA 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, Cp (GA, NC, SC, VA), Mt (GA, NC, VA): in the Piedmont primarily in clayey or thin rocky soils (especially in areas which formerly burned and were prairie-like), 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. 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. [= F, FNA, G, W; < *M. capillaris* – RAB, GW (also see *M. sericea*); = *M. capillaris* var. *capillaris* – C, HC, K, S]

Muhlenbergia cuspidata (Torrey ex Hooker) Rydberg, Plains Muhly. Mt (VA): dolomite and limestone palisade cliffs along the New, Roanoke, and Shenandoah rivers; rare (VA Rare). OH west to MT and Alberta, south to sw. VA, KY, MO, OK, and NM. [= C, F, FNA, G, HC, K]

Muhlenbergia expansa (Poiret) Trinius, Savanna Hairgrass. Cp (GA, NC, SC, VA): pine savannas, pine flatwoods, mesic areas in sandhill-pocosin ecotones; common (VA Rare). September-October. An important part of the grassy component of many longleaf pine savannas, *M. expansa* is a Coastal Plain species, ranging from se. VA south to FL, and west to e. TX (nearly exactly the range of *Pinus palustris*). Its 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), 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 discussion of Morden & Hatch (1989) advocating varietal status for the three taxa in the ***M. capillaris-expansa-sericea*** complex. [= RAB, F, FNA, GW, HC, S; = ***M. capillaris*** var. *trichopodes* (Elliott) Vasey – C, K]

Muhlenbergia frondosa (Poiret) Fernald, Smooth Wirestem Muhly. Mt, Pd (GA, NC, VA), Cp (NC): moist forests and disturbed areas; uncommon (rare in Piedmont and Coastal Plain). 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; = ***M. mexicana*** – S, misapplied]

Muhlenbergia glabriflora Scribner, Clay-pan Muhly. Pd (NC, VA): in clayey soils (such as those derived from diabase); rare (NC Watch List, VA 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 (NC Rare, VA 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), Pd (VA): forest edges; rare (NC Watch List). 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; > ***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, Pd, Cp (GA, NC, SC, VA): bottomland and other moist forests, disturbed areas; common. August-October. This species is widespread in e. United States. [= RAB, C, F, FNA, GW, HC, K, S, W; > ***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 (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 a recent paper (Morden & Hatch 1989) advocating varietal status for the three taxa in the ***M. capillaris-expansa-sericea*** complex. [= FNA; < ***M. capillaris*** – RAB, GW; = ***M. capillaris*** var. *filipes* (M.A. Curtis) Chapman ex Beal – HC, K, S; = ***M. filipes*** M.A. Curtis]

Muhlenbergia sobolifera (Muhlenberg ex Willdenow) Trinius, Rock Muhly. Mt (GA, NC, VA), Pd (VA): dry wooded limestone slopes, rock outcrops and rocky forests; uncommon (GA Special Concern, NC Watch List). July-September. This species is widespread in e. United States, south to AL. [= RAB, C, F, FNA, G, HC, K, S, W]

Muhlenbergia sylvatica Torrey ex A. Gray, Woodland Muhly. Mt (GA, NC, SC, VA), Pd (NC, VA), Cp (VA): bottomland and other moist forests, calcareous strembanks; rare (GA SPecial Concern, NC Watch List). September. This species is widespread in e. United States, south to ne. GA. [= RAB, C, FNA, K, W; > ***M. sylvatica*** var. *sylvatica* – F, G, GW, HC; = ***M. umbrosa*** Scribner – S]

Muhlenbergia tenuiflora (Willdenow) Britton, Sterns, & Poggenburg, Slender Muhly. Mt, Pd (GA, NC, VA), Cp (VA), {SC}: moist forests and disturbed areas, up to at least 1400m; uncommon (rare in Piedmont). August-October. This species is widespread in e. United States. 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; > ***M. tenuiflora*** var. *tenuiflora* – C; > ***M. tenuiflora*** var. *variabilis* (Scribner) Pohl – C]

Muhlenbergia torreyana (J.A. Schultes) A.S. Hitchcock, Pinebarren Smokegrass. Cp (GA, NC): moist soils of depression meadows and clay-based Carolina bays, often under or near *Taxodium ascendens*; rare (GA Special Concern, NC Endangered). 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 asperifolia (Nees & Meyen ex Trinius) Parodi, Alkali Muhly, Scratchgrass. Alkaline soils, wetlands, lawns. Reported east and south to MD, PA, and OH (Kartesz 1999). [= C, F, FNA, G, HC, K] {not keyed at this time}

* *Muhlenbergia emersleyi* Vasey, Bull Muhly, is reported as introduced in NC (Kartesz 1999), 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] {not keyed}

Muhlenbergia uniflora (Muhlenberg) Fernald. Bogs, wet meadows. South to NJ and se. PA (Rhoads & Klein 1993). [= C, FNA, G, HC, K; > ***M. uniflora*** var. ***uniflora*** – F] {not keyed at this time}

Nassella (Trinius) Desvaux

* ***Nassella leucotricha*** (Trinius & Ruprecht) Pohl, Texas Needlegrass. Cp (SC): waste areas near wool-combing mill; rare, introduced from sc. United States and Mexico. [= K; = *Stipa leucotricha* Trinius & Ruprecht – HC]

Neeragrostis Bush

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, is 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 (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 Sheath and culm axis glabrous or with a few scattered hairs, the hairs < 1 mm long; lemma (7-) 9-11-veined..... ..... ***O. hirtellus*** *ssp.* ***setarius***

1 Sheath and culm axis noticeably pilose, the hairs 1-3 mm long; lemma 7-veined .... ***[O. hirtellus*** *ssp.* ***undulatifolius]***

Oplismenus hirtellus (Linnaeus) Palisot de Beauvois *ssp.* ***setarius*** (Lamarck) Mez ex Ekman, Woods-grass. Cp (GA, NC, SC), Pd (GA, SC): maritime forests, shell middens, moist forests; uncommon (NC Watch List). August-October. ***O. hirtellus*** is widespread in tropical and subtropicals 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 sspp. 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, native to the Eastern Hemisphere, has been reported as an introduction in Baltimore Co., MD (Peterson et al. 1999). It can be expected to spread, and may likely be found in our area. [= FNA, K, Y; < ***O. hirtellus*** (Linnaeus) Palisot de Beauvois – Z]

Oryza Linnaeus (Rice)

A genus of about 20 species, native of tropical and warm temperate portions of the Old World. References: Tucker (1988)=Z; Judziewicz et al. (2000)=Y; Nanda & Sharma (2003=X.

* ***Oryza sativa*** Linnaeus, Rice. Cp (GA, NC, SC): escaped in marshes (probably not truly naturalized); rare, 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 and extreme se. NC. [= RAB, C, G, GW, HC, K, S, X, Y, Z]

Oryzopsis Michaux (Ricegrass)
(also see *Piptatherum*)

1 Leaves involute when dry, 1-2 mm wide; glumes 3.5-4.8 mm long ..... ***[see Piptatherum canadense]***

1 Leaves flat, 5-15 mm wide; glume 6-9 mm long.

2 Leaves primarily basal or low-cauline, 2-4 (-5) dm long, 4-10 mm wide; inflorescence a raceme or a racemiform panicle; culms prostrate, the upper leaves very reduced, often merely bladeless sheaths ..... ***O. asperifolia***
2 Leaves primarily cauline, 1-2.5 dm long, 8-15 mm wide; inflorescence a panicle; culms erect, the upper leaves well-developed..... ***[see Piptatherum racemosum]***

Oryzopsis asperifolia Michaux, Rough-leaved Ricegrass, Whiteseed Mountain-ricegrass. Mt (VA): high elevation pine-oak/heath barrens and woodlands; rare (VA Rare). Newfoundland west to British Columbia, south to w. VA, 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, G, HC, K]

Panicum Linnaeus 1753 (Panic Grass)
(also see *Dichanthelium*, *Phanopyrum, Setaria, Steinchisma*, and *Urochloa*)
(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.}

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).

1 Spikelets tuberculate ..... ***P. verrucosum***
1 Spikelets smooth, not tuberculate.
2 First glume 5-7.5 mm long, nearly as long as sterile lemma; fertile lemma 1/3 length of sterile lemma ..... ***[Phanopyrum gymnocarpon]***
2 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.
3 Sterile palea indurate and expanding the spikelet at maturity, as long as sterile lemma; outer surface of the distal palea with compound papillae..... ***[Steinchisma hians]***
3 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.
4 Panicle < 2 cm wide at maturity.
5 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***
5 Spikelets < 4 mm long; first glume < 2.1 mm long; ligule < 2 mm long; [not of coastal dunes].
6 Blades involute, 1.5-4 mm wide; culms wiry; [subgenus *Agrostoides*, section *Tenera*]..... ***P. tenerum***
6 Blades flat, the larger 6-20 mm wide; culms stout.

7 Panicles constricted, 0.3-1.6 cm wide; spikelets subsessile to short-pediceled; summit of fertile palea not enclosed by fertile lemma ..... ***P. hemitomon***
7 Panicles > 1 cm wide; spikelets short to long-pediceled; summit of fertile palea enclosed by fertile lemma; [subgenus *Agrostoides*, section *Agrostoidea*].
8 Plants tufted, without rhizomes; culms strongly compressed below; fertile lemma 1.3-1.5 mm long..... ***P. rigidulum* *var*. *condensum***
8 Plants rhizomatous; culms slightly compressed below; fertile lemma 1.8-2.2 mm long.
9 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..... ***P. anceps* *var*. *anceps***
9 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..... ***P. anceps* *var*. *rhizomatum***

4 Panicle > 2 cm wide at maturity.
10 Plants from a cluster of fibrous roots, without rhizomes or hard knotty crowns, annual.
11 First glume 1/5 to 1/4 length of spikelet, broadly rounded to truncate; sheaths usually glabrous; nodes glabrous; [subgenus *Panicum*, section *Dichotomiflora*]..... ***P. dichotomiflorum* *var*. *dichotomiflorum***
11 First glume 1/3 to 1/2 length of spikelet, acute to subacute; sheaths villous or hispid; nodes often bearded; [subgenus *Panicum*, section *Panicum*].
12 Spikelets 4.5-6 mm long; panicle branches often nodding or drooping at maturity..... ***P. miliaceum***
12 Spikelets 1.8-3.6 mm long; panicle branches ascending-spreading at maturity.
13 Spikelets long-acuminate, (2.6-)3.0-3.6 mm long; mature panicle slender, usually 2-3 times as long as wide..... ***P. flexile***
13 Spikelets short-pointed to acuminate, 1.8-2.5 (-2.8) mm long; mature panicle usually > ½ as wide to wider than long.
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***
10 Plants with rhizomes or hard knotty crowns, perennial.
17 Plants with rhizomes; fertile lemma 1.6-4 mm long.
18 First glume truncate apically..... ***P. repens***
18 First glume acute to obtuse.
19 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; [subgenus *Agrostoides*, section *Agrostoidea*].
20 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..... ***P. anceps* *var*. *anceps***
20 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..... ***P. anceps* *var*. *rhizomatum***
19 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, 2/3-3/4 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, ½-2/3 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 1/2 length of spikelet, blunt to acute ..... ***P. virgatum*** *var.* ***cubense***

23 Spikelets 3.5-5 mm long; first glume 2/3 length of spikelet, acuminate ..... ***P. virgatum*** *var.* ***virgatum***

17 Plants with hard crowns, lacking rhizomes; fertile lemma 1.2-1.6 mm long; [subgenus *Agrostoides*, section *Agrostoidea*].

24 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.

25 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..... ***P. longifolium*** *var.* ***longifolium***

25 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..... ***P. longifolium*** *var.* ***combsii***

24 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.

26 Spikelets 2.4-2.8 mm long, long-acuminate, usually < 0.7 mm wide; fertile lemma often conspicuously stipitate..... ***P. rigidulum*** *var.* ***elongatum***

26 Spikelets 1.6-2.5 mm long, short-acuminate, usually > 0.7 mm wide; fertile lemma estipitate to short stipitate.

27 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..... ***P. rigidulum*** *var.* ***rigidulum***

27 Culms to 1.8 m long; mature panicle < 1/3 as wide as long, the branches erect; spikelets 2.0-2.5 mm long..... ***P. rigidulum*** *var.* ***condensum***

Panicum amarum Elliott *var.* ***amarulum*** (A.S. Hitchcock & Chase) P.G. Palmer, Southern Seabeach Grass. Cp (GA, NC, SC, VA): coastal dunes and shores, sandflats, and sandhills; rare. July-November. NJ s. to FL and West Indies, w. to TX and Mexico; restricted to the Coastal Plain except for WV. 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; = *P. amarum* ssp. *amarulum* (A.S. Hitchcock & Chase) Freckmann & Lelong – FNA; not ***Panicum***]

Panicum amarum Elliott *var.* ***amarum***, Bitter Seabeach Grass. Cp (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 anceps Michaux *var.* ***anceps***, Beaked Panic Grass. Mt, Pd, Cp (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 var. *anceps* are glabrous to pilose, while those of var. *rhizomatum* are often villous; the leaves of var. *rhizomatum* also tend to be hairier. [= RAB, F, G, Z; < *P. anceps* – C, GW, K, W; = *P. anceps* ssp. *anceps* – FNA; = *P. anceps* – HC, S; not ***Panicum***]

Panicum anceps Michaux *var.* ***rhizomatum*** (A.S. Hitchcock & Chase) Fernald, Small Beaked Panic Grass. Cp (GA, NC, SC, VA): moist to dry sandy or loamy pinelands, ditches; common (VA Watch List). July-October. Se. VA and KY s. to FL and TX. See note under var. *anceps*. [= 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; not ***Panicum***]

Panicum capillare Linnaeus, Old-witch Grass, Tumbleweed, Tickle Grass. Mt, Pd (GA, NC, SC, VA), Cp (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, 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, Pd, Cp (GA, NC, SC, VA): marshy shores, exposed wet soils, alluvial deposits in floodplain forests, spoil banks, ditches; common. July-October. E. Canada w. to SD, s. to FL and TX; also in the Bahamas (Sorrie & LeBlond 1997). *P. dichotomiflorum* var. *puritanorum* ranges along the coast from s. NH to DE, and occurs inland in n. IN. It is distinguished by ovoid to ellipsoid, abruptly short-

tipped spikelets only 1.8-2.2 mm long, culms to 6 dm long, and leaves 1-8 mm wide. In var. *dichotomiflorum*, the oblong-lanceolate, acuminate spikelets are (2.0-) 2.6-3.6 mm long, culms to 2 m long, and leaves 4-20 mm wide. 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. Plants with spikelets similar to those of var. *puritanorum*, but with culm and leaf features of var. *dichotomiflorum*, have been recognized as var. *imperiorum* Fernald, and are known only from se. VA. Recognition of any infraspecific taxa in this morphologically complex species is risky business. [= HC, K; < ***P. dichotomiflorum*** – RAB, C, GW, S, Z; > ***P. dichotomiflorum*** var. ***dichotomiflorum*** – F, G, W; > ***P. dichotomiflorum*** var. ***geniculatum*** – F, G, W; > ***P. dichotomiflorum*** var. ***imperiorum*** – F; ***Panicum*** s.s.]

Panicum flexile (Gattinger) Scribner, Wiry Panic Grass. Pd (GA, NC, SC, VA), Mt (GA, NC,VA): glades and openings over mafic rocks, damp sandy meadows, open woods; rare (NC Rare). July-October. NY, sw. Québec, S. Ontario, and ND south to FL and TX. First reported for SC by Nelson & Kelly (1997). [= RAB, C, F, FNA, G, HC, K, S, W, Y, Z; ***Panicum*** s.s.]

Panicum gattingeri Nash, Gattinger's Panic Grass. Mt, Pd (NC, VA), {GA}: damp or dry, usually calcareous sandy soils of fields, roadsides, shores, and cultivated ground; frequent in Mountains, uncommon in Piedmont (VA Watch List). August-October. NY, sw. Québec, and MN south to NC, TN, GA, AL, and AR. [= RAB, F, HC, K, S; < ***P. capillare*** – C, Y; = ***P. philadelphicum*** Bernhardi ex Trinius ssp. ***gattingeri*** (Nash) Freckmann & Lelong – FNA; = ***P. capillare*** Linnaeus var. ***campestre*** Gattinger – G, W; ***Panicum*** s.s.]

Panicum hemitomon J.A. Schultes, Maidencane. Cp (GA, NC, SC, VA), Mt (VA): lake, pond, and river shores, swamp borders, marshes, ditches, often in shallow water; common (VA Rare). 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 (NC 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 longifolium Torrey ***var. combsii*** (Scribner & Ball) Fernald, Combs Panic Grass. Cp (GA, NC, SC, VA): pond shores, depression meadows, cypress savannas, marshes, low woods; uncommon (VA Watch List). 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 var. *combsii* typically are longer than 1.5 mm long, while those of var. *longifolium* are shorter than 1.5 mm long. [= RAB, F, G; = ***P. rigidulum*** Bosc ex Nees ssp. *combsii* (Scribner & Ball) Freckmann & Lelong – FNA; = ***P. rigidulum*** Bosc ex Nees var. *combsii* (Scribner & Ball) Lelong – K, Z; < ***P. longifolium*** – C; = ***P. combsii*** Scribner & Ball – HC, S; not ***Panicum***]

Panicum longifolium Torrey ***var. longifolium***, Long-leaved Panic Grass. Cp, 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. Nova Scotia, NH, MA, PA, and IN south to FL, west to TX. See note under var. *combsii*. [= 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; not ***Panicum***]

* ***Panicum miliaceum*** Linnaeus *ssp.* ***miliaceum***, Broomcorn Millet, Proso Millet, Hog Millet. Cp (NC), Mt (VA): planted in wildlife food plots, sometimes persistent or self-sowing; rare, 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, Mt (GA, NC, SC, VA), Cp (VA): glades, barrens, desiccated pondshores, riversides, or other rocky or dry sandy soil of open woods and roadsides; frequent (rare in SC). Nova Scotia 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; > ***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***); ***Panicum*** s.s.]

*? ***Panicum repens*** Linnaeus, Torpedo Grass. Cp (GA, NC, SC): disturbed coastal sands, in area where ship's ballast was deposited; rare, apparently introduced. First reported for NC by Leonard (1971b). [= FNA, GW, HC, K, S; ***Panicum*** s.s.]

Panicum rigidulum Bosc ex Nees ***var. condensum*** (Nash) Mohlenbrock, Dense Panic Grass. Cp (GA, NC, SC, VA): marshes, meadows, low woods, ditches, stream and pond shores, freshwater tidal shores; occasional. 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. [= ***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; not ***Panicum***]

Panicum rigidulum Bosc ex Nees ***var. elongatum*** (Pursh) Lelong, Tall Flat Panic Grass. Pd, Cp, Mt (GA, NC, SC, VA): marshes, low woods, ditches, swamps, shores, meadows; occasional (common in Piedmont). August-October. CT and NY west to IN, south to GA, LA, and ne. TX. [= K, W, Z; = ***P. stipitatum*** Nash – RAB, F, HC, S; = ***P. rigidulum*** Bosc ex Nees ssp. *elongatum* (Pursh) Freckmann & Lelong – FNA; < ***P. rigidulum*** – C, GW; = ***P. agrostoides*** Sprengel var. *elongatum* (Pursh) Scribner – G; not ***Panicum***]

Panicum rigidulum Bosc ex Nees ***var. rigidulum***, Redtop Panic Grass. Cp, Pd (GA, NC, SC, VA): wet sandy or peaty soils low woods, meadows, marshes, shores, swamps, ditches; frequent. July-October. ME and MI south to FL and TX; also in CA and British Columbia; Central America. [= 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; not ***Panicum***]

Panicum tenerum Beyrich ex Trinius, Southeastern Panic Grass. Cp (GA, NC, SC): limesink ponds, depression meadows, cypress savannas, wet pinelands, bogs; rare (GA Special Concern, NC Rare). 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. [= RAB, FNA, GW, HC, K, S, Z; not ***Panicum***]

Panicum verrucosum Muhlenberg, Warty Panic Grass. Cp, Pd, Mt (GA, NC, SC, VA): wet pinelands, marshes, shores, ditches; common (occasional 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 (GA, NC, SC, VA?): wet to dry sandy pinelands; occasional (frequent in the Sandhills). 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.* ***virgatum***, Switchgrass. Cp, Pd, Mt (GA, NC, SC, VA): dry or wet sandy soils of pinelands, fresh and brackish marshes, shores; common (occasional in Mountains). June-October. Sw. Québec 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, Z; < ***P. virgatum*** var. *virgatum* – K; not ***Panicum***]

* ***Panicum antidotale*** Retzius. Cp (SC): Native of India. Reported for NC and SC (FNA, Kartesz 1999). {investigate} [= FNA, HC, K; not ***Panicum***] {not keyed at this time}

* ***Panicum bergii*** Arechav. Cp (GA): disturbed areas; rare, native of South America. Reported for sc. GA (HC) and AL (Kartesz 1999). {investigate} [= FNA, HC, K; ***Panicum*** s.s.] {not keyed at this time}

* ***Panicum bisulcatum*** Thunberg. Cp (GA, SC): disturbed 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* Thunberg] {not keyed at this time}

Panicum brachyanthum Steudel. Cp (GA): {habitat unknown}; rare. Sw. GA west to c. TX. [= FNA, HC, K]

Panicum dichotomiflorum Michaux *var.* ***puritanorum*** Svenson, Puritan Panic Grass. Alleged to be in VA northward (FNA). [= F, G, HC, K; < ***P. dichotomiflorum*** – C; = ***P. dichotomiflorum*** Michaux ssp. *puritanorum* (Svenson) Freckmann & Lelong – FNA]

* *Panicum miliaceum* Linnaeus ssp. *ruderale* (Kitag.) Tzvelev, Panic Millet. [= FNA, K; = ***P. miliaceum*** ssp. *spontaneum* (Kit.) Tzvelev – C; < ***P. miliaceum*** – F, G, HC] {not keyed at this time}

Panicum virgatum Linnaeus var. *spissum* Linder ranges south to PA, MD, and DE (Kartesz 1999). [= F, HC, K; < ***P. virgatum*** – C, FNA, G; not ***Panicum***] {not keyed at this time}

Parapholis C.E. Hubbard (Sickle Grass)

References: Tucker (1996)=Z.

* ***Parapholis incurva*** (Linnaeus) C.E. Hubbard, Sickle Grass, Hard Grass, Thin-tail. Cp (NC, VA): sandy and muddy flats, brackish or salt marshes; rare, introduced from Europe. [= RAB, C, HC, K, Z; = *Pholiurus incurvus* (Linnaeus) Schinzius & Thellung – F, G; *? Lepturus filiformis* (Roth) Trinius]

Pascopyrum A. Löve (Wheatgrass)

* ***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). [= K; = *Elytrigia smithii* (Rydberg) Nevski – C; = *Agropyrum smithii* Rydberg – F, G, W]

Paspalidium
(see *Setaria*)

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 a rudimentary spikelets or naked pedicels.
  2 Panicles with 1-70 branches, if > 1, the branches arranged racemosely.

3 Panicle branches 7-70, the axes extending beyond the outermost spikelets; panicle branches disarticulating at maturity ..... ***P. fluitans***
3 Panicle branches 1-6, terminating in a spikelet; panicle branches persistent.
4 Upper florets olive to dark brown ..... ***P. scrobiculatum***
4 Upper florets pale to tan.
5 Axes of panicle branches not broadly winged, 0.6-1.3 mm wide.
6 Spikelets orbicular, 2.8-3.2 mm wide ..... ***P. laeve*** *var.* ***circulare***
6 Spikelets slightly longer than broad, 2.0-2.5 mm wide ..... ***P. laeve*** *var.* ***laeve***
5 Axes of panicle branches broadly winged, 1.8-3.3 mm wide.
7 Spikelets 3.2-4.0 mm long; upper lemmas with a few short hairs at their tips..... ***P. acuminatum***
7 Spikelets 1.7-2.1 mm long; upper lemmas glabrous ..... ***P. dissectum***
2 Panicles usually composed of a terminal pair of brancxhes, sometimes with 1 (-5) additional branches below the terminal pair.
8 Upper glumes pubescent on the back or margins.
9 Spikelets 1.3-1.9 mm long; upper glumes pilose along the margins ..... ***[P. conjugatum]***
9 Spikelets 2.4-3.2 mm long; upper glumes sparsely pubescent on the back ..... ***P. distichum***
8 Upper glumes glabrous.
10 Spikelets elliptic, acute or acuminate at the tip ..... ***P. vaginatum***
10 Spikelets ovate to broadly elliptic, obtuse to broadly acute at the tip.
11 Spikelets 1.9-2.3 mm long; leaf blades flat ..... ***[P. minus]***
11 Spikelets 2.5-4.0 mm long; leaf blades flast or longitudinally folded ..... ***P. notatum***
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 2.5-4.1 mm long.
30 Spikelet pairs barely if at all imbricate; lower glumes usually present ..... ***P. bifidum***
30 Spikelet pairs imbricate; lower glumes absent or present.
31 Upper glumes pubescent; lower lemmas usually pubescent.
32 Lower glumes present ..... ***[P. langei]***
32 Lower glumes absent ..... ***P. pubiflorum***
31 Upper glumes glabrous; lower lemmas usually glabrous.
33 Upper florets golden brown ..... ***P. floridanum***
33 Upper florets pale to tan.
34 Terminal panicle branches erect..... ***[P. monostachyum]***
34 Terminal panicle branches spreading to ascending.
35 Plants decumbent, rooting at the lower nodes; spikelets obovate to elliptic ..... ***P. pubiflorum***
35 Plants rhizomatous; spikelets orbicular to elliptic.
36 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***
36 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.
37 Lower sheaths villous or hirsute..... ***P. praecox* *var.* *curtisianum***
37 Lower sheaths glabrous or sparsely papillose pubescent..... ***P. praecox* *var.* *praecox***
29 Spikelets 1.3-2.5 mm long.
38 Upper glumes (and usually also the lower lemmas) shortly pubescent.
39 Lower glumes present..... ***[P. langei]***
39 Lower glumes absent.
40 Panicles both terminal and axillary, the axillary panicles partially or completely enclosed by the subtending leaf sheath ..... [see Key to *Paspalum setaceum* complex]
40 Panicles all terminal..... ***[P. caespitosum]***
38 Upper glumes and lower lemmas glabrous.
41 Panicles both terminal and axillary, the axillary panicles partially or completely enclosed by the subtending leaf sheath ..... [see Key to *Paspalum setaceum* complex]
41 Panicles all terminal.
42 Upper panicle branches erect ..... ***[P. monostachyum]***
42 Upper panicle branches spreading to ascending.
43 Upper glumes and lower lemmas 5-veined ..... ***P. caespitosum***
43 Upper glumes and lower lemmas 3-veined.
44 Lower sheaths villous or hirsute..... ***P. praecox* *var.* *curtisianum***
44 Lower sheaths glabrous or sparsely papillose pubescent..... ***P. praecox* *var.* *praecox***

Key to *Paspalum setaceum* complex
(by Richard J. LeBlond)

1 Leaves variously pubescent.
2 Leaves villous to villous-hirsute, 2-10 mm wide; spikelets 1.3-1.9 mm long.
3 Leaves villous, 2-7 mm wide, not especially crowded toward the base, erect to spreading; [widespread] ..... ***P. setaceum* *var.* *setaceum***
3 Leaves villous-hirsute, 3-10 mm wide, crowded toward the base, recurved; [of n. FL south to Cuba]..... ***[P. setaceum* *var.* *villosissimum]***
2 Leaves puberulent, pilose, or hirsute, 3-15 mm wide; spikelets 1.6-2.5 mm long.
4 Leaves puberulent at least distally on the adaxial surface (and often also pilose in var. *stramineum*); spikelets 1.6-2.2 mm long.
5 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***
5 Plants spreading to prostrate; leaves densely puberulent; spikelets pubescent ..... ***P. setaceum* *var.* *psammophilum***
4 Leaves pilose or hirsute but not puberulent; spikelets 1.8-2.5 mm long.
6 Plants mostly erect; leaves pilose; spikelets usually glabrous; sterile lemma midnerve usually present..... ***P. setaceum* *var.* *muhlenbergii***

6 Plants mostly widely spreading; leaves hirsute; spikelets glabrous or pubescent; sterile lemma midnerve present or absent..... ***P. setaceum*** *var.* ***supinum***

1 Leaves glabrous to glabrate (if glabrate, also see var. *stramineum* in couplet 5).

7 Blades crowded toward the base, often recurved, 3-8 mm wide; spikelets 1.4-1.9 mm long, usually glabrous .... ***P. setaceum*** *var.* ***longepedunculatum***

7 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.

8 Blades 3-8 mm wide; spikelets 1.6-1.9 mm long, pubescent, subacute; [of GA and FL southward] .... ***[P. propinquum]***

8 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].

9 Plants stiffly erect; blades 2-6 mm wide; spikelets 2.0-2.6 mm long; [of GA and FL] .... ***P. setaceum*** *var.* ***rigidifolium***

9 Plants erect to spreading; blades 3-20 mm wide; spikelets 1.7-2.6 mm long; [of NJ to TX]..... ..... ***P. setaceum*** *var.* ***ciliatifolium***

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 (GA, NC, SC, VA), Pd (GA, SC): mesic to wet longleaf pine savannas and mesic swales in sandhills; uncommon (NC Watch List, VA Rare). 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, Pd (GA, NC, SC, VA), Mt (GA, SC, VA): low fields, ditches; common (VA Watch List). July-October. MD, KY, and TX south through tropical America. [= RAB, C, F, FNA, G, GW, HC, K, S, W, Y]

* ***Paspalum conspersum*** Schrad., Scattered Paspalum. Cp (GA): roadsides, other disturbed areas; rare, introduced from a native range of Mexico to South America. [= FNA] {synonymy incomplete}

* ***Paspalum coryphaeum*** Trinius, Emperor Crown-grass. Pd (NC): disturbed areas; rare, native of South America. [= FNA, K] {synonymy incomplete}

* ***Paspalum dilatatum*** Poiret, Dallis Grass. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, fields, disturbed areas; common, introduced from tropical America. May-October. [= RAB, C, F, FNA, G, GW, HC, K, S, W, Y]

Paspalum dissectum (Linnaeus) Linnaeus, Mudbank Crown Grass, Walter Paspalum. Cp (GA, NC, SC, VA), Pd (NC, SC): mud flats, drawdown zones; rare (NC Rare, VA Rare). 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 (VA Rare). 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, Pd, 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): mucky soils in swamp forests; uncommon (NC Watch List). 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, introduced from 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. {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, Y]

Paspalum laeve Michaux *var.* ***laeve***. Cp, Pd, Mt (GA, NC, SC, VA): 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, Y; > *P. longipilum* Nash – HC, S, Y]

* ***Paspalum malacophyllum*** Trinius, Ribbed Paspalum. Cp (GA): disturbed areas; rare, introduced from a native range of Mexico to South America. [= FNA, HC]

* ***Paspalum nicorae*** Parodi, Brunswickgrass. Cp (GA): disturbed areas; rare, introduced from Brazil. [= FNA, HC, K]

* ***Paspalum notatum*** Flügge, Bahia Grass. Cp (GA, NC, SC, VA), Pd (GA, SC, VA), Mt (GA): roadsides and disturbed areas; uncommon, introduced from 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 (GA, SC): pine savannas, fields; uncommon. 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 (GA, NC, SC, VA): pine savannas; rare (NC Watch List, VA Rare). June-October. 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 (GA, NC, SC): pine savannas; rare (NC Watch List). May-July. [= RAB, C, F, G; < *P. praecox* – FNA, GW, K; = *P. praecox* – HC, S, Y]

Paspalum propinquum Nash. Cp: {habitat}; uncommon. GA and FL. [= HC, S; < *P. setaceum* – K]

Paspalum pubiflorum Ruprecht *var.* ***glabrum*** Vasey, Hairyseed Crown Grass. Mt, Pd (GA, NC, VA), Cp (SC, VA): disturbed areas; uncommon (NC Watch List). 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, Pd, 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, Y]

Paspalum setaceum Michaux *var.* ***longepedunculatum*** (LeConte) A. Wood. Cp (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, Pd, Cp (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, 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 (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, Pd, Mt (GA, NC, SC, VA): sandhills, savannas, dry soils; common (uncommon in Piedmont and Mountains). 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, 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 (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 (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 urvillei*** Steudel, Vasey Grass. Cp, Pd (GA, NC, SC, VA): roadsides, fields, and disturbed areas; common, introduced from South America. May-July. [= RAB, C, F, FNA, G, GW, HC, K, S, Y]

Paspalum vaginatum Swartz, Sand Knotgrass, Seashore Crown Grass. Cp (GA, NC, SC), Pd (NC): brackish marshes, rarely inland in disturbed places; rare (NC Watch List). 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, introduced from Mexico, Central America, and South America. [= FNA, K] {synonymy incomplete}

Paspalum caespitosum Flügge. Pinelands, hammocks. 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. 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 convexum* Flügge, Mexican Paspalum. Disturbed areas. MS, LA, and e. TX, introduced from tropical America. [= FNA, K] {synonymy incomplete}

Paspalum langei (E. Fournier) Nash, Rustyseed Paspalum. N. peninsular FL and Panhandle FL west to se. TX, and south through the New World tropics to South America. [= FNA, K] {synonymy incomplete}

Paspalum minus E. Fournier, Matted Paspalum. Disturbed areas. FL Panhandle and s. AL west to e. TX. [= FNA, K] {synonymy incomplete}

Paspalum monostachyum Vasey, Gulfdune Paspalum. Coastal dunes, wet prairies. AL and FL west to TX. [= FNA, HC, K, S] {synonymy incomplete}

* *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}
Paspalum setaceum var. *villosissimum* (Nash) D. Banks. Sandy pine flatwoods and fields. N. FL (very near GA) south to s. FL; Cuba. [= FNA, Z; < *P. setaceum* – GW, K; < *P. debile* Michaux – HC; = *P. villosissimum* Nash – S]

Pennisetum L.C. Richard ex Persoon

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; plants 2-8 m tall ..... ***[P. purpureum]***
1 Primary bristles conspicuously long-ciliate; plants 0.1-3 m tall.
  2 Spikelets 9-12 mm long ..... ***P. villosum***
  2 Spikelets 2.5-7 mm long.
    3 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***
    3 Fascicles disarticulating from the rachises at maturity; fascicles 8-37 per cm of inflorescence; panicles 2-32 cm long; leaves 2-13 mm wide.
      4 Spikelets 4.5-7 mm long; leaves 2-3.5 mm wide, folded or conduplicate and superficially appearing even narrower; rachis pubescent ..... ***[P. setaceum]***
      4 Spikelets 2.5-5.6 mm long; leaves 2-13 mm wide, flat; rachis scabrous.
        5 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]***
        5 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 glaucum*** (Linnaeus) R. Brown, Pearl Millet. (GA, NC, SC, VA). [= RAB, FNA, HC, K; *? Chaetochloa lutescens* (Weigel) Stuntz – S; = *Setaria glauca* (Linnaeus) Palisot de Beauvois]
* ***Pennisetum villosum*** R. Brown ex Fresenius, Feathertop. Reported as an introduction in GA (Kartesz 1999). [= C, FNA, HC, K; *? Cenchrus longisetus* M.C. Johnston]

* *Pennisetum ciliare* (Linnaeus) Link, Buffelgrass. Disturbed areas, 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 purpureum* Schumacher, Elephant Grass, Napier Grass. Disturbed areas, native of Africa. Naturalized in FL north to the FL-GA border. [= FNA, HC, K]
* *Pennisetum setaceum* (Forskål) Chiovenda, Tender Fountaingrass Reported as an introduction in FL, TN, and KY (Wipff in FNA). [= FNA, HC, K] {synonymy incomplete}
* *Pennisetum setigerum* (Vahl) Wipff. Disturbed areas, 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]

Phalaris Linnaeus (Canary-grass)

A genus of about 16 species, north temperate and South American. References: Tucker (1996)=Z.

1 Perennial, with scaly rhizomes; inflorescence obviously paniculate, 7-25 cm long, with ascending to appressed branches, the main branches of the inflorescence apparent, the inflorescence outline thus appearing lobed.
  2 Glumes broadly winged; fertile lemmas ovate-lanceolate, densely pubescent ..... ***Ph. aquatica***
  2 Glumes not winged; fertile lemmas narrowly lanceolate, glabrous to sparsely pubescent ..... ***Ph. arundinacea***
1 Annual, without rhizomes; inflorescence densely spikelike or almost capitate, 1-6 cm long, the branches not apparent, the inflorescence outline a single ovoid, ellipsoid, or lanceolate form.
  3 Keels of the glumes broadly winged (the wing ca. 1 mm wide); sterile lemmas 2.5-4.5 mm long ..... ***Ph. canariensis***
  3 Keels of the glume narrowly winged (the wing < 0.5 mm wide); sterile lemmas 1.5-2.5 mm long.
    4 Nerves of the glumes scabrous; panicle cylindric in outline, 6-18 cm long; glumes 3.5-4.0 mm long .... ***Ph. angusta***
    4 Nerves of the glumes not scabrous; panicle narrowly ovate in outline, usually 2-6 cm long; glumes 5-6 mm long ... ***Ph. caroliniana***

* ***Phalaris angusta*** Nees ex Trinius. Cp (GA, SC): waterfowl impoundments, marshes; uncommon, introduced from tropical America. [= GW, HC, K, Z]
* ***Phalaris aquatica*** Linnaeus, Bulbous Canary-grass. Cp (NC, SC, VA): disturbed areas; rare, introduced from Europe. [= K, Z; *? Ph. tuberosa* Linnaeus var. *stenoptera* (Hackel) Hitchcock – HC]

*? ***Phalaris arundinacea*** Linnaeus, Reed Canary-grass, Ribbon Grass. Mt, Pd (NC, VA), Cp (VA): moist forests, moist disturbed areas, bogs; common (rare in Coastal Plain). June. Newfoundland west to AK, south to NC, TN, AR, NM, CA; Mexico; Eurasia. A variegated form, ***Ph. arundinacea*** forma *variegata* (Parn.) Druce, is cultivated for ornament, as Ribbon Grass. [= RAB, C, F, GW, K, S, W, Z; > ***Ph. arundinacea*** var. *arundinacea* – G, HC; > ***Ph. arundinacea*** var. *picta* Linnaeus – G, HC]

* ***Phalaris canariensis*** Linnaeus, Birdseed Grass, Canary-grass. Cp, Pd (GA, NC, SC, VA), Mt (VA): disturbed areas; rare, introduced from Mediterranean Europe. [= RAB, C, F, G, GW, HC, K, S, Z]

Phalaris caroliniana Walter, Maygrass. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): ditches, roadsides, disturbed areas; uncommon. May-June. [= RAB, C, F, G, GW, HC, K, S, Z]

* ***Phalaris minor*** Retzius, Lesser Canary Grass. Cp (SC): waste areas near wool-combing mills; rare, introduced from Mediterranean Europe. Also reported for other scattered states in e. North America (Kartesz 1999). [= HC, K] {not keyed at this time; synonymy incomplete}

* *Phalaris paradoxa* Linnaeus, Mediterranean Canary Grass, is reported for MD, NJ, and PA (Kartesz 1999). [= K; > ***Ph. paradoxa*** var. *paradoxa* – HC; > ***Ph. paradoxa*** var. *praemorsa* (Lamarck) Coss. & Durieu – HC] {not keyed at this time; synonymy incomplete}

Phanopyrum (Rafinesque) Nash (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 (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 (NC Watch List, VA Rare). 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 (Timothy)

References: Tucker (1996)=Z; Stace (1997)=Y. Key based on Stace (1997).

1 Spikelets 2.0-3.5 mm long, including the 0.2-1.0 (-1.2) mm long awns; panicle 3-6 mm wide; leaves 2-6 mm wide; ligule usually acute ..... ***Phl. pratense*** *ssp.* ***nodosum***
1 Spikelets (3.5-) 4-5.5 mm long, including the (0.8-) 1.0-2.0 mm long awns; panicle 6-10 mm wide; leaves 3-9 mm wide; ligule usually obtuse ..... ***Phl. pratense*** *ssp.* ***pratense***

* ***Phleum pratense*** Linnaeus *ssp.* ***nodosum*** (Linnaeus) Arcangeli, Small Timothy. (NC) {included based on Fernald's report – corroboration and additional information needed} [< ***Ph. pratense*** – RAB, C, G, HC, K, S, W, Z; = ***Ph. pratense*** var. *nodosum* (Linnaeus) Hudson – F; = ***Ph. bertolonii*** Augustin de Candolle – Y]

* ***Phleum pratense*** Linnaeus *ssp.* ***pratense***, Timothy. Mt, Pd, Cp (GA, NC, SC, VA): meadows, pastures, roadsides, disturbed areas; common, introduced from 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." [< ***Ph. pratense*** – RAB, C, G, HC, K, S, W, Z; = ***Ph. pratense*** var. *pratense* – F; = ***Ph. pratense*** – Y]

* *Phleum subulatum* (Savi) Ascherson & Graebner, Italian Timothy, is reported as introduced in MD and PA (Kartesz 1999). Not keyed. [= K, Y]

Phragmites Adanson (Common Reed)

A genus with one species and 2 or more varieties, nearly worldwide in distribution. References: Allred in FNA (2003a); Saltonstall, Peterson, & Soreng (2004)=Z; Saltonstall (2002). Key based on Z.

Key 1

1 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 NC] .... ***Phr. australis*** *ssp.* ***americanus***
1 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, **either** smooth and shiny **or** ridged and not shiny.

2 Culms smooth and shiny; [native on the Gulf Coast]..... [***Phr. australis*** *var*. ***berlandieri]***
2 Culms ridged and not shiny; [introduced and weedy]..... ***Phr. australis*** *ssp*. ***australis***

Key 2

1 First glume 2.3-4.2 mm long; stems at base of plant in summer and late fall mostly tan-brown or yellow; [alien and weedy].. ..... ***Phr. australis*** *var*. ***australis***
1 First glume 3.5-6.4 mm long; stems at base of plant in summer and late fall reddish-brown or reddish-purple; [native]..... ..... ***Phr. australis*** *var*. ***berlandieri***

* ***Phragmites australis*** (Cavanilles) Trinius ex Steudel *var*. ***australis***, Common Reed. Cp (GA, NC, SC, VA), Pd, Mt (NC, VA): marshes, dredge-spoil deposit islands, ditches; common in outer Coastal Plain (rare elsewhere). September-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. [< *Ph. australis* – C, FNA, GW, K; < *Ph. communis* Trinius – RAB, G, HC; = *Ph. communis* var. *communis* – F; < *Ph. phragmites* (Linnaeus) Karsten – S]

Phragmites australis (Cavanilles) Trinius ex Steudel *var*. ***berlandieri*** (Fornier) C.F. Reed, North American Reed. Cp (VA): freshwater marshes; rare. September-October. [< *Ph. australis* – C, FNA, GW, K; < *Ph. communis* Trinius – RAB, G, HC; = *Ph. communis* var. *berlandieri* (Fournier) Fernald – F; < *Ph. phragmites* (Linnaeus) Karsten – S]

Phyllostachys Siebold & Zuccarini (Bamboo)

References: 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..... ***Ph. 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.....***Ph. 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..... ***Ph. 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 .... ***Ph. 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)..... ***Ph. 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..... ***Ph. rubromarginata***

* ***Phyllostachys aurea*** Carrière ex A. & C. Rivière, Golden Bamboo, Fishpole Bamboo. Cp, Pd (NC, SC, VA): suburban woodlands; uncommon, 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, K, Y, Z]
* ***Phyllostachys aureosulcata*** McClure, Yellowgroove Bamboo. Cp (SC), Pd (VA), {GA}: cultivated as an ornamental, persistent or spreading from plantings; rare, native of China. [= K, Y, Z]
* ***Phyllostachys bambusoides*** Siebold & Zuccarini, Giant Timber Bamboo. Cp, Pd, Mt (NC, SC): cultivated as an ornamental, persistent or spreading from plantings; rare, native of China. [= 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; *? Ph. edulis* (Carrière) Houzeau de Lehaie – K; *? Ph. pubescens* Mazel ex Houzeau de Lehaie – Z]

* ***Phyllostachys nigra*** (Loddiges) Munro, Black Bamboo. Pd (SC), Cp (VA): cultivated as an ornamental, persistent or spreading from plantings; rare, native of China and Japan. [= K, Y, Z]
* ***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 NC and SC (Kartesz 1999). {investigate} [= K] {not keyed at this time}

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

1 Leaves involute when dry, 1-2 mm wide; glumes 3.5-4.8 mm long ..... ***[P. canadense]***
1 Leaves flat, 5-15 mm wide; glume 6-9 mm long.
  2 Leaves primarily basal or low-cauline, 2-4 (-5) dm long, 4-10 mm wide; inflorescence a raceme or a racemiform panicle; culms prostrate, the upper leaves very reduced, often merely bladeless sheaths ..... ***[see Oryzopsis asperifolia]***
  2 Leaves primarily cauline, 1-2.5 dm long, 8-15 mm wide; inflorescence a panicle; culms erect, the upper leaves well-developed ..... ***P. racemosum***

Piptatherum racemosum Ricker ex A.S. Hitchcock, Blackseed Ricegrass. Mt (VA): calcareous woodlands and forests; common. Québec and Ontario west to ND, south to w. VA, KY, MO, and NE. [= K; = *Oryzopsis racemosa* (Smith) Ricker ex A.S. Hitchcock – C, F, G, HC, W]

Piptatherum canadense (Poiret) Barkworth ined., Mountain Ricegrass, ranges south to Panther Knob, Pendleton County, WV; it may occur in our primary area as well. [= K; = *Oryzopsis canadensis* (Poiret) Torrey – C, F, G, HC]
* *Piptatherum miliaceum* (Linnaeus) Cosson, Smilo Grass, is reported as an introduction in MD, NJ, and PA (Kartesz 1999). [= K; = *Oryzopsis miliacea* (Linnaeus) Bentham & Hooker – HC; = *Agrostis miliacea* Linnaeus] {not keyed at this time}
Piptatherum pungens (Torrey ex Sprengel) Barkworth ined. ranges south to e. PA (Rhoads & Klein 1993), NJ, and WV (Kartesz 1999). [= K; = *Oryzopsis pungens* (Torrey ex Sprengel) A.S. Hitchcock – C, F, G, HC] {not keyed at this time}

Piptochaetium J. Presl (Needlegrass)

A genus of about 36 species, of temperate North and South America, and montane tropical South America (Cialdella & Giussani 2002). *P. avenacioides* (Nash) Valencia & Costa, endemic to FL, is the only other species in the genus in eastern North America. References: Cialdella & Giussani (2002).

Piptochaetium avenaceum (Linnaeus) Parodi, Eastern Needlegrass, Black Oatgrass. Cp, Pd, Mt (GA, NC, SC, VA): 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). April-June. [= C, K; = *Stipa avenacea* Linnaeus – RAB, F, G, HC, S, W]

Pleioblastus Nakai 1925

* ***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, cosmopolitan. References: 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 ..... ***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]; [subgenus *Poa*].
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 *Ochlopoa*] ..... ***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 *Bolbophorum*] ..... ***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..... ***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..... ***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. Mt (NC, VA), Pd (NC): rich forests; uncommon. May-June. Nova Scotia west to SD, south to NC and IL; also in w. United States. [= RAB, C, F, G, HC, K, W, Z]

* ***Poa annua*** Linnaeus, Speargrass, Six-weeks Grass, Annual Bluegrass. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common, introduced from Eurasia. April-May. [= RAB, C, F, G, GW, HC, K, W, Z]

* ***Poa arachnifera*** Torrey, Texas Bluegrass. Pd (GA, NC, SC): disturbed areas; rare, introduced from South America and w. United States. April. [= RAB, HC, K]

Poa autumnalis Muhlenberg ex Elliott. Cp, Pd, Mt (GA, NC, SC, VA): moist or dry nutrient-rich forests; common. April-May. NJ west to MI, south to FL and TX. [= RAB, C, F, G, GW, HC, K, W, Z]

* ***Poa bulbosa*** Linnaeus, Bulbous Bluegrass. Cp (NC, VA), Pd (GA, NC, VA): lawns; rare, introduced from Europe. April-May. [= RAB, C, F, G, HC, K, Z]

Poa chapmaniana Scribner. Pd, Cp (GA, NC, SC, VA): low fields, roadsides, disturbed areas; common (VA Watch List). April-May. DE west to IA, south to FL and LA. [= RAB, C, F, G, HC, K, W, Z]

* ***Poa compressa*** Linnaeus, Canada Bluegrass. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): fields, roadsides, disturbed areas; common, introduced from Europe. May-August. [= RAB, C, F, G, HC, K, W, Z]

Poa cuspidata Nuttall. Mt, Pd (GA, NC, SC, VA), Cp (GA, NC, VA): moist forests; common. March-April. NJ west to s. IN, south to sw. GA. [= RAB, C, F, G, HC, K, W, Z]

Poa languida Hitchcock, Drooping Bluegrass. Mt (VA): ultramafic outcrop woodlands, barrens, and glades; rare (VA Rare as *P. saltuensis*). 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* – K; = *P. saltuensis* Fernald & Wiegand ssp. *languida* (Hitchcock) A. Haines – Y]

* ***Poa nemoralis*** Linnaeus, Wood Bluegrass. Mt (NC, VA), Pd (VA): sandy creek bottoms; rare, introduced from Europe (NC Watch List). [= C, F, G, HC; *? P. nemoralis* ssp. *nemoralis* – K]

Poa paludigena Fernald & Wiegand, Bog Bluegrass. Mt (NC, VA): mountain bogs, especially in deep shade under shrubs; rare (US Species of Concern, NC Endangered, VA 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, G, HC, K]

Poa palustris Linnaeus, Fowl Bluegrass, Fowl Meadow-grass. Mt (NC, SC, VA), Pd (VA): meadows, moist areas; rare (NC Rare, VA Rare). June-July. Circumboreal, south in North America to VA, w. NC, MO, and NM. [= RAB, C, F, G, HC, K, W, Z]

* ***Poa pratensis*** Linnaeus, Kentucky Bluegrass, Junegrass, Speargrass. Mt, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): lawns, roadsides, disturbed areas; common, introduced from Europe. April-August. [= RAB, C, F, G, HC, W, Z; *P. pratensis* ssp. *pratensis* – K]

Poa saltuensis Fernald & Wiegand, Old-pasture Bluegrass. Mt (NC, VA): northern hardwood forests, ultramafic outcrop woodlands, barrens, and glades; rare (NC Rare, VA Rare). April-May. 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; < *P. languida* – RAB, Z, misidentification; = *P. saltuensis* var. *saltuensis* – F; < *P. saltuensis* – K (also see *P. languida*); = *P. saltuensis* ssp. *saltuensis* – Y]

Poa sylvestris A. Gray, Forest Bluegrass. Mt, Pd, Cp (GA, NC, SC, VA): moist forests; common. April-May. NY west to WI and IA, south to FL and TX. [= RAB, C, F, G, GW, HC, K, W, Z]

* ***Poa trivialis*** Linnaeus, Rough Bluegrass. Mt, Pd (NC, VA), Cp (VA), {GA}: moist forests, disturbed areas, bottomlands; common, introduced from Europe. April-June. [= RAB, C, F, G, GW, HC, K, W, Z]

Poa wolfii Scribner. Mt (NC, VA): moist rich forests; rare (VA Rare). {} OH west to MN, south to n. VA, MO, and e. NE. The NC occurrence is based on material from Great Smoky Mountains National Forest (Haywood County) (K. Langdon, pers. comm.. 2006). [= C, F, G, HC, K, W, Z]

* ***Poa infirma*** Kunth. Introduced in SC (Kartesz 1999), but not attributed to any e. North American area in FNA (in prep.). {investigate} [= K] {not keyed at this time; synonymy incomplete}

Polypogon Desfontaines

References: Tucker (1996)=Z; Barkworth in FNA (in prep.).

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, introduced from Meditteranean Europe. *P. maritimus* Willdenow is reported as introduced to GA (Small 1933). [< *P. maritimus* – HC, K, S, Z]

* ***Polypogon monspeliensis*** (Linnaeus) Desfontaines, Rabbitfoot Grass, Beardgrass, Annual Beardgrass. Cp (GA, NC, SC, VA), Pd (GA): brackish marshes, disturbed areas; uncommon, introduced from s. Europe and w. Asia. May-July. [= RAB, C, F, 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, introduced from the Old World. Distinguished from *Agrostis* in having the spikelet falling as a whole, disarticulating below the glumes. [= K, Z; = *Agrostis viridis* Gouan – C; *? Agrostis verticillata* Villars – F; *? Agrostis semiverticillata* (Forskål) C. Christensen – G, HC]

Pseudosasa Makino ex Nakai (Arrow Bamboo)

References: 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 (VA): cultivated as an ornamental, persistent or spreading from plantings; rare, native of Japan. [= K, Y, Z; = *Sasa japonica* (Siebold & Zuccarini ex Steudel) Makino]

Puccinellia Parlatore (Alkali Grass, Goosegrass)

A genus of about 80 species, north temperate.

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 (VA): coastal sands; rare, introduced from Europe. [= *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 (VA): salt or brackish marshes; rare (VA Rare). Nova Scotia south to VA; Europe; and in sw. United States. [= C, F, G, HC, K]

* *Puccinellia maritima* (Hudson) Parlatore, Seaside Alkali Grass, Seaside Speargrass, salt marshes and ballast near ports, is introduced south to se. PA (Philadelphia), NJ (Camden), and DE, especially on ballast. [= C, F, G, HC; > *P. americana* Sorenson – K] {synonymy incomplete}

Reimarochloa A.S. Hitchcock

A genus of about 4 species, of the New World tropics.

Reimarochloa oligostachya (Munro ex Bentham) A.S. Hitchcock. AL, FL; Cuba. [= HC, K]

Rhynchelytrum Nees
(see *Melinis*)

Ripidium Trinius (Ravenna-grass)

References: Hodkinson et al. (2002).

* ***Ripidium ravennae*** (Linnaeus) Trinius, Ravenna-grass, Plume-grass. Cp (GA): cultivated as an ornamental and rarely escaping or persisting; rare, introduced from s. Europe. In sw. GA, TN, and MD (Kartesz 1999) and DC (Steury 2004a). [= *Saccharum ravennae* (Linnaeus) Linnaeus – FNA, K; = *Erianthus ravennae* (Linnaeus) Palisot de Beauvois – F; > *Erianthus ravennae* var. *ravennae* – HC; > *Erianthus ravennae* var. *purpurascens* (Anderss.) Hackel – HC]

Rostraria Trinius

* ***Rostraria cristata*** (Linnaeus) Tzvelev. Cp (SC): waste areas near wool-combing mills; rare, introduced. 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; = *Lophochloa cristata* (Linnaeus) Hylander; *? Koeleria phleoides* (Vill.) Persoon – HC]

Rottboellia Linnaeus f. (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) Clayton, Itch-grass. Cp (GA, NC): disturbed ground; rare, native of tropical Asia. August-October. This grass, considered a noxious weed, was found in at least 13 GA counties by 1985 (Duncan 1985) and on a farm in Robeson County, NC in 1984. [= FNA, K, Z; = *Rottboellia exaltata* Linnaeus f. – HC; = *Manisuris exaltata* (Linnaeus f.) Kuntze – S]

Saccharum Linnaeus (Plume Grass)
(also see *Ripidium*)

A genus of uncertain circumscription at this time. Clayton & Renvoize (1986) have pointed out that the "traditional division [of *Saccharum*] into awned (*Erianthus*) and awnless species seems wholly artificial;" Hodkinson et al. (2002) develop 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).

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, Mt, Cp (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; = *Saccharum alopecuroidum* – K, orthographic variant; = *Erianthus divaricatus* (Linnaeus) A.S. Hitchcock – S; **= *Miscanthidium species 1***]

Saccharum baldwinii Sprengel, Narrow Plume Grass. Cp (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, Pd, Mt (GA, NC, SC, VA): open woodlands and forests, woodland borders; common, rare in Mountains. 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 (GA, NC, SC, VA): marshes, ditches, clay-based Carolina bays, swamps; common (rare in 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, Pd, 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

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. Cp (GA, NC, SC): low fields, ditches; rare, introduced from India. October. [= RAB, FNA, GW, HC, K]

Sacciolepis striata (Linnaeus) Nash, American Cupscale. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): marshes, interdune swales, ditches, swamps; common (rare in Piedmont and Mountains). 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]

Schedonorus Palisot de Beauvois

The correct generic placement of the introduced species *Schedonorus arundinaceus* (= *Festuca elatior; = Festuca arundinacea; = Lolium arundinaceum*) and *Sch. 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*. NOTE: apparently, the Soreng & Terrell (1998) paper was preceded by another paper which renders Soreng & Terrell's combinations superfluous. References: Darbyshire (1993)=X; Aiken & Darbyshire (1990)=Y; Tucker (1996)=Z; Soreng & Terrell (1998)=V; Darbyshire in FNA (in prep.). 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 ..... ***Sch. 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..... ***Sch. pratensis***

* ***Schedonorus arundinaceus*** (Schreber) Dumortier, Tall Fescue, Alta Fescue. Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, pastures, disturbed areas; common, introduced from Eurasia. May-July. [= FNA, V; < *Festuca elatior* Linnaeus – RAB, F, S, W, 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): fields, roadsides, pastures, disturbed areas; rare, introduced from Eurasia. May-July. [= FNA, V; < *Festuca elatior* Linnaeus – F, S, W, 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 (False Melic)

A monotypic genus, circumboreal in Asia and North America.

Schizachne purpurascens (Torrey) Swallen, Purple Oatgrass, False Melic. Mt (VA): moist, rocky northern hardwood and spruce forests; rare (VA Rare). Newfoundland west to AK, south to MD, w. VA, WV, KY, IL, NM, and Mexico; also in ne. Asia. May-July. [= F, G, HC, K; > *S. purpurascens* var. *purpurascens* – C]

Schizachyrium Nees (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 ..... ***Sch. 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 ..... ***Sch. 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 ..... ***Sch. 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 ca. 5 mm long; stems decumbent at base, rooting at the lower nodes ..... ***Sch. littorale***
      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.
        5 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 ..... ***[Sch. scoparium*** *var.* ***divergens]***
        5 Most pedicellate spikelets sterile, 1-6 mm long, without a lemma; sheaths and blades usually glabrous, occasionally pubescent ..... ***Sch. scoparium*** *var.* ***scoparium***

Schizachyrium littorale (Nash) Bicknell, Seaside Little Bluestem. Cp (GA, NC, VA): coastal dunes and maritime dry grasslands, often with *Uniola paniculata*, *Panicum amarum*, and other dune plants; common. August-October. E. MA south to NC (or SC?), and inland on the shores of the Great Lakes. In NC, ***Sch. 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). [= FNA, GW, K; < *Andropogon scoparium* Michaux – RAB; = ***Sch. scoparium*** var. *littorale* (Nash) Gould – C, Z; = *Andropogon scoparius* Michaux var. *littoralis* (Nash) A.S. Hitchcock – F, G; = *Andropogon littoralis* Nash – HC, S; < ***Sch. scoparium*** (Michaux) Nash ssp. *littorale* (Nash) Gandhi & Smeins – Y]

Schizachyrium sanguineum (Retzius) Alston *var.* ***hirtiflorum*** (Nees) Hatch, Hairy Crimson Bluestem. Cp (GA): {habitat}; rare. Sw. GA and FL west to AZ and south through Central America to South America. [= FNA, K; = *Andropogon hirtiflorus* (Nees) Kunth – HC, S; *? Sch. sanguineum* var. *brevipedicellatum* (Beal) Hatch]

Schizachyrium scoparium (Michaux) Nash *var.* ***scoparium***, Common Little Bluestem. Cp, Pd, Mt (GA, NC, SC, VA): in a wide range of moist to dry habitats; common. (June-) August-October. New Brunswick west to Alberta, 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 ***Sch. littorale***); = ***Sch. 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; = ***Sch. scoparium*** ssp. *scoparium* – K, Y; < *Andropogon scoparius* – S, W]

Schizachyrium scoparium (Michaux) Nash *var.* ***stoloniferum*** (Nash) J. Wipff, Creeping Little Bluestem. Cp (GA, SC): fall-line sandhills in the inner Coastal Plain, perhaps in other dry habitats, the habitat and range in our area requiring further study; uncommon? August-October. SC and GA south to FL and west to MS. See Wipff (1996a) for additional discussion. [= FNA, K, Z; = ***Sch. stoloniferum*** Nash – GW; = *Andropogon stolonifer* (Nash) A.S. Hitchcock – HC, S; < ***Sch. scoparium*** ssp. *littorale* (Nash) Gandhi & Smeins – Y]

Schizachyrium tenerum Nees, Slender Bluestem. Cp (GA): longleaf pine savannas; uncommon. GA west to e. TX. [= FNA, K; = *Andropogon tener* (Nees) Kunth – HC, S]

Schizachyrium maritimum (Chapman) Nash. AL, FL west to LA. [= K; = *Andropogon maritimus* Chapman] {not keyed at this time; 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). Not keyed. [= FNA, K; = *Andropogon niveus* Swallen – HC, S]

Schizachyrium scoparium (Michaux) Nash var. *divergens* (Hackel) Gould, Pinehill Bluestem. East to c. TN, AL, KY. [= FNA, K; = *Andropogon scoparius* Michaux var. *divergens* Hackel; = *Andropogon divergens* – HC; < *Andropogon scoparius* – S]

Sclerochloa Palisot de Beauvois

References: Tucker (1996)=Z; Brandenburg, Estes, & Thieret (1991).

* ***Sclerochloa dura*** (Linnaeus) Palisot de Beauvois. Mt (VA): disturbed areas; rare, introduced from Mediterranean Europe. A monotypic genus, native to s. Europe. [= C, HC, K, Z]

Secale Linnaeus 1753 (Rye)

References: Tucker (1996)=Z.

* ***Secale cereale*** Linnaeus, Rye. Cp, Pd, Mt (GA, NC, SC, VA): fields; commonly cultivated, rarely persistent or volunteering following cultivation, introduced from Eurasia. May-June. An important crop. The lemmas are awned from 2-6 cm long. [= RAB, C, F, G, HC, K, Z]

Setaria Palisot be Beauvois 1807 (Foxtail Grass)
(also see *Pennisetum*)

A genus of about 110-140 species, of tropicala nd warm temperate regions. References: Webster (1993)=Z; Webster (1995)=Y; Crins (1991)=X; Webster (1988); Rominger in FNA (2003a); Allen in FNA (2003a). Key adapted from FNA.

Setaria corrugata (Elliott) J.A. Schultes. Cp (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, Pd, Cp (GA, NC, SC, VA): disturbed areas; uncommon, native of China. [= RAB, C, FNA, G, K, W; = *S. faberii* – F, HC, Z, orthographic variant]

Setaria geminata (Forsskål) Veldkamp *var.* ***paludivaga*** (A.S. Hitchcock & Chase) R.D. Webster, Alligator Grass, Paspalidium. Cp (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. Webster (1995) has merged *Paspalidium* into *Setaria*. [= 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 (GA, NC, SC, VA), Cp, Mt (VA): disturbed areas, rare, 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, Z; = *Chaetochloa italica* (Linnaeus) Lamson-Scribner – S]

Setaria macrosperma (Lamson-Scribner & Merrill) K. Schumann, Coral Bristlegrass. Cp (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 (GA, NC, SC, VA), Pd* (GA*): interdune swales, near-coastal marshes; uncommon. 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 parviflora (Poiret) Kerguélen, Knotroot Bristlegrass, Perennial Foxtail-grass. Cp, Pd, Mt (GA, NC, SC, VA): marshes, ditches, moist disturbed areas; common. 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; = *Chaetochloa geniculata* (Palisot de Beauvois) Millspaugh & Chase – S]

* ***Setaria pumila*** (Poiret) Roemer & Schultes *ssp.* ***pumila***, Yellow Foxtail. Mt, Pd, Cp (GA, NC, SC, VA): disturbed areas, lawns, fields; common, native of Europe. [= FNA; = *Setaria glauca* (Linnaeus) Palisot de Beauvois – RAB, C, F, G, W, misapplied; >< *Setaria lutescens* (Weigel) Hubb. – HC, misapplied; >< *S. pumila* ssp. *pallidifusca* – K, treatment apparently garbled; = *Chaetochloa lutescens* (Weigel) Stuntz – S]

* ***Setaria verticillata*** (Linnaeus) Palisot de Beauvois, Hooked Bristlegrass. Mt (VA): disturbed areas; uncommon, introduced from Europe. [= FNA, G, K; = *S. verticillata* var. *verticillata* – C, F, HC; = *Chaetochloa verticillata* (Linnaeus) Lamson-Scribner – S; < *S. verticillata* – Z]

* ***Setaria viridis*** (Linnaeus) Palisot de Beauvois *var.* ***viridis***. Cp, Pd, Mt (GA, NC, SC, VA): fields, disturbed areas; common, introduced from Eurasia. [= C, FNA, K, Z; < *S. viridis* – RAB, HC, W; > *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. 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 geminata (Forsskål) Veldkamp var. *geminata*. AL, FL. [= Y; < *Paspalidium geminatum* – FNA, GW, X; = *Panicum geminatum* Forsskål – HC, S; = *Paspalidium geminatum* (Forsskål) Stapf var. *geminatum* – K]

* *Setaria verticilliformis* Dunart. is 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, is reported as introduced in TN, MD, and PA (Kartesz 1999). [= C, FNA, G, K, Z; < *S. viridis* – RAB, HC]

Sorghastrum Nash (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 3-10 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 elliottii (C. Mohr) Nash, Slender Indiangrass. Cp, Pd (GA, NC, SC, VA), Mt (GA, NC, SC): woodlands and forests, river-scour areas, including oak-hickory forests and woodlands over mafic rocks; uncommon. 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. Mt, Pd, Cp (GA, NC, SC, VA): xeric and mesic woodlands and forests of a wide variety, powerline rights-of-way, roadbanks; common. September-October. ME and Québec west to s. Manitoba, south to 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, Z; = *S. avenaceum* (Michaux) Nash]

Sorghastrum secundum (Elliott) Nash, Lopsided Indiangrass. Cp (GA, SC): sandhills; uncommon. September-October. S. SC south to FL and west to s. AL (Sorrie & Leonard 1999). [= RAB, FNA, HC, K, S, Z]

Sorghastrum apalachicolense D.W. Hall, Apalachicola Indiangrass, Open Indiangrass. Flatwoods and sandhills. Panhandle FL west to s. MS (Sorrie & Leonard 1999). It may well occur as well in GA. July-August. [= K, Z; < *S. elliottii* – FNA]

Sorghum Moench (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, Pd (GA, NC, SC, 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 Chiov. – HC; = *Sorghum bicolor* ssp. *drummondii* (Nees ex Steudel) de Wet & Harlan – K; < *Holcus sorghum* Linnaeus – S]

* ***Sorghum halepense*** (Linnaeus) Persoon, Johnson Grass. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, fields, waste places; common, introduced from Eurasia. A serious weed, difficult to eradicate. [= RAB, C, FNA, GW, HC, K, W; = *Sorgum halepense* – F, G, orthographic variant; = *Holcus halepensis* Linnaeus – S]

Spartina Schreber (Cordgrass)

A genus of ca. 15 species, of temperate America, Europe, and Africa. References: Barkworth in FNA (2003a).

1 Leaf blades mostly 5-40 mm wide, flat toward the base, generally somewhat involute toward the tip, or involute after drying; plants 0.3-4.0 m tall.
  2 Glumes with smooth keels; spikelets spaced 3-8 mm apart on each face of the rachis (the rachis triangular in cross-section, with spikelets attached on two faces); [of salt to brackish coastal marshes] ..... ***S. alterniflora***
  2 Glumes with scabrous keels; spikelets spaced 1-3 mm apart on each face of the rachis; [of fresh to brackish coastal marshes, or inland].
    3 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***
    3 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***
1 Leaf blades mostly 1-4 (-6) mm wide, involute; plants 0.3-1.0 m tall (to 2.0 m tall in the distinctly clumped *S. bakeri*).
  4 Plants forming large clumps with numerous culms and leaves; spikelets 6-9 mm long; spikes usually 9-14 per inflorescence; [of se. SC southward] ..... ***S. bakeri***
  4 Plants with creeping rhizomes, culms arising singly or few together from a point; spikelets 7-13 mm long; spikes usually 1-9 per inflorescence; [widely distributed in coastal parts of our area].
    5 Spikelets 7-10 mm long; second glume acute to obtuse (rarely acuminate); spikes (2-) 4-9 per inflorescence; second highest leaf blade on the stem (1-) avg. 2 (-5) dm long; plants to 15 dm tall; culms to 6 mm in diameter at base ..... ***S. patens*** *var.* ***monogyna***

5 Spikelets 9-13 mm long; second glume acuminate; spikes 1-4 per inflorescence; second highest leaf blade on the stem (0.5-) avg. 1 (-2) dm long; plants to 8 dm tall; culms to 3 mm in diameter at base .....***S. patens* var. *patens***

Spartina alterniflora Loiseleur, Saltmarsh Cordgrass, Smooth Cordgrass. Cp (GA, NC, SC, VA): salt marshes; common. August-October. 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; > *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. Cp (GA, SC): brackish marshes, marsh edges, wet coastal hammocks, under *Sabal palmetto*, *Quercus virginiana*, and *Juniperus virginiana* var. *silicicola*; rare. June. Se. SC south to s. FL, west to panhandle FL. Distinctive among our species in its densely clumped growth form. [= FNA, GW, HC, K, S]

Spartina cynosuroides (Linnaeus) Roth, Giant Cordgrass. Cp (GA, NC, SC, VA): brackish and freshwater tidal marshes, especially along margins of tidal creeks; common. June-September. MA south to FL, west to e. TX. [= RAB, C, FNA, G, GW, HC, K, S; > *S. cynosuroides* var. *cynosuroides* – F]

Spartina patens (Aiton) Muhlenberg *var.* ***monogyna*** (M.A. Curtis) Fernald, Large Saltmeadow Cordgrass. Cp (GA, NC, SC, VA): sandy shores, overwash flats; common. June-September. MA south to FL, west to TX. Whether var. *monogyna* is worthy of recognition is a matter of debate; there appear to morphological differences correlated with geography and, according to some authors, habitat, but positive identification to variety is sometimes difficult. [= F, G, HC; < *S. patens* – RAB, C, FNA, GW, K, S]

Spartina patens (Aiton) Muhlenberg *var.* ***patens***, Small Saltmeadow Cordgrass, Salt Hay, Marsh-hay Cordgrass. Cp (NC, VA): dunes, sand flats, upper edges of marshes, maritime wet grasslands; common. June-September. Newfoundland south to NC, and perhaps further. [= F, G, HC; < *S. patens* – RAB, C, FNA, GW, K, S]

Spartina pectinata Link, Prairie Cordgrass, Slough Grass. Mt, Cp (NC, VA): spray cliffs below waterfalls, rocky or sandy flood-scoured riverside grasslands, tidal freshwater (oligohaline) marshes, calcareous oak flatwoods and prairies; rare (GA Rare, NC Rare, VA Rare). July-September. Newfoundland west to WA, south to ne. NC, sw. NC, AR, TX, and NM. [= RAB, C, F, FNA, G, GW, HC, K, W; > *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] {not keyed at this time}

Sphenopholis Scribner (Wedgegrass)

A genus of 5 species, North American. References: 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, involute, < 2 mm wide .....***S. filiformis***
2 Lower leaf blades mostly less han 10 cm long, flat, 2-8 mm wide.
3 First glume 1/3 to 2/3 as wide as the second glume; second glume strongly scabrous.....***S. nitida***
3 First glume less tha 1/3 as wide as the second glume; second glume 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 (GA, NC, SC, VA), Pd (GA, NC, SC): pine savannas, sandy woodlands; uncommon (VA Rare). April-May. Se. VA south to c. FL, west to e. TX. [= RAB, C, F, K, S, Z]

Sphenopholis intermedia (Rydberg) Rydberg, Slender Wedgegrass. Mt, Pd, Cp (GA, NC, SC, VA): moist nutrient-rich forests; rare. May-June. Newfoundland west to c. AK, south to panhandle FL, c. TX, and AZ. [= RAB, F, K, S; = *S. obtusata* (Michaux) Scribner var. *major* (Torrey) K.S. Erdman – C, Z; < *S. intermedia* – G (also see *S. ×pallens*); < *S. obtusata* – GW, W]

Sphenopholis nitida (Biehler) Scribner. Cp, Pd, Mt (GA, NC, SC, VA): moist forests, bottomlands; common. April-May. MA west to IL, south to FL and TX. [= RAB, C, F, K, W, S, Z; > *S. nitida* var. *glabra* (Nash) Scribner – G; > *S. nitida* var. *nitida* – G]

Sphenopholis obtusata (Michaux) Scribner, Prairie Wedgegrass. Cp, Pd, Mt (GA, NC, SC, VA): forests, roadsides, disturbed areas; common (uncommon in Mountains). April-May. ME west to MN and British Columbia, south to s. FL, TX, c. Mexico, and s. CA. [= RAB, G, K, S; = *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 (also see *S. intermedia*)]

Sphenopholis ×pallens (Biehler) Scribner (pro sp.) [*S. obtusata* × *pensylvanica*]. Cp (NC, SC, VA): ditches, wet forests; rare. 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, Pd (GA, NC, SC, VA), Cp (NC, SC, VA): bogs, ditches, wet forests; uncommon. April-June. MA west to OH and se. MO, south to n. FL and LA. [= C, K, Z; = *Trisetum pensylvanicum* (Linnaeus) Palisot de Beauvois ex Roemer & J.A. Schultes – RAB, F, G, S; = *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 1/4 to 1/8 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 ..... ***S. indicus***
13 Spikelets 4-8 mm long; first glume 2-5 mm long; leaves cauline and basal.
14 Lemma pubescent, usually conspicuously shorter than the palea; pericarp loose when moist ..... ***S. clandestinus***
14 Lemma glabrous, about as long as the palea; pericarp gelatinous when moist.
15 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***
15 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 clandestinus (Biehler) A.S. Hitchcock, Rough Dropseed. Pd, Cp (GA, NC, SC, VA), Mt (VA): glades, barrens, and thin soil of woodlands, also in dry sands; uncommon. 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. Pd (NC?, VA), Mt, Cp (VA): diabase glades and barrens, limestone glades and barrens, disturbed areas over diabase or calcareous rocks; rare (NC Watch List, VA Rare). 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]

* ***Sporobolus cryptandrus*** (Torrey) A. Gray, Sand Dropseed. Cp? (NC?): disturbed areas; rare, probably adventive from c. and w. North America. This species is reported for NC by HC, F, and S. [= C, FNA, G, K, HC, S, X; > *S. cryptandrus* var. *cryptandrus* – F]

Sporobolus curtissii (Vasey ex Beal) Small ex Scribner, Curtiss's Dropseed. Cp (GA, SC): moist, gummy-clay flatwoods; uncommon (rare north of GA). 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 (GA, SC): wet savannas; uncommon (rare north of GA). June-September. Se. SC south to ne. FL, west to Panhandle FL. First positively documented for our area 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): barrens and glades over mafic, ultramafic, and calcareous rocks (olivine, serpentine, limestone); rare (NC Endangered, VA 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 in calcareous, mafic, or ultramafic glades, barrens, and prairies. [= RAB, C, F, FNA, G, HC, K, W, Y]

* ***Sporobolus indicus*** (Linnaeus) R. Brown, Smut Grass, Blackseed. Cp, Pd, Mt (GA, NC, SC, VA): roadsides, lawns, disturbed situations; common, introduced from the tropics of Asia. July-October. [= C, FNA, GW, W; > *S. poiretii* (Roemer & J.A. Schultes) A.S. Hitchcock – RAB, F, G, HC; > *S. indicus* – HC; = *S. berteroanus* (Trinius) A.S. Hitchcock & Chase – S; = *S. indicus* var. *indicus* – K]

Sporobolus junceus (Palisot de Beauvois) Kunth, Sandhills Dropseed. Cp (GA, NC, SC), Pd (GA, NC, SC, VA): sandhills, other dry, open areas; common, uncommon in Piedmont (VA Rare). 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. Mt (VA): dry rocky barrens and outcrops, over calcareous rocks (such as limestone or dolomite); rare (VA Rare). 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. Pd (NC): diabase glades; rare (NC 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: *Oligoneuron rigidum, Oligoneuron album, 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; rare (GA Rare, NC Watch List, SC Rare). 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 teretifolius Harper, Wireleaf Dropseed. Cp (GA, NC, SC): wet savannas, pitcherplant bogs; rare (US Species of Concern, GA Rare, NC Threatened). 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 *Sporobolus 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, Mt (GA, NC, SC, VA), Cp (VA): glades, barrens, open disturbed sites; uncommon. 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; = *S. vaginiflorus* var. *vaginiflorus* – F, FNA, K; = *S. vaginaeflorus* – S, orthographic variant]

Sporobolus virginicus (Linnaeus) Kunth, Seashore Dropseed, Coastal Dropseed. Cp (GA, NC, SC): salt marshes, tidal mud flats, and low dunes in the outer Coastal Plain; rare (NC Watch List). September-October. This species occurs from 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 airoides*** (Torrey) Torrey, Alkali Sacaton. Cp (SC): waste areas near wool-combing mills; rare, intoduced from , not known to be established or persistent. [= FNA, HC, K] {not keyed}

Sporobolus compositus (Poiret) Merrill *var.* ***drummondii*** (Trinius) Kartesz & Gandhi, ranges east to the Ridge and Valley province of e. TN (Chester et al. 1993), occurring over limestone, and allegedly to KY and 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 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, introduced from 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 (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA): stream, pond, and lake shores, low woods, cypress-gum ponds, floodplains, marshes, ditches, seepage slopes; common in Piedmont, occasional in Coastal Plain. 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 (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 (GA, NC, SC): 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, Z]

Stipa
(see *Nassella* and *Piptochaetium*)

Thinopyrum (Prat) Á. Löve

References: Tucker (1996)=Z; Barkworth (1997)=Y.

* ***Thinopyrum intermedium*** (Host) Barkworth & D.R. Dewey. Pd (GA): waif in railroad yards; rare, introduced from {}. Tucker (1996) states that the record is as a waif in railroad yards. [= K, Z; = *Elytrigia intermedia* (Host) Nevski; = *Agropyron intermedium* (Host) Palisot de Beauvois] {not keyed at this time; add to synonymy}
* ***Thinopyrum ponticum*** (Podp.) Z.W. Liu & R. R.-C. Wang, Tall Wheatgrass. Cp (SC): waste areas near wool-combing mills; rare, intoduced from {}, not known to be established or persistent. [= K; *? Agropyron elongatum* (Host) Palisot de Beauvois] {not keyed at this time; add to synonymy}

Torreyochloa Church (Pale Mannagrass)

A genus of 4 species, with a classic Tertiary moist temperate disjunct pattern; *Torreyochloa* is distributed in e. North America (our taxa), one species in the Pacific Northwest, and two in e. Asia (Tucker 1996). References: 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. **pallida***, Pale Mannagrass. Mt (GA, NC, VA), Cp (NC, VA), Pd (SC): bogs, mucky wetlands such as old beaver-ponds, pools in cypress swamps, drawdown shores of natural ponds; rare (GA Special Concern, NC Rare). June-July. The species as a whole is widespread in e. North America. Var. *pallida* ranges from Nova Scotia 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. [= K, Y, Z; < *Glyceria pallida* (Torrey) Trinius – RAB, GW, HC, W; < *Puccinellia pallida* (Torrey) Clausen – C; = *G. pallida* – F; = *G. pallida* var. *pallida* – G; = *Panicularia pallida* (Torrey) Kuntze – S]

Torreyochloa pallida (Torrey) Church var. *fernaldii* (A.S. Hitchcock) Dore ex Koyama & Koyama ranges from Newfoundland west to MN, south to WV and TN. [= K, Y, Z; < *Glyceria pallida* (Torrey) Trinius – RAB, GW, HC, W; < *Puccinellia pallida* (Torrey) Clausen – C; = *G. fernaldii* (A.S. Hitchcock) St. John – F; = *G. pallida* var. *fernaldii* A.S. Hitchcock – G]

Tragus Haller

* ***Tragus racemosus*** (Linnaeus) Allioni, Texas Bur. Cp (NC): on ballast near old seaports; rare, introduced from the Old World, probably no longer present. [= HC, C, F, G, K]

* *Tragus australianus* S.T. Blake. Cp (SC): waste areas around wool-combing mills; rare, perhaps only a waif, introduced. [= K] {not keyed}
* *Tragus berteronianus* J.A. Schultes. Cp (SC): waste areas around wool-combing mills; rare, perhaps only a waif, introduced. [= K] {not keyed}
* *Tragus heptaneuron* W.D. Clayton. Cp (SC): waste areas around wool-combing mills; rare, perhaps only a waif, introduced. [= K] {not keyed}

Tridens Roemer & J.A. Schultes (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 (GA, NC, SC): wet savannas, clay-based Carolina bays; uncommon (rare north of GA) (NC Rare). 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 (GA, NC, SC): mesic swales in sandhills; rare (GA Rare, NC Rare). 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 (GA, NC, SC, VA): loamy sands of disturbed longleaf pine woodlands, roadsides; rare (NC Watch List). 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, Pd, Mt (GA, NC, SC, VA): 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; < *Triodia flava* (Linnaeus) Smyth – S (also see *Tridens chapmanii*); < *Tridens flavus* – W]

Tridens strictus (Nuttall) Nash, Spike Triodia, Longspike Fluffgrass, Longspike Tridens. Cp (GA, NC, SC, VA), Pd (GA, SC, VA): sandhills, moist pine savannas, roadsides; rare (NC Rare, VA 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 (thus in our entire area). 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 (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 (GA, NC, SC): open sandy areas; common. August-October. A Southeastern Coastal Plain endemic: NC south to FL, west to e. LA. [= RAB, FNA, HC, K, S]

Triplasis purpurea (Walter) Chapman *var.* ***purpurea***, Purple Sandgrass. Cp (GA, NC, SC, VA): dunes, maritime dry grasslands, open sandy areas; common. September-October. NH south to 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 (Gamma 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***, Gamma Grass. Pd, Mt, Cp (GA, NC, SC, VA): roadsides, moist areas, disturbed areas, moist riverbanks; common. 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; > *T. dactyloides* var. *dactyloides* – F; > *T. dactyloides* var. *occidentale* Cutler & Anderson – F]

Trisetum Persoon (Oat-grass)
(also see *Sphenopholis*)

A genus of about 85 species, north and south temperate. References: Randall & Hilu (1986)=Z; Tucker (1996)=Y.

Trisetum spicatum (Linnaeus) K. Richter, Alpine Oat-grass, Spike Trisetum. Mt (NC, VA): mountain cliffs at high elevations; rare (NC Endangered, VA 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, 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)

References: Tucker (1996)=Z; Zohary & Hopf (1994).

* ***Triticum aestivum*** Linnaeus, Bread Wheat. Cp, Pd, Mt (GA, NC, SC, VA): fields; frequently cultivated, rarely persistent or volunteering following cultivation, introduced from 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, G, HC, K, Z]

Uniola Linnaeus (Sea Oats)
(also see *Chasmanthium*)

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.

Uniola paniculata Linnaeus, Sea Oats. Cp (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 (VA Watch List). 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, Z]

Urochloa Palisot de Beauvois (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.

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, introduced from 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 (GA, NC, SC, VA), Pd (GA, SC, NC): disturbed wet or seasonally moist areas; rare, presumably introduced from 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, Cp (GA, NC, SC, VA): disturbed areas; rare, introduced from 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 (GA, NC, SC, VA), Pd (GA, SC): disturbed areas, fields, gardens; uncommon, introduced from 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 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 keyed at this time; synonymy incomplete}

* ***Urochloa maxima*** (Jacquin) R. Webster *var.* ***maxima***, Guinea Grass. Introduced in the Gulf states, east to GA (FNA). Native of Africa. [= FNA; < *U. maxima* – K; *? Panicum maximum* Jacquin] {not keyed at this time; synonymy incomplete}

* ***Urochloa plantaginea*** (Link) R. Webster. Cp (GA): Reported for s. GA by Jones & Coile (1988), as *Brachiaria plantaginea*. [= FNA, K, Y, Z; = *Brachiaria plantaginea* (Link) A.S. Hitchcock] {not keyed at this time; synonymy incomplete}

Urochloa reptans (Linnaeus) Stapf. Cp (GA): [= FNA] {not keyed at this time; synonymy incomplete}

Vulpia C. Gmelin (Annual Fescue)

A genus of about 23 species, north and south temperate. References: Tucker (1996)=Z. Key based in part on C.

1 First glume < half as long as the second glume ..... ***V. myuros***
1 First glume > ½ as long as the second.
  2 Lemma pubescent; lowest lemma 2.5-3.5 mm long; grains 1.5-2 mm long ..... ***V. elliottea***
  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 mm long; awn of the lowest lemma 2.5-6 (-9) mm long ..... ***V. octoflora*** *var.* ***glauca***
      4 Spikelets 5.5-10 mm long; awn of the lowest lemma 0.3-3 mm long ..... ***V. octoflora*** *var.* ***octoflora***

* ***Vulpia bromoides*** (Linnaeus) S.F. Gray, European Squirreltail Fescue, Brome Fescue. Cp (VA): sandy disturbed areas; rare, introduced from Eurasia. [= C, K, Z; *Festuca dertonensis* (Allioni) Ascherson & Graebner – G, HC]

Vulpia elliotea (Rafinesque) Fernald, Squirreltail Fescue. Cp (GA, NC, SC, VA), Pd (GA): sandy roadsides, fields, disturbed areas; common. April-May. S. NJ south to FL, west to TX, and north in the interior to MO. [= C, F, K; = *Vulpia sciurea* (Nuttall) Henrard – Z; = *Festuca sciurea* Nuttall – RAB, G, HC, S]

* ***Vulpia myuros*** (Linnaeus) K.C. Gmelin, Rat-tail Fescue. Cp (NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC): roadsides, fields, disturbed areas; common, introduced from Eurasia. May-June. [= C, F, K, Z; = *Festuca myuros* Linnaeus – RAB, G, HC, S, W]

Vulpia octoflora (Walter) Rydberg *var.* ***glauca*** (Nuttall) Fernald, Northern Six-weeks Fescue. {Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common.} April-June. S. ME west to British Columbia, south to GA, AR, TX, and CA. [= C, K; < *Festuca octoflora* Walter – RAB, GW, S, W; = *Festuca octoflora* var. *tenella* (Willdenow) Fernald – F, G, HC; < *Vulpia octoflora* – Z]

Vulpia octoflora (Walter) Rydberg *var.* ***octoflora***, Southern Six-weeks Fescue. {Cp, Pd, Mt (GA, NC, SC, VA): fields, roadsides, disturbed areas; common.} April-June. S. NJ south to FL, west to TX, north in the interior to MO and OK. [= C, F, K; < *Festuca octoflora* Walter – RAB, GW, S, W; > *Festuca octoflora* var. *aristulata* Torrey ex L.H. Dewey – G; = *Festuca octoflora* var. *octoflora* – HC; < *Vulpia octoflora* – Z]

Zea Linnaeus (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, Pd, Mt (GA, NC, SC, VA): 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 and FL (Kartesz 1999). 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 (Wild-rice)

A genus of 4 species (and 6 taxa) of northern and eastern North America. References: Terrell et al. (1997)=Y; Tucker (1988)=Z; Judziewicz et al. (2000)=X.

Zizania aquatica Linnaeus *var. **aquatica***, Northern Wild-rice. Cp (GA, NC, SC, VA): freshwater marshes, usually tidal; common (uncommon in NC). 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 Québec. *Zizania* was formerly an important food for Amerindians; it is now gathered as a specialty grain, commanding high prices. [= C, F, G, HC, K, X, Y, Z; < *Z. aquatica* – RAB, GW, S]

Zizaniopsis Döll & Ascherson (Southern Wild-rice)

A genus of about 5 species, of tropical and subtropical America. References: 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, Southern Wild-rice, Water-millet, Giant Cutgrass. Cp (GA, NC, SC, VA): 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, G, GW, HC, K, S, Y, Z; = *Zizania miliacea* Michaux]

Zoysia Willdenow (Zoysia)

* *Zoysia japonica* Steudel, Zoysia, is used as a lawn grass. Reported for VA (Kartesz 1999). It is not known to naturalize in our area. [= C, HC, K]
* *Zoysia matrella* (Linnaeus) Merr. var. *matrella*, Zoysia, is used as a lawn grass. Reported for GA (Kartesz 1999). It is not known to naturalize in our area. [= K; = *Z. matrella* – HC]

PONTEDERIACEAE Kunth 1816 (Pickerelweed Family)

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 Plant floating (or stranded by dropping water levels), the petioles expanded into air-filled floats; perianth lobes 3-4 cm long. ..... ***Eichhornia***
1 Plant rooted, the petioles not adapted as floats; perianth lobes 0.4-1.0 cm long.
  2 Leaves lanceolate to ovate, 1.5-10× as long as wide, the base cordate, truncate, or cuneate; flowers 2-lipped; corolla blue, marked with yellow; stamens 6 (3 each of 2 different lengths) ..... ***Pontederia***
  2 Leaves either reniform, 0.5-1.5× as long as wide, the base cordate, or narrowly linear, 20-50× as long as wide, the base attenuate; flowers radially symmetrical; corolla white, pale blue, or yellow; stamens 3..... ***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).

* ***Eichhornia crassipes*** (Martius) Solms-Laub, Water Hyacinth. Cp (GA, NC, SC, VA), Pd (GA, NC): ponds, ditches, sluggish water; uncommon, introduced from South 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)
(also see *Zosterella*)

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. Mt (NC, VA), Pd (VA), Cp (VA): streams, rivers; uncommon (rare in NC). August-September. Québec 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; = *Zosterella dubia* (Jacquin) Small – C, G, S]

Heteranthera multiflora (Grisebach) Horn. Cp (NC, VA): in shallow, stagnant water in floodplains, or emersed on mud; rare (NC Watch List). 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. Cp (NC, VA), Pd (GA, NC, SC, VA): in shallow, stagnant water in floodplains, or emersed on mud; uncommon (SC Rare). 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, Z]

Heteranthera limosa (Swartz) Willdenow occurs east to TN, KY, 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 rotundifolia (Kunth) Grisebach. Ponds. Midwestern, as a rare disjunct east to c. KY (Larue County) (Medley 1993). [= 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. Cp, Pd (GA, NC, SC, VA), Mt (NC): marshes, pond-shores, lake-shores; common, uncommon in Piedmont, rare in Mountains. May-October. Nova Scotia 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]

Pontederia cordata Linnaeus *var.* ***lancifolia*** (Muhlenberg ex Elliott) Torrey, Lanceleaf Pickerelweed. Cp (GA, NC, SC): marshes, pond-shores, lake-shores; rare. 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 Augustin de Candolle, is restricted to South America. [= GW, Z; < *P. cordata* – RAB, C, FNA, K, W; = *P. lanceolata* Nuttall – F, G, S]

Zosterella Small 1913
(see *Heteranthera*)

POTAMOGETONACEAE Dumortier 1829 (Pondweed)

A family of 2-3 genera and about 90 species, aquatic herbs, nearly cosmopolitan. References: Haynes & Hellquist in FNA (2000); Haynes (1978); Les & Haynes (1996); Haynes, Les, & Holm-Nielsen in Kubitzki (1998b); Wiegleb & Kaplan (1998)=Z.

1 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***
1 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)
(also see *Stuckenia*)

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).

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 Rhizomes spotted rusty-red; leaf tips cucullate, splitting when pressed; stipules usually persistent and conspicuous ..... ***[P. praelongus]***
    3 Rhizomes unspotted; leaf tips flat, not splitting when pressed; stipules deciduous or deteriorating into fibers.
      4 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***
      4 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.
5 Submersed leaves 19-49 veined, distinctly arcuate ..... ***P. amplifolius***
5 Submersed leaves with fewer than 29 veins, not arcuate.
6 Stems conspicuously black-spotted; submersed leaves crisped along the margin; floating leaves 15-21 veined ..... ***P. pulcher***
6 Stems inconspicuously spotted or lacking spots; submersed leaves flat along the margin; floating leaves 7-29 veined.
7 Submersed leaves with petioles 1-13 cm long.
8 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***
8 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***
7 Submersed leaves sessile.
9 Stipules blunt; submersed leaves 7 veined; fruit plump, stalked, tawny-olive..... ***[P. alpinus]***
9 Stipules acute; submersed leaves 3-19 veined; fruit laterally compressed, not stalked, reddish-brown, gray-green, or olive-green.
10 Fruit reddish-brown, with obsolete or rounded keel; submersed leaves with (3-) 5-9 veins..... ***P. gramineus***
10 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 Floating leaves 0.3-1.6 cm long; peduncle 0.6-1.5 cm long; fruit < 2.5 mm long..... ***[P. vaseyi]***
4 Floating leaves 1.5-12 cm long; peduncle 2.5-3.5 mm long; fruit 2.5-5 mm long.
5 Petiole junction with leaf distinctly pale in color; floating leaves ovate, oblong-ovate, cordate at base, rarely tapering ..... ***P. natans***
5 Petiole junction with leaf lacking pale color; floating leaves elliptical, ovate-elliptical, or oblong-ellliptical.
6 Floating leaves 7-12 mm wide, tapering at both ends; fruit apparently not produced ..... ***[P. floridanus]***
6 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.
7 Rhizomes obvious; peduncle 5-25 cm long; leaves thread-like, 0.1-0.5 mm wide..... ***P. confervoides***
7 Rhizomes absent or not apparent; peduncle 0.3-7 cm long, often curved; leaves usually not thread-like, 0.1-5 mm wide.
8 Nodal glands absent.
9 Leaves 15-35 veined, > 2 mm wide; stem conspicuously flattened; peduncles terminal, usually straight... ***P. zosteriformis***
9 Leaves 3-5 veined, usually < 2 mm wide; stem terete; peduncles usually axillary, recurved.
10 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***
10 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***
8 Nodal glands present.
11 Stipules fibrous, often whitish.
12 Leaf apex acute or apiculate; leaves 5-7 (-9) veined; turions with inner leaves at a right angle to outer leaves..... ***[P. friesii]***
12 Leaf apex usually bristle-tipped, acute or rarely obtuse to apiculate; leaves 3-5 (-7) veined; turions flattened with inner and outer leaves in same plane ..... ***P. strictifolius***
11 Stipules not fibrous, usually delicate, green, brown, or white.
13 Leaf apex bristle-tipped (rarely apiculate); peduncles recurved, axillary or axillary and terminal, 0.5-6.6 cm long..... ***P. hillii***
13 Leaf apex blunt, acute, or apiculate, but not bristle-tipped; peduncles straight, terminal, 0.5-6.6 cm long.

14 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***

14 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. Cp (NC, VA), Pd (VA), Mt (GA, VA): ponds, lakes, sluggish streams; rare (GA Special Concern, VA Rare). June-September. Newfoundland west to British Columbia, south to e. NC, nw. GA (Jones & Coile 1988), n. AL, OK, and CA. [= RAB, C, F, FNA, G, K, S, W, Z]

Potamogeton bicupulatus Fernald. Mt (VA): quiet waters; rare. July-September. ME west to WI, south to VA 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. Cp (NC, SC): acidic blackwater pools and streams; rare (NC Rare). April-September. Newfoundland west to Ontario, 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. Cp, Pd (GA, NC, VA), Mt (NC, VA): uncommon. May-September. ME, MN, s. Saskatchewan and s. British Columbia, south to NC, Panhandle FL, TX, AZ, and CA. [= RAB, C, F, FNA, G, GW, K, W, Z]

Potamogeton diversifolius Rafinesque, Common Snailseed Pondweed. Cp, Pd, Mt (GA, NC, SC, VA): pools, ponds, and lakes; common. June-September. MA and NY west to MN, MT, and OR, south to FL, TX, and CA. [= RAB, FNA, G, K, S, W, 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. Mt, Pd (NC, VA), Cp (NC, SC, VA): uncommon. June-September. Newfoundland west to AK, south to GA, s. MS (Sorrie & Leonard 1999), LA, CO, and CA. [= RAB, C, FNA, K, S, W; > *P. epihydrus* var. *epihydrus* – F, G; > *P. epihydrus* var. *nuttallii* (Chamisso & Schlechtendahl) Fernald – F, G; < *P. epihydrus* – Z (also see *P. tennesseensis*)]

Potamogeton foliosus Rafinesque *var. **foliosus***, Leafy Pondweed. Mt (GA, NC, VA), Pd (SC, VA), Cp (NC, SC, VA): uncommon. May-October. Newfoundland west to AK, south to SC, w. FL, TX, and Mexico. [= C; < *P. foliosus* – RAB, G, GW, S, W, Z; > *P. foliosus* var. *foliosus* – F; > *P. foliosus* var. *macellus* Fernald – F; = *P. foliosus* ssp. *foliosus* – FNA, K; > *P. curtissii* Morong – S; > *P. foliosus* – S]

Potamogeton gramineus Linnaeus, Variable Pondweed. Cp (VA): estuarine waters; rare. 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, Z; > *P. gramineus* var. *maximus* Morong – F]

Potamogeton hillii Morong, Hill's Pondweed. Mt (VA): spring-fed oxbow pond, rare (VA Rare). VT, MA, Ontario, 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. Cp (GA, NC, SC, VA), Mt (GA, VA), Pd (VA): calcareous waters of streams, lakes, and ponds; rare. May-September. Québec west to Nortwest Territories and s. British Columbia, south to FL, TX, Mexico, and CA. [= RAB, C, F, FNA, G, GW, K, W, Z; > *P. angustifolius* Berchtold & K. Presl – S; > *P. heterophyllus* Schreber – S; > *P. lucens* Linnaeus – S, misapplied]

Potamogeton natans Linnaeus, Floating Pondweed. Mt (NC): lakes and slow streams; rare. June-September. 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. Cp (GA, NC, VA), Mt (NC, VA), Pd (VA), {SC}: ponds, streams; uncommon. May-September. ME and Québec west to British Columbia, south to FL, TX, Mexico, and CA. [= RAB, C, F, FNA, G, GW, K, W, Z; *? P. fluitans* Roth – S; *P. oblongifolium* Forster, proposed for nomenclatural rejection (Reveal et al. 2003)]

Potamogeton oakesianus J.W. Robbins, Oakes Pondweed. Cp, Mt (VA): lakes and streams; rare (VA Rare). Newfoundland west to MN, south to VA and n. IL; apparently disjunct in MT, and British Columbia, and possibly in s. AL (Sorrie, pers. comm.). [= C, F, FNA, G, K, W, Z]

Potamogeton perfoliatus Linnaeus, Perfoliate Pondweed, Redhead Grass. Cp (NC, VA): rare (VA Watch List). June-October. Newfoundland, Labrador west to MI, south to ne. NC, and n. OH; apparently disjunct in w. FL, s. AL, and se. LA, and in SD. [= FNA, G, K, S, Z; > *P. perfoliatus* var. *bupleuroides* (Fernald) Farwell – RAB, F, GW; *P. bupleuroides* Fernald]

Potamogeton pulcher Tuckerman, Spotted Pondweed. Cp, Pd, Mt (GA, NC, SC, VA): ponds, pools, ditches, streams; common. June-September. Nova Scotia west to WI, south to FL and e. TX. [= RAB, C, F, FNA, G, GW, K, S, W, Z; = *P. rotundifolium* Forster, proposed for nomenclatural rejection (Reveal et al. 2003)]

Potamogeton pusillus Linnaeus *var. **pusillus***. Cp (GA, NC, SC, VA), Pd, Mt (NC, SC, VA): acid and alkaline waters; uncommon? May-September. Nova Scotia west to AK, south to 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, Z]

Potamogeton pusillus Linnaeus *var. **tenuissimus*** F.K. Mertens & W.D.J. Koch, Slender Pondweed. Cp, Pd, Mt (NC, SC, VA), {GA}: millponds, other quiet waters; rare? (GA Special Concern). May-September. Newfoundland west to AK, south to w. 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. *acuminatus* Fieber – F; > *P. berchtoldii* var. *polyphyllus* (Morong)

Fernald – F; > ***P. berchtoldii*** var. *tenuissimus* (Mertens & Koch) Fernald – F; < ***P. pusillus*** – G, GW, S, Z; = ***P. pusillus*** ssp. *tenuissimus* (Mertens & Koch) R.R. Haynes & C.B. Hellquist – FNA, K]

Potamogeton robbinsii Oakes, Fern Pondweed. Pd (VA): muddy waters; rare (VA Rare). August-September. Nova Scotia and Prince Edward Island 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. Cp (VA): quiet waters; rare (VA Rare). July-November. Newfoundland west to Manitoba, south to e. VA, n. OH, n. IA, and se. NE. [= C, F, FNA, G, K, Z]

Potamogeton strictifolius A. Bennett, Straightleaf Pondweed. Mt (VA): calcareous waters; rare (VA Rare). July-September. Newfoundland west to Yukon, 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. Mt (VA), {NC?}: quiet or flowing water; rare (VA Rare). Late May-September. PA and OH south to w. VA, and se. TN. [= F, FNA, K, W; < ***P. epihydrus*** – Z, in part]

Potamogeton zosteriformis Fernald, Flatstem Pondweed. Cp, Mt (VA): quiet waters; rare (VA Rare). July-September. Newfoundland west to AK, south to n. VA, n. IL, KS, UT, and CA. [= C, F, FNA, G, K, Z]

Potamogeton alpinus Balbis, Red Pondweed, south to e. PA (Rhoads & Klein 1993). [= FNA, G, K, Z; > ***P. alpinus*** var. *tenuifolius* (Rafinesque) Ogden – C, F; > ***P. tenuifolius*** Rafinesque]

Potamogeton floridanus Small, Florida Pondweed, is apparently endemic to blackwater rivers of the Panhandle of FL. Considering the under-collection of *Potamogeton*, it should be sought elsewhere. [= FNA, S; < ***P. natans*** – Z]

Potamogeton friesii Ruprecht, Fries's Pondweed, south to c. PA (Rhoads & Klein 1993). (VA Watch List) [= C, F, FNA, G, K, Z]

Potamogeton obtusifolius Mertens & Koch, south to MD, NJ, and PA. [= C, F, FNA, G, K] {not keyed at this time; synonymy incomplete}

Potamogeton praelongus Wulfen, Whitestem Pondweed, south to MD and nw. PA (Rhoads & Klein 1993). [= C, F, FNA, G, K, Z]

Potamogeton richardsonii (Bennett) Rydberg, Richardson Pondweed, south to DE, MD, and PA. [= C, F, FNA, G, K, Z]

Potamogeton vaseyi J.W. Robbins, Vasey Pondweed, south to se. and sc. PA (Rhoads & Klein 1993). [= C, F, FNA, G, K, 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*. References: Haynes & Hellquist in FNA (2000); Les & Haynes (1996)=Z; Haynes, Les, & Král (1998)=Y; Wiegleb & Kaplan (1998)=X.

1 Leaves minutely acute (use 10× magnification); achenes usually 3-4.5 mm long, with the style persistent as a very short beak ..... ***S. pectinata***

1 Leaves minutely rounded or retuse (use 10× magnification); achenes usually 2-3 mm long, with the sessile stigma persistent as a bump ..... ***[S. filiformis ssp. alpine]***

Stuckenia pectinata (Linnaeus) C. Börner, Sago-pondweed. Cp (NC, SC, VA), Mt, Pd (VA), {GA}: calcareous or brackish waters of ponds, lakes, estuaries, sounds; uncommon. June-September. The species is irregularly cosmopolitan. [= FNA, K, Y; = *Potamogeton pectinatus* Linnaeus – RAB, C, F, G, GW, S, W, X; = *Coleogeton pectinatus* (Linnaeus) D.H. Les & R.R. Haynes – Z]

Stuckenia filiformis (Persoon) C. Börner ssp. *alpina* (Blytt) R.R. Haynes, D.H. Les, & M. Král, Threadleaf Pondweed, approaches our area in se. and sc. PA. [= FNA, K, Y; = *Potamogeton filiformis* Persoon var. *alpinus* (Blytt) Ascherson & Graebner; > *Potamogeton filiformis* Persoon var. *borealis* (Rafinesque) H. St. John – C, F, G; < *Potamogeton filiformis* – X; = *Coleogeton filiformis* (Persoon) D.H. Les & R.R. Haynes ssp. *alpinus* (Blytt) D.H. Les & R.R. Haynes – Z]

RUPPIACEAE Horaninow ex Hutchinson 1934 (Wigeon-grass Family)

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. Cp (GA, NC, SC, VA): brackish estuaries, rivers, marsh pools; common. 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]

RUSCACEAE M. Roemer 1840 (Ruscus Family)

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, quickly exposing berry-like seeds with a fleshy seed coat; inflorescence spikelike, to 3 dm tall; [aliens, scarcely naturalized from horticultural plantings]; [tribe *Ophiopogoneae*] ..... ***Liriope***
    5 Fruit indehiscent, 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***

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. Pd, Cp, Mt (NC, VA): persistent after cultivation; rare, introduced from Eurasia. April-May; July-August. [= F, K, W; = *C. majalis* var. *majalis* – RAB, FNA; < *C. majalis* – C, G, S, Z (also see *C. majuscula*)]

Convallaria majuscula Greene, American Lily-of-the-Valley. Mt (GA, NC, SC, VA), Pd (NC, VA): 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*; uncommon, rare in Piedmont (SC Rare). 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, apparently misapplied]

Danae Medikus (Alexandrian Laurel, Danaë)

A monotypic genus, a shrub, of sw. Asia.

* ***Danae racemosa*** (Linnaeus) Moench, Alexandrian Laurel. Pd (NC): suburban forests; rare, uncoomon in cultivation, arrely 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: Conran & Tamura in Kubitzki (1998a); Judd (2003)=Z.

* ***Liriope muscari*** (Dcne.) Bailey, Liriope, Big Blue Lilyturf. Pd (NC), {SC}: planted and persistent; commonly cultivated, rarely persistent. [= K, Z] {not keyed at this time}

* *Liriope spicatum* Loureiro, Creeping Lilyturf. Reported for AL, FL, MD (Kartesz 1999). [= K; *L. spicata* Loureiro – Z, orthographic variant] {not keyed at this time}

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 (or 1-4 in *M. trifolium*).
    3 Leaves 6 or more, pubescent beneath ..... ***M. stellatum***
    3 Leaves 1-4, glabrous beneath ..... ***[M. trifolium]***

Maianthemum canadense Desfontaines, Canada Mayflower, False Lily-of-the-valley. Mt (GA, NC, VA), Pd (VA): moist forests, especially at high elevations; common. Mid May-early July; August-September. Labrador and Newfoundland west to Mackenzie, 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, 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. Mt, Pd, Cp (GA, NC, SC, VA): forests; common. Mid April-June; August-October. The species ranges from Nova Scotia west to British Columbia, south to GA 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; > *S. racemosa* var. *cylindrata* Fernald – F; > *Vagnera racemosa* (Linnaeus) Morong – S; > *Vagnera australis* Rydberg – S]

Maianthemum stellatum (Linnaeus) Link, Starry Solomon's-plume. Mt, Pd (VA): alluvial forests; rare (VA Rare). April-June; August-October. Newfoundland west to British Columbia, south to NJ, w. VA, e. TN, IN, MO, and CA. [= FNA, K, Y, Z; = *Smilacina stellata* (Linnaeus) Desfontaines – C, F, G, W]

Maianthemum trifolium (Linnaeus) Sloboda occurs in bogs and moist sphagnous forests, south to sc. PA. [= FNA, K, Z; = *Smilacina trifolia* (Linnaeus) Desfontaines – C, F, G]

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 georgiana Michaux, Georgia Beargrass, Sandhills Lily. Cp (GA, SC): sandhills, sometimes locally common on slightly less xeric lower sandhill slopes; rare (SC Rare). 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]

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, Z]

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 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) degrees ..... ***P. 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 degrees ..... ***P. biflorum*** *var.* ***commutatum***

Polygonatum biflorum (Walter) Elliott *var.* ***biflorum***, Small Solomon's-seal. Mt, Pd, Cp (GA, NC, SC, VA): moist to dry forests; common. April-June; August-October. CT, NY, and s. Ontario west to MI, NE, and IN, south to n. FL and s. AL. In addition to the two varieties recognized for our area, *P. biflorum* includes several additional varieties: var. *hebetifolium* R.R. Gates of panhandle FL (Apalachicola River area), var. *melleum* (Farwell) R. Ownbey of MI and Ontario, 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, Y; = *P. biflorum* – F, G, in the narrow sense; < *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. Mt (GA, NC, SC?, VA), Pd (NC, VA): moist forests, roadbanks; common. May-June; September-October. NH west to s. Manitoba, 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, 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 pubescens (Willdenow) Pursh. Mt (GA, NC, SC?, VA): moist forests, especially cove forests; common. Late April-June; August-October. S. Québec west to s. Manitoba, south to nw. SC, WV, KY, IN, WI, and IA. [= RAB, C, F, FNA, G, K, W, Y, Z; = *P. biflorum* – S, misapplied]

SCHEUCHZERIACEAE F. Rudolphi 1830 (Scheuchzeria Family)

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. South to sc. PA (Rhoads & Klein 1993), NJ, and Pocahontas County, WV. [= F; < *Sch. palustris* – C, FNA, G; = *Sch. palustris* ssp. *americana* (Fernald) Hultén – K; = *Sch. americana* (Fernald) G.N. Jones]

SMILACACEAE Ventenat 1799 (Greenbrier Family)

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 ion 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, toothlike projections; berries with (1-) 2-3 seeds; [of 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; [of swamp forests, bogs, often where submersed for at least part of the year] ..... ***S. walteri***

Smilax auriculata Walter, Dune Greenbrier. Cp (GA, NC, SC): dunes on barrier islands, dry sandy openings in maritime forests or sandhills near the coast; common. 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, Y]

Smilax biltmoreana (Small) J.B.S. Norton ex Pennell, Biltmore Carrionflower. Mt, Pd (GA, NC, SC), Cp (GA): dry forests (such as dry pine ridges and chestnut oak forests) and moist forests; rare (NC Rare). 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, in part (concept interpreted from stated geographic range); = *Nemexia biltmoreana* Small – S]

Smilax bona-nox Linnaeus, Catbrier, Tramp's-trouble. Cp, Pd, Mt (GA, NC, SC, VA): in a wide variety of upland and wetland habitats; common. Late April-May; September-November. MD and MO south to c. FL and TX, and also in Mexico. [= RAB, C, FNA, G, GW, K, S, W, 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. Mt (VA): forests; rare (VA Rare). 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, orthographic variant; < *S. ecirrhata* – G, broader sense (apparently also including in statement of range *S. hugeri* and/or *S. biltmoreana*); = *Nemexia ecirrhata* (Engelmann ex Kunth) Small – S]

Smilax glauca Walter, Whiteleaf Greenbrier, Wild Sarsaparilla. Mt, Pd, Cp (GA, NC, SC, VA): in a wide variety of upland and wetland habitats; common. Late April-early June; September-November (and persisting). NJ, c. PA, OH, IN, MO, and KA south to c. FL and TX, and also in Mexico. [= RAB, C, FNA, GW, S, W, Y; > *S. glauca* var. *glauca* – F, G, K; > *S. glauca* var. *leurophylla* Blake – F, G, K]

Smilax herbacea Linnaeus, Common Carrionflower. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (GA, VA): moist deciduous forests; common. May-June; August-October. Centered in the Appalachian Mountains, from Québec and ME west to OH, south to AL, GA, and TN. Young, non-flowering plants closely resemble *S. biltmoreana*. [= F, FNA, K, W, Y, Z; = *S. herbacea* var. *herbacea* – RAB, C, G; = *Nemexia herbacea* (Linnaeus) Small – S]

Smilax hispida Rafinesque, Bristly Greenbrier, Hellfetter. Mt, Pd, Cp (GA, NC, SC, VA): moist to wet forests; common. CT, NY, MN, and NE south to c. FL and TX. Wilbur (2003) discusses the complicated nomenclatural problems involving this plant and concludes that *S. hispida* Raf. is the correct name. [= *Smilax tamnoides* Linnaeus – FNA, GW, K, W, Y, misapplied; = *S. hispida* Muhlenberg – RAB, C, G, S; > *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. Mt (GA, NC, SC), Pd (GA, NC, SC), Cp (GA, SC): moist deciduous forests; rare (NC Watch List). 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]

Smilax lasioneura Hooker, Midwestern Carrionflower. Mt (NC, SC, VA?), Pd (NC), {GA}: moist deciduous forests, bluff forests, pine-oak hickory submesic forests, perhaps only or primarily over mafic rocks; rare (GA Rare, NC Rare). April-May; August-September. Ontario and MT south to w. VA (?), w. NC, n. 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* – Y, orthographic variant]

Smilax laurifolia Linnaeus, Blaspheme-vine, Bamboo-vine. Cp, Pd, Mt (GA, NC, SC, VA): pocosins, swamp forests, mountain bogs in sw. NC; common (rare in Piedmont and Mountains). 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, Y]

Smilax pseudochina Linnaeus, Coastal Carrionflower. Cp (GA, NC, SC, VA): pocosins, swamp forests, edges of pine savannas; uncommon. 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. Mt (GA, NC, SC, VA), Pd, Cp (NC, SC, VA): moist deciduous forests: common. 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, Y, Z; = *S. herbacea* var. *pulverulenta* (Michaux) A. Gray – RAB, C, G; = *Nemexia pulverulenta* (Michaux) Small – S]

Smilax pumila Walter, Sarsaparilla-vine, Dwarf Smilax. Cp (GA, SC): mesic to dryish hammocks and bluffs, northward primarily in maritime-influenced mainland forest, with *Magnolia grandiflora* and *Tilia americana* var. *caroliniana*; rare (NC Watch List). October-November; January-April (and persisting). Ne. SC (within a few hundred meters of Brunswick County, NC) to 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, Y]

Smilax rotundifolia Linnaeus, Common Greenbrier, Bullbrier, Horsebrier. Mt, Pd, Cp (GA, NC, SC, VA): in a wide variety of upland and wetland habitats; common. April-May; September-November (and persisting). Nova Scotia and s. Ontario south to n. FL and e. TX. [= RAB, C, F, FNA, G, GW, K, S, W, Y; > *S. rotundifolia* var. *quadrangularis* (Muhlenberg ex Willdenow) Wood]

Smilax smallii Morong, Jackson-brier. Cp (GA, NC, SC, VA), Pd, Mt (GA): bottomland forests; uncommon, rare in VA (VA Rare). June-July; April-June of the next year. Se. VA to c. FL, west to s. AR and e. TX, primarily on the Coastal Plain. [= RAB, FNA, G, GW, K, W, Y; = *S. lanceolata* Linnaeus – S, misapplied]

Smilax walteri Pursh, Coral Greenbrier, Red-berried Swamp Smilax. Cp, Pd (GA, NC, SC, VA): swamp forests, bogs, often where submersed for at least part of the year; common (rare in Piedmont). Late April-May; September-November (and persisting). NJ south to c. FL and west to TN, AR, and TX. [= RAB, C, F, FNA, G, GW, K, S, W, Y]

Smilax leptanthera Pennell. See Pennell (1916) for additional information. Treated as valid and rare by GAHP. [= *Nemexia leptanthera* (Pennell) Small – S; < *S. pseudochina*] {investigate}

SPARGANIACEAE (Bur-reed Family)

(see TYPHACEAE)

STEMONACEAE Engler 1887 (Stemona Family)

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. Cp (GA): moist forests, often with beech and basswood; rare (GA Threatened). April-May. AL (or perhaps LA) to sw. GA, Panhandle FL, and allegedly se. GA (Whetstone in FNA 2002, Jones & Coile 1988). [= FNA, K, S, Z]

THEMIDACEAE Salisbury 1866

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, native of the Pacific northwestern North America, is cultivated and apparently escaped in the Piedmont of nc. GA (Jones & Coile 1988). {further investigate} [= FNA, K; = *Brodiaea congesta* Smith]

TOFIELDIACEAE Takhtajan 1994 (False-asphodel Family)

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 flava]***
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 (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. Endemic to FL Panhandle (Franklin and Liberty counties). [= FNA, K, Y, 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. Cp (GA?, NC, SC): 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); uncommon (SC Rare). 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; = *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. Cp (NC, SC): savanna-pocosin ecotones, wet savannas, seepage bogs; rare (US Species of Concern, NC Rare, SC Rare). (Late August-) late September-October; October-November. Endemic to the coastal plain and sandhills of NC and northern SC (the reports from GA are dubious). [= RAB, FNA, GW, K, S, Z]

Triantha (Nuttall) Baker

A genus of ca. 4 species, herbs, of North America and Japan. References: 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, Sticky Bog Asphodel. Mt (GA, NC, VA), Pd (NC): bogs and seeps, especially over mafic or calcareous rocks; rare (GA Rare, NC Rare, VA Rare). July-August; September-October. Newfoundland west to British Columbia, 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, W; > *Tofieldia glutinosa* ssp. *glutinosa* – GW, Y, Z; > *Tofieldia glutinosa* var. *glutinosa* – C]

Triantha racemosa (Walter) Small, Coastal Plain Bog Asphodel. Cp (GA, NC, SC, VA), Mt (VA), Pd (GA): savannas, savanna-pocosin ecotones, seepage bogs, sinkhole ponds (dolines) in the mountains of VA; uncommon (VA Rare). 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, Z]

TRILLIACEAE Lindley 1846 (Trillium Family)

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; 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 Z, unpublished keys of J.D. Freeman, 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 bracts.

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 bone 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 Leaves sessile or subsessile, borne in a descending or drooping manner (similar to the sepals); petals usually > 4× as long as wide ..... ***T. lancifolium***
4 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 ..... ***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.
5 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]***
5 Petals erect to slightly spreading, not spirally twisted; anther dehiscence introrse (toward the inside of the flower), or latrorse (toward the side).
6 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***
6 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].
7 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***
7 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.
8 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 green streak along the midvein; [of the Coastal Plain and fall-line area of GA, AL, and FL panhandle]; [*T. sessile* group].
9 Stem 2.5-3× as long as the leaves; petals oblanceolate-obovate, usually 1.5-3× as long as wide ..... ***T. decipiens***
9 Stem 1-2× as long as the leaves; petals narrowly elliptic to oblanceolate-obovate, usually 3-5× as long as wide ..... ***T. underwoodii***
8 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].
10 Petals < 4× as long as wide, elliptic-oblanceolate to oblanceolate; [of inland provinces, rarely in the Coastal Plain].
11 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***
11 Flower fragrance lemon-like; petals greenish-yellow darkening to yellow; ovary and stamens greenish-white during anthesis ..... ***T. luteum***
10 Petals > 4.5× as long as wide, narrowly oblanceolate-spatulate to linera oblnaceolate; [of the Coastal Plain, rarely further inland].
12 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***
12 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].
13 Petals 3-5 mm wide; anther dehiscence introrse; anther connective extending 1-1.5 mm beyond the anther sacs ..... ***[T. foetidissimum]***
13 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 Pedicel abruptly declined below the leaves; leaves petiolate to subsessile (or even sessile); petals recurved between the sepals.
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; 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, the anther sacs lavender to vivid purple (or albino); ovary large, ovoid, 10-17 mm long; flower fragrance weak, like green apples; pedicel short, 1.5-3 cm long; petals not strongly overlapping, usually white (rarely maroon).
3 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 south to n. VA] ..... ***T. cernuum***
3 Anthers 7.0 mm long or more, longer than the filaments; petals ovate to elliptic, much broader than the sepals; [of mesic forests north to n. NC] ..... ***T. rugelii***

1 Pedicel inclined, erect or declined (the flower generally borne above the leaves); leaves sessile to subsessile; petals variously disposed, generally spreading in the same plane as the sepals or forming a cup concealing the ovary in side view (then recurved toward the apex).
4 Anthers creamy-white, 2-5× as long as the filaments; ovary white to pink (rarely darker), ovoid (widest near the base); stigmas prominent, nearly as long as the ovary; flower fragrance weakly sweet to musty ..... ***T. flexipes***
4 Anthers creamy-white, yellowish, or purplish, at most 2.2× as long as the filaments; ovary purple-black to maroon (or albino), subglobose; stigmas smaller, < 0.3× as long as the ovary; flower fragrance variable (see below).
5 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***
5 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.
6 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***
6 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 about as broad as the petals or broader, obtuse; leaves obtuse; anthers purplish-green between anther sacs; pedicel erect through fruiting.
4 Pedicel 1-4 mm long ..... ***T. pusillum*** *var.* ***virginianum***
4 Pedicel 5-30 mm long ..... ***T. pusillum*** *var.* ***pusillum***
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.
5 Ovary obscurely 3-lobed; leaves < 5 cm long, blue-green, obtuse ..... ***T. nivale***
5 Ovary sharply 6-angled (-winged); leaves > 5 cm long, green, acute to acuminate.
6 Petals obovate, tightly rolled at base, abruptly flared near the apex; leaves broadly elliptic, acuminate; style minute, < 1.0 mm long..... ***T. grandiflorum***
6 Petals elliptic, loose, gradually separating; leaves ovate, acute; style conspicuous, > 1.5 mm long..... ***T. persistens***

Trillium catesbaei Elliott, Catesby's Trillium, Bashful Trillium, Rosy Wake-robin. Pd (GA, NC, SC), Mt (GA, NC, SC), Cp (GA, NC): bottomland forests, mesic slopes, cove forests; common (uncommon in Mountains). 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. Petals white to pink. [= RAB, FNA, K, S, W, X, Z]

Trillium cernuum Linnaeus, Northern Nodding Trillium. Mt (VA): damp forest with *Fraxinus nigra* and *Ulmus americana*; rare (VA Rare). Late April-May. Newfoundland, Hudson Bay area, and se. Saskatchewan south to n. VA, ne. WV, n. IN, n. IL, n. IA, and SD. Petals white, pink, maroon, or green. [= FNA, K, W, 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. Pd, Mt (GA, NC, SC), Cp (GA): in rich soils of cove forests, moist slopes, and bottomlands, usually over mafic or calcareous rocks; uncommon, but 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, 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* – S; >< *T. underwoodii* – S, misapplied]

Trillium decipiens J.D. Freeman, Chattahoochee Trillium, Deceptive Trillium. Cp (GA): moist forests; uncommon. Late January-early April. W. FL and sc. AL east to ec. GA, and might be expected in SC, near the Fall Line. It is similar to *T. underwoodii*. [= FNA, K, X, Y, Z]

Trillium decumbens Harbison, Decumbent Trillium. Mt, Pd, Cp (GA): moist forests; uncommon (rare in Piedmont and Coastal Plain). 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. Mt (GA, NC, SC), Pd (GA, SC): rich cove forests, restricted to the Savannah River drainage; rare (GA Special Concern, NC Threatened, SC 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, W, X, Y, Z]

Trillium erectum Linnaeus, Red Trillium, Purple Trillium, Stinking Willie, Stinking Benjamin, Wake-robin. Mt (GA, NC, SC, VA): wooded slopes, usually at middle to high elevations; common. April-early June; July-August. New Brunswick, Québec, 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, W, X, Z; < *T. erectum* var. *erectum* – RAB (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. Mt (GA, NC, VA): moist coves over mafic or calcareous rocks; rare (GA Special Concern, NC Rare, VA Rare). April. E. PA, s. Ontario 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, W, X, Z; < *T. erectum* var. *vaseyi* – RAB; = *T. gleasoni* Fernald – G; = *T. declinatum* (A. Gray) Gleason – S, misapplied]

Trillium grandiflorum (Michaux) Salisbury, Large-flowered Trillium, White Trillium, Great White Trillium. Mt (GA, NC, SC, VA), Pd (NC, SC, VA): rich coves and mesic slopes, also less typically on ridges over "rich" rock types; common (SC Rare). April-May; July-August. S. Québec, s. Ontario, 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, W, X, Z]

Trillium lancifolium Rafinesque, Lanceleaf Trillium, Narrowleaf Trillium. Pd (SC), Mt (GA), Cp (GA): rich forests over marble, limestone, and other calcareous substrates, floodplain forests; rare (GA Special Concern, SC Rare). Late March-April. Nc. SC and se. TN south through w. GA and AL to panhandle FL and se. AL. Petals purple, green, or greenish-purple. [= FNA, K, Y, X, Z; = *T. lanceolatum* (S. Watson) Boykin ex Small – RAB, S]

Trillium luteum (Muhlenberg) Harbison, Yellow Trillium, Yellow Toadshade, Wax Trillium, Lemon-scented Trillium. Mt (GA, NC, VA*): moist coves over mafic or calcareous rocks, restricted to the vicinity of the Great Smokies; uncommon (but locally abundant). 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, 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. Cp, Pd (GA, SC): rich forests and floodplains, over calcareous materials such as coquina limestone ("marl") or on shell middens; uncommon. Early February-mid April. S. SC south to n. FL, west to sc. AL. Petals maroon or yellow. [= FNA, K, X, Y, Z; < *T. viride* – RAB, misapplied; < *T. sessile* – S, misapplied]

Trillium nivale Riddell, Snow Trillium, Dwarf White Trillium. Mt (VA): rocky, calcareous forests; rare (VA Rare). 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, X, Z]

Trillium persistens Duncan, Persistent Trillium. Mt (GA, SC): acidic forests with hemlocks and heaths; rare (US Endangered, GA Endangered, SC Rare). April. Endemic to a short stretch of the Tallulah-Tugaloo river system in nw. SC and ne. GA. Petals white to pink. [= FNA, K, W, X, Z]

Trillium pusillum Michaux *var.* ***monticulum*** Bodkin & Reveal. Mt (VA): dry to dry-mesic forests and woodlands, moist forests along small mountain streams; rare. Endemic to nw. VA, e. WV, w. MD and disjunctly in sw. VA (at The Glades, Grayson County). 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] {not keyed at this time}

Trillium pusillum Michaux *var.* ***ozarkanum*** (Palmer & Steyermark) Steyermark. Mt (NC): dry to dry-mesic slopes, in NC under *Quercus coccinea* and *Kalmia latifolia*; rare (NC Endangered). KY, TN, w. NC, AR, MO, and s. MS. Petals white to pink. [= K, X; < *T. pusillum* – RAB, G, S, Z; < *T. pusillum* var. *pusillum* – FNA; **= *T. ozarkanum*** Palmer & Steyermark] {not keyed at this time}

Trillium pusillum *var.* ***2***. Mt (GA): {habitat}; rare. Endemic to n. GA. Apparently most closely related to *Trillium texanum*. Petals white to pink. {not keyed at this time}

Trillium pusillum Michaux *var*. ***pusillum***, Carolina Least Trillium, Carolina Dwarf Trillium. Cp (NC, SC), Mt (GA, NC): bottomland forests along small streams in the upper Coastal Plain, ecotones of calcareous savannas and swamp forests in the lower Coastal Plain; rare (US Species of Concern, GA Special Concern, NC Endangered, SC Rare). 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 species as a whole has a highly disjunct and 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 may be 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. Cp (NC, VA), Mt (VA): bottomland forests along small streams in the upper Coastal Plain, swamps and bottomland forests, also mesic beech islands in swamp forests, moist mafic areas in Grayson Co. VA; rare (US Species of Concern, NC Endangered, VA Rare). Late March-May; June-July. Var. *virginianum* occurs in the Coastal Plain of se. VA and ne. NC; disjunct in Grayson County in the Mountains of sw. VA. The Grayson County site is within a kilometer of the Alleghany County, NC border, and the plant may be found to occur in nw. NC. 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 recurvatum Beck, Prairie Trillium, Prairie Wake-robin. Mt, Pd (NC): rich soils of cove over calcareous rock; rare (NC Rare). 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. Pd (GA, SC), Cp (GA): rich forests on bluffs and ravine slopes; rare (US Endangered, GA Endangered, SC Rare). 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, X, Y, Z]

Trillium rugelii Rendle, Southern Nodding Trillium. Mt, Pd (GA, NC, SC): rich woodlands and forests over mafic or calcareous rocks; rare (NC Watch List, SC Rare). April-early May. W. NC and e. TN south to c. GA, and c. AL. Petals white or maroon. [= FNA, K, 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. Mt (VA), Pd (VA), Cp (NC, VA): rich forests, in NC limited to very rich soils of natural levees and lower slopes along the Roanoke River; uncommon in VA, rare in NC (NC Rare). 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, X, Y, Z]

Trillium simile Gleason, Sweet White Trillium. Mt (GA, NC, SC): very rich soils of slopes and coves over mafic or calcareous rocks, often also in or near seepage; rare (GA Special Concern, NC Rare, SC Rare). 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, W, X, Z; < *T. erectum* var. *vaseyi* – RAB]

Trillium sulcatum T. Patrick, Southern Red Trillium, Barksdale Trillium. Mt (GA, NC, VA): coves and moist slopes; uncommon (GA Special Concern). 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, W, X, Z; < *T. erectum* var. *erectum* – RAB; < *T. erectum* – F, G, S]

Trillium underwoodii Small, Underwood's Trillium. Cp (GA): moist forests; uncommon. Late February-mid April. N. FL north to wc. GA and c. and s. AL; it is the only erect trillium with the stems < 2× as long as the leaves. [= FNA, K, S, X, Y, Z]

Trillium undulatum Willdenow, Painted Trillium, Striped Wake-robin. Mt (GA, NC, SC, VA): acidic soils of ridges, slopes, and bog margins, mostly at high elevations and often associated with *Rhododendron, Tsuga, Pinus,* or *Picea*; common (SC Rare). Late April-May; late July-August. New Brunswick, e. Québec, s. Ontario, 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, W, X, Z]

Trillium vaseyi Harbison, Sweet Trillium, Vasey Trillium, Sweet Beth. Mt (GA, NC, SC), Pd (GA): cove forests; uncommon. 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, W, X, Z; < *T. erectum* var. *vaseyi* (Harbison) Ahles – RAB (also see *T. simile* and *T. flexipes*)]

Trillium foetidissimum J.D. Freeman, Stinking Wake-robin. Bluffs, ravines, bottomlands. Late February-early April. MS west to LA. [= FNA, K, X, Y, Z]

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 2*. [= FNA, K, X, Y, Z]

Trillium pusillum var. *1*. AL, TN, KY. Petals white to pink. [< *T. pusillum* var. *pusillum* – C, F, FNA, K; < *T. pusillum* – G, S, Z; = *T. pusillum* var. *alabamicum* – X (nomen nudum)] {not keyed at this time}

Trillium species 1. Pd (SC): rich forests; rare. Under study by L.L. Gaddy. Somewhat similar to *T. lancifolium* and *T. recurvatum*. With clawed, bicolored petals (the claw maroon and the blade green) and green sepals reflexed somewhat (in the same plane as the drooping leaves). [previously misidentified as *T. lancifolium*] {not keyed at this time}

Trillium species 2. Mt (GA): rich forests; rare. Under study by Susan Farmer. {not keyed at this time}

Trillium species 3. Lookout Mountain area, reesembles ***T. ludovicianum***. Under study by Susan Farmer. {not keyed at this time}

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]

TYPHACEAE A.L. de Jussieu 1789 (Cattail Family)

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).

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. Cp, Mt, Pd (GA, NC, SC, VA): streams, marshes, ponds, pools, often submerged; common (rare in NC and SC Piedmont). May-September. 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, W, X, Y, Z; > *S. americanum* – S; > *S. eurycarpum* – S, misapplied]

Sparganium androcladum (Engelmann) Morong. Cp, Pd (VA): marshes, shores; rare (VA Rare). May-September. ME and Québec west to MN, south to se. VA, e. TN, s. MO, and ne. OK. [= C, F, FNA, G, K, W, X, Y, Z]

Sparganium emersum Rehmann, Greenfruit Bur-reed. Mt (NC, VA): bogs, stream margins; rare (NC Rare, VA Rare). May-September. Newfoundland and c. Québec west to s. Alberta and WA, south to w. NC, IN, IA, CO, and CA. [= FNA, X; > *S. chlorocarpum* Rydberg – RAB, C, F, G, W, Y, Z; > *S. chlorocarpum* var. *acaule* (Beeby) Fernald – F; *? S. angustifolium* Michaux – K, misapplied; > *S. acaule* (Beeby) Rydberg]

Sparganium eurycarpum Engelmann ex A. Gray, Giant Bur-reed. Cp, Pd, Mt (VA): marshes, shores; uncommon (VA Watch List). Nova Scotia west to British Columbia, south to w. VA, IN, OK, and CA. [= C, F, FNA, G, K, W, X; = *S. erectum* Linnaeus ssp. *stoloniferum* (Graebner) C.D.K. Cook & M.S. Nicholls]

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] {not keyed; synonymy incomplete}

Typha Linnaeus 1753 (Cattail)

A genus of 8-13 species, wetland herbs, cosmopolitan. References: Smith in FNA (2000); Kubitzki in Kubitzki (1998b).

1 Staminate and pistillate portions of spike normally contiguous; pistillate portion of spike (1.5-) 2.0-3.5 cm in diameter at maturity; leaves (8-) 10-24 mm wide, flat on one side; stigmas lance-ovate, fleshy, persistent; pollen grains in 4's; [in acid to alkaline waters, widespread in our area] ..... ***T. latifolia***
1 Staminate and pistillate portions of spike normally separated by a gap; pistillate portion of spike 0.5-2.2 (-2.5) cm in diameter at maturity; leaves 4-15 mm wide, biconvex (or flat on one side in *T.* ×*glauca*); stigmas linear to lance-linear, not fleshy (or slightly so in *T.* ×*glauca*), either quickly deciduous or persistent; pollen grains single; [in circumneutral to alkaline waters, primarily in tidal situations in the outer Coastal Plain, but scattered inland, especially in VA].
  2 Pith at base of stem yellowish buff; stigmas lance-linear, slightly fleshy; pistillate portion of spike 1.6-2.5 cm in diameter at maturity; pistillate bracteoles usually absent (or present on a few flowers) ..... ***T. ×glauca***
  2 Pith at base of stem white; stigmas linear, not fleshy; pistillate portion of spike 0.5-2.5 cm in diameter at maturity; pistillate bracteoles present on all flowers.
    3 Leaves 4-7 (-11) mm wide, auriculate at the junction of the blade and the sheath; pistillate portion of spike 0.5-2.0 cm in diameter and dark brown at maturity; plants 1-1.5 m tall; pistillate bracteoles rounded to blunt at the tip .... ***T. angustifolia***
    3 Leaves 6-12 (-15) mm wide, most or all not auricled at the junction of the blade and the sheath; pistillate portion of spike (0.8-) 1.3-2.5 cm in diameter and light cinnamon brown at maturity; plants (1-) 2-4 m tall; pistillate bracteoles acute to acuminate at the tip ..... ***T. domingensis***

Typha angustifolia Linnaeus, Narrowleaf Cattail. Cp (GA?, NC, SC, VA), Pd, Mt (VA): brackish to fresh waters of marshes and swamps, usually tidal; common (rare in Piedmont and Mountains). May-July; June-November. Nova Scotia west to ND, south to SC, FL (?), LA, and TX (?); Eurasia. [= C, F, FNA, G, GW, K, W; < *T. angustifolia* – S (also see *T. domingensis*)]

Typha domingensis Persoon, Southern Cattail. Cp (GA, NC, SC, VA): brackish to nearly fresh waters of marshes and swamps, usually tidal; common. 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; < *T. angustifolia* – S]

Typha* ×*glauca Godron (pro sp.), Hybrid Cattail. Cp (GA?, NC, SC, VA), Mt (VA): fresh to brackish waters of lakes, ponds, and rivers; rare. 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). [= C, GW, K; = *T. glauca* Godron – RAB, F]

Typha latifolia Linnaeus, Common Cattail. Mt, Pd, Cp (GA, NC, SC, VA): fresh waters of ponds, lakes, ditches, marshes, including in tidal freshwater marshes; common. May-July; June-November. Newfoundland west to AK, south to FL, TX, CA, and Mexico; Central America; South America; Eurasia. [= C, F, FNA, G, GW, K, S, W]

UVULARIACEAE A. Gray ex Kunth 1843 (Bellwort Family)

[see *CALOCHORTACEAE (Prosartes, Streptopus, Tricyrtis), COLCHICACEAE (Uvularia), LILIACEAE (Clintonia*)]

XYRIDACEAE C. Agardh 1823 (Yellow-eyed Grass Family)

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); 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 outer 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, 5-25 mm wide; leaf bases soft, not swollen, not bulbous, pale; scape ridges strongly scabrous; petal blades yellow; [of aquatic to very wet peaty, mucky, or sandy ponds, marshes, or other wetlands]..... ***X. fimbriata***

11 Keel of the lateral sepals lacerate, or if very shortly fimbriate, then not conspicuously exserted from the subtending bract.

13 Lateral sepals longer than and exserted from the subtending bracts; scapes 5-15 dm tall.

14 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]***

14 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***

13 Lateral sepals shorter than the subtending bracts, and therefore hidden (except when the spikes open to shed seeds); scapes 1.5-12 dm tall.

15 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.

16 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***

16 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.

17 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***

17 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.
18 Seeds translucent; leaf margins smooth; [plants of acidic sites of the Coastal Plain] ..... ***X. platylepis***
18 Seeds opaque; leaf margins slightly scabrous; [plants of calcareous seeps and fens of the Ridge and Valley] ***X. tennesseensis***

15 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.
19 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.
20 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***
20 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***
19 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.
21 Seeds farinose, very dark; surfaces of leaves tuberculate-scabrid, the leaves strongly ascending, linear, generally > 10 cm long; leaves generally dull-colored.
22 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***
22 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***
21 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.
23 Leaves broadly linear-curvate, spreading, typically < 10 cm long, 2-4.5 mm wide; plants perennial, in tufts (rarely solitary); mature spikes acute, with < 10 flowers; leaf bases pinkish or purplish; old flowers fugacious, not persisting on spikes ***X. curtissii***
23 Leaves linear, ascending, 10-60 cm long, 5-10 mm wide; plants annual, solitary or in small tufts; mature spikes obtuse, many-flowered; leaf bases tan (very rarely pinkish); old flowers often persistent on the spikes, drying blackish ***X. jupicai***

Xyris ambigua Beyrich ex Kunth. Cp (GA, NC, SC, VA), Pd (NC), Mt (VA): wet savannas and flatwoods, pinelands, edges of depression ponds; common. June-August. Se. VA south to FL, west to AL and ec. TX, primarily on the Coastal Plain. [= RAB, C, F, FNA, G, K, W, X; < *X. ambigua* – GW, S, Z (also see *X. louisianica*)]

Xyris baldwiniana J.A. Schultes, Grassleaf Yellow-eyed Grass. Cp (GA, NC, SC), Pd (NC): wet savannas, seepage bogs, sandhill seeps, wet savanna ecotones; rare (NC Watch List). June-July. Se. NC south to n. FL, west to s. AR and ec. TX, primarily on the Coastal Plain. [= RAB, FNA, GW, K, S, X, Z]

Xyris brevifolia Michaux, Shortleaf Yellow-eyed Grass. Cp (GA, NC, SC): wet sands of pinelands, especially seasonally wet, open, white sands of spodosol longleaf pine flatwoods (Leon series soils), margins of Carolina bay sandrims; rare (NC Rare, SC Rare). 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, X, Z]

Xyris caroliniana Walter, Pineland Yellow-eyed Grass. Cp (GA, NC, SC, VA): dry to moist pine flatwoods, moist savannas, scrub oak sandhills; common (VA Rare). June-July. Se. VA south to FL, west to se. TX, and disjunct northward in s. NJ. White-petaled populations of *X. caroliniana* occurring in the East Gulf Coastal Plain need additional study. [= RAB, C, FNA, GW, K, X, Z; > *X. flexuosa* Muhlenberg ex Elliott – F, G, S; > *X. pallescens* (C. Mohr) Small – S]

Xyris chapmanii Bridges & Orzell, Chapman's Yellow-eyed Grass. Cp (GA?, NC, SC): sandhill seepage bogs in areas of copious lateral seepage in deep muck soils; rare (NC Rare). Sc. NC south to panhandle FL, west to e. TX. This taxon is abundantly distinct from *X. scabrifolia*. [= X; < *X. scabrifolia* – FNA, K, Z]

Xyris curtissii Malme, Curtiss's Yellow-eyed Grass. Cp (GA, NC, SC, VA), Pd (SC): savannas; rare (NC Watch List, VA Rare). July-August. Se. VA south to n. FL and west to s. AR and ec. TX, primarily on the Coastal Plain; disjunct in s. NJ. [= RAB, G; = *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. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC): savannas, roadside ditches, pond margins, other wet habitats; common (VA Watch List). August-October. New England and s. Canada south to n. FL and ec. TX. [= X; = *X. difformis* Chapman var. *difformis* – C, FNA, GW, K, Y, Z; < *X. difformis* – RAB, F, G, S, W (also see *X. curtissii*)]

Xyris drummondii Malme, Drummond's Yellow-eyed Grass. Cp (GA): wet pine flatwoods, ditches; uncommon. Se. GA south to Panhandle FL, west to s. MS. [= FNA, GW, K, X, Z]

Xyris elliottii Chapman, Elliott's Yellow-eyed Grass. Cp (GA, SC): margins of drawdown zones of clay-based Carolina bays, limesinks and flatwoods swales, wet savannas; uncommon. May-June. E. SC south to the Gulf Coastal Plain. [= RAB, FNA, GW, K, S, X, Z]

Xyris fimbriata Elliott, Giant Yellow-eyed Grass. Cp (GA, NC, SC, VA): 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*; common (VA Rare). September-October. Se. VA south to c. FL, west (interruptedly) to se. TX; disjunct in s. NJ, DE, and c. TN. [= RAB, C, F, FNA, G, GW, K, S, X, Z]

Xyris flabelliformis Chapman, Savanna Yellow-eyed Grass. Cp (GA, NC, SC): wet sands of pinelands, especially seasonally wet, open, white sands of spodosol longleaf pine flatwoods (Leon series soils), margins of Carolina bay sandrims; rare (NC Rare, SC Rare). May-June. Se. NC south to s. FL, west to se. LA, on the Coastal Plain. [= RAB, FNA, GW, K, S, X, Z]

Xyris floridana (Kral) Bridges & Orzell, Florida Yellow-eyed Grass. Cp (GA, NC, SC): savannas, wet pine flatwoods, ditches; rare (NC Rare, SC Rare). August. Se. NC south to s. FL, west to se. LA. [= X; = *Xyris difformis* Chapman var. *floridana* Kral – FNA, GW, K, Y, Z]

Xyris iridifolia Chapman, Irisleaf Yellow-eyed Grass. Cp (GA, NC, SC, VA): marshes, upland pond margins, blackwater river channels, floodplain pools, other wet habitats; uncommon (NC Watch List, VA Rare). July-September. Se. VA south to n. FL, west to e. TX; disjunct in c. TN. [= RAB, C, GW, S, Z; = *X. laxifolia* Mart. var. *iridifolia* (Chapman) Kral – FNA, K, X]

Xyris jupicai L.C. Richard. Cp (GA, NC, SC, VA), Pd (NC), Mt (VA): ditches, various wet habitats; common. July-September. NJ south to s. FL, west to TN, AR, OK, and TX, and in Latin America. 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, X, Z; = *F. caroliniana* – F, misapplied; > *X. elata* Chapman – G, S; > *X. communis* Kunth – S; > *X. caroliniana* – G, S, misapplied]

Xyris louisianica Bridges & Orzell. Cp (GA): pine savannas, bogs, ditches and disturbed areas; rare. FL Panhandle and GA west to se. TX. [= K, X; = *X. stricta* Chapman var. *obscura* Kral – FNA; < *X. ambigua* – GW, S, Z]

Xyris platylepis Chapman. Cp (GA, NC, SC, VA): sandhill seeps, savannas, ditches; common (VA Watch List). 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, X, Z]

Xyris scabrifolia Harper, Roughleaf Yellow-eyed Grass. Cp (GA, NC, SC): sandhill seepage bogs and wet pine savannas; rare (US Species of Concern, NC Rare). 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, X; < *X. scabrifolia* – FNA, K, Z (also see *X. chapmanii*)]

Xyris serotina Chapman. Cp (GA, NC, SC): depression meadows, ultisol savannas (Lynchburg/Rains complex or Eulonia/Oketee), ditches; rare (NC Rare, SC Rare). September. Se. NC south to c. FL, west to s. MS, in the Coastal Plain. Reported for our area by Kral (1966b) and relocated by B.A. Sorrie. [= RAB, FNA, GW, K, S, X, Z]

Xyris smalliana Nash, Small's Yellow-eyed Grass. Cp (GA, NC, SC), Mt (SC): pond margins, ditches; uncommon (NC Watch List). July-August. ME south to FL, west to s. MS; disjunct to se. TX. [= RAB, C, FNA, GW, K, S, W, X, Z; > *X. congdonii* Small – F; > *X. smalliana* – F; > *X. smalliana* var. *smalliana* – G; > *X. smalliana* var. *olneyi* (Wood) Gleason – G]

Xyris stricta Chapman. Cp (GA, NC, SC): depression ponds, depression meadows, borrow pits, ultisol savannas and ditches; rare. July-September. SC south to n. 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, X, Z; = *X. stricta* var. *stricta* – FNA]

Xyris tennesseensis Kral, Tennessee Yellow-eyed Grass. Mt (GA): seepy, fenlike areas over limestone; rare (US Endangered, GA Endangered). TN, AL, and nw. GA (Jones & Coile 1988). See Kral (1978b). [= FNA, K]

Xyris torta J.M. Smith, Mountain Yellow-eyed Grass. Mt, Pd (GA, NC, SC, VA), Cp (SC, VA): mountain bogs, marshes, ditches; uncommon (SC Rare). 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, Z; > *X. torta* var. *macropoda* Fernald – F, G; > *X. torta* var. *torta* – F, G]

Xyris isoetifolia Kral. Bogs, savannas, and depression pond margins. FL Panhandle and s. AL. [= FNA, GW, K, X, Z]

Xyris longisepala Kral. Depression pond margins. FL Panhandle and s. AL. [= FNA, GW, K, X, Z]

ZANNICHELLIACEAE Dumortier 1829 (Horned Pondweed Family)

A family of 4 genera and about 10-12 species, aquatic herbs, nearly cosmopolitan. Probably better included in the Potamogetonaceae (Angiosperm Phylogeny Group 2003). References: Haynes & Hellquist in FNA (2000); Haynes & Holm-Nielsen (1987)=Z; Haynes, Les, & Holm-Nielsen in Kubitzki (1998b).

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. Cp (NC, VA), Mt (VA), {GA}: fresh or brackish water; common. February-October. The species occurs throughout much of the world. [= RAB, C, FNA, G, GW, K, S, W, Z; > *Z. palustris* var. *major* (Hartman) W.D.J. Koch – F; > *Z. palustris* var. *palustris* – F]

ZOSTERACEAE Dumortier 1829 (Eelgrass Family)

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=Z.

Zostera marina Linnaeus *var. **stenophylla*** Ascherson & Graebner, Eelgrass. Cp (NC, VA): estuarine waters; common. 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]

BIBLIOGRAPHY

Ackerfield, J., and J. Wen. 2002. A morphometric analysis of *Hedera* L. (the ivy genus, Araliaceae) and its taxonomic implications. Adansonia 24: 197-212.

Adams, P. 1961. Observations on the *Sagittaria subulata* complex. Rhodora 63: 247-265.

Adams, R.M. II, and W.J. Dress. 1982. Nodding *Lilium* species of eastern North America (Liliaceae). Baileya 21: 165-188.

Adams, R.P. 1986. Geographic variation in *Juniperus silicicola* and *J. virginiana* of the Southeastern United States: multivariant analyses of morphology and terpenoids. Taxon 35: 31-75.

——. 1995. Revisionary study of Caribbean species of *Juniperus* (Cupressaceae). Phytologia 78: 134-150.

——, and T. Demeke. 1993. Systematic relationships in *Juniperus* based on random amplified polymorphic DNAs (RAPDs). Taxon 42: 553-571.

Adams, W.P. 1957. A revision of the genus *Ascyrum* (Hypericaceae). Rhodora 59: 73-95.

——. 1962. Studies in the Guttiferae. I. A synopsis of *Hypericum* section *Myriandra*. Contr. Gray Herbarium Harv. 182: 1-51.

——. 1973. Clusiaceae of the southeastern United States. J. Elisha Mitchell Sci. Soc. 89: 62-71.

——, and N.K.B. Robson. 1961. A re-evaluation of the generic status of *Ascyrum* and *Crookea* (Guttiferae). Rhodora 63: 10-16.

Adler, L. 1999. *Polygonum perfoliatum* (mile-a-minute weed). Chinquapin 7: 4.

Aedo, C., J.J. Aldasoro, and C. Navarro. 1998. Taxonomic revision of *Geranium* sections *Batrachioidea* and *Divaricata* (Geraniaceae). Ann. Missouri Bot. Gard. 85: 594-630.

Affolter, J.M. 1985. A monograph of the genus *Lilaeopsis* (Umbelliferae). Systematic Bot. Monographs 6.

Ahles, H.E., and A.E. Radford. 1959. Species new to the flora of North Carolina. J. Elisha Mitchell Sci. Soc. 75: 140-147.

Ahrendt, L.W.A. 1961. *Berberis* and *Mahonia*: a taxonomic revision. J. Linn. Soc., Bot. 57: 1-410.

Aiken, S.G. 1981. A conspectus of *Myriophyllum* (Haloragaceae) in North America. Brittonia 33: 57-69.

——, and S.J. Darbyshire. 1990. Fescue grasses of Canada. Agriculture Canada Publication 1844/E.

——, M.J. Dallwitz, C.L. McJannet, and L.L. Consaul. 1997. Biodiversity among *Festuca* (Poaceae) in North America: diagnostic evidence from DELTA and clustering programs, and an INTKEY package for interactive, illustrated identification and information retrieval. Can. J. Bot. 75: 1527-1555.

Akiyama, S. 1988. A revision of the genus *Lespedeza* section *Macrolespedeza* (Leguminosae). Univ. of Tokyo Press.

——, and H. Ohba. 1985. The branching of the inflorescence and vegetative shoot and taxonomy of the genus *Kummerowia* (Leguminosae). Bot. Mag. Tokyo 98: 137-150.

Al-Shehbaz, I.A. 1984. The tribes of Cruciferae (Brassicaceae) in the southeastern United States. J. Arnold Arb. 65: 343-373.

——. 1985a. The genera of Thelypodieae (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arb. 66: 95-111.

——. 1985b. The genera of Brassiceae (Crucifrae; Brassicaceae) in the southeastern United States. J. Arnold Arb. 66: 279-351.

——. 1986a. The genera of Lepidieae (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arb. 67: 265-311.

——. 1986b. New wool-alien Cruciferae (Brassicaceae) in eastern North America: Lepidium and Sisymbrium. Rhodora 88: 347-355.

——. 1987. The genera of Alysseae (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arb. 68: 185-240.

——. 1988a. The genera of Arabideae (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arb. 69: 85-166.

——. 1988b. The genera of Sisymbrieae (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arb. 69: 213-237.
——. 1988c. *Cardamine dissecta*, a new combination replacing *Dentaria multifida* (Cruciferae). J. Arnold Arb. 69: 81-84.
——. 1988d. The genera of Anchonieae (Hesperideae) (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arb. 69: 193-212.
——. 1991. The genera of Boraginaceae in the southeastern United States. J. Arnold Arb. Suppl. Series 1: 1-169.
——. 2003. Transfer of most North American species of *Arabis* to *Boechera* (Brassicaceae). Novon 13: 381-391.
——, and V. Bates. 1987. *Armoracia lacustris* (Brassicaceae), the correct name for the North American lake cress. J. Arnold Arb. 68: 357-359.
——, and S.L. O'Kane, Jr. 2002. *Lesquerella* is united with *Physaria* (Brassicaceae. Novon 12: 319-329.
——, and R.A. Price. 1998. Delimitation of the genus *Nasturtium* (Brassicaceae). Novon 8: 124-126.
——, and B.G. Schubert. 1989. The Dioscoreaceae in the southeastern United States. J. Arnol Arb. 70: 57-95.
——, K. Mummenhoff, and O. Appel. 2002. *Cardaria*, *Coronopus*, and *Stroganowia* are united with *Lepidium* (Brassicaceae). Novon 12: 5-11.
Allan, G.J., and J.M. Porter. 2000. Tribal delimitations and phylogenetic relationships of Loteae and Coronilleae (Faboideae: Fabaceae) with special reference to *Lotus*: evidence from nuclear ribosomal ITS sequences. Amer. J. Botany 87: 1871-1881.
Albach, D.C., and M.W. Chase. 2001. Paraphyly of *Veronica* (Veroniceae; Scrophulariaceae): evidence from the Internal Transcribed Spacer (ITS) sequences of nuclear ribosomal DNA. J. Plant Res. 114: 9-18.
——, H.M. Meudt, and B. Oxelman. 2005. Piecing together the "new" Plantaginaceae. Amer. J. Bot. 92: 297-315.
Aldasoro, J.J., C. Aedo, F.M. Garmendia, F. Pando de la Hoz, and C. Navarro. 2004. Revision of *Sorbus* subgenera *Aria* and *Torminaria* (Rosaceae-Maloideae). Systematic Botany Monographs 69: 1-148.
Alexander, E.J. 1934. *Parnassia caroliniana*, Carolina grass-of-Parnassus, native of southeastern United States. Addisonia 18: 43-46.
——. 1941. Two new species from the southern Appalachians. Castanea 6: 30-32.
Alice, L.A., and C.S. Campbell. 1999. Phylogeny of *Rubus* (Rosaceae) based on nuclear ribosomal DNA internal transcribed spacer region sequences. Amer. J. Bot. 86: 81-97.
Allard, H.A. 1940. *Phacelia ranunculacea* (Nutt.) Constance, its length of day, temperature reactions and seasonal adaptations. Castanea 5: 94-97.
Allison, J.R. 2006. Big-fruited buckthorn, *Sideroxylon macrocarpum* (Sapotaceae), a long-forgotten Georgia endemic. Sida 22: 243-264.
——, and T.E. Stevens. 2001. The endemic flora of Ketona dolomite outcrops in Bibb County, Alabama. Castanea 66: 154-205.
——, M.W. Morris, and A.N. Egan. 2006. A new species of *Pediomelum* (Fabaceae) from the lower Piedmont Plateau of Georgia and South Carolina. Sida 22: 227-241.
Allred, K.W. 1984. Studies in the genus *Aristida* (Gramineae) of the southeastern United States. I. Spikelet variation in *A. purpurescens*, *A. tenuispica*, and *A. virgata*. Rhodora 86: 73-77.
——. 1985. Studies in the *Aristida* (Gramineae) of the southeastern United States. III. Nomenclature and a taxonomic comparison of *A. lanosa* and *A. palustris*. Rhodora 87: 147-155.
——. 1986. Studies in the *Aristida* (Gramineae) of the southeastern United States. IV. Key and conspectus. Rhodora 88: 367-387.
——, and F.W. Gould. 1983. Systematics of the *Bothriochloa saccharoides* complex (Poaceae: Andropogoneae). Systematic Botany 8: 168-184.
Ambrose, J.D. 1980. A re-evaluation of the Melanthoideae (Liliaceae) using numerical analyses. Pp. 65-81 in C.D. Brickell, D.F. Cutler, & M. Gregory (editors), Petaloid monocotyledons. Linn. Soc. Symp. Ser. 8. Academic Press, London.
——. 1985. *Lophiola*, familial affinity with the Liliaceae. Taxon 34: 149-150.
Amoroso, J.L., compiler. 1997. Natural Heritage Program list of the rare plants of North Carolina. North Carolina Natural Heritage Program, Raleigh, NC.
Anderberg, A.A. 1991. Taxonomy and phylogeny of the tribe Gnaphalieae (Asteraceae). Opera Botanica 104.
——, and X. Zhang. 2002. Phylogenetic relationships of Cyrillaceae and Clethraceae (Ericales) with special emphasis on the genus *Purdiaea* Planch. Org. Divers. Evol. 2: 127-137.
Anderson, E., and R.E. Woodson. 1935. The species of *Tradescantia* indigenous to the United States. Contr. Arnold Arb. 9: 132.
Anderson, E.F. 2001. The cactus family. Timber Press, Portland, OR.
Anderson, L.C. 1970. Studies in *Bigelowia* (Astereae, Compositae) 1. Morphology and taxonomy. Sida 3: 451-465.
——. 1983. *Hydrocotyle bowlesioides* in Georgia – new to United States. Castanea 48: 317.
——. 1985. *Forestiera godfreyi* (Oleaceae), a new species from Florida and South Carolina. Sida 11: 1-5.
——. 1987. *Boltonia apalachicolensis* (Asteraceae): a new species from Florida. Systematic Bot. 12: 133-138.
——. 1988. Status of endangered *Rhynchospora crinipes* (Cyperaceae). Systematic Bot. 13: 407-410.
——. 1996. New geographical and morphological data for *Sideroxylon thornei* (Sapotaceae). Sida 17: 343-348.
——. 1998. *Arnoglossum album* (Asteraceae): new species from northern Florida. Sida 18: 377-384.
——, and D.W. Hall. 1993. *Luziola bahiensis* (Poaceae): new to Florida. Sida 15: 619-622.

Anderson, L.E., and T.T. Bannister. 1952. An addition to the fern flora of North Carolina. J. Elisha Mitchell Sci. Soc. 68: 81-83.
———, H.A. Crum, and W.R. Buck. 1990. List of the mosses of North America north of Mexico. The Bryologist 93: 448-499.
Angiosperm Phylogeny Group. 1998. An ordinal classification for the families of flowering plants. Ann. Mo. Bot. Garden 85: 531-553.
——. 2003. An update of the Angiosperm Phylogeny Group clssification for the orders and families of flowering plants: APG II. Bot. J. Linn. Soc. 141: 399-436.
Anonymous. 1999. Harmful aquatic weed discovered in several North Carolina counties. Wildlife in North Carolina 63: 32.
——. 2003. Rare plant relocated after 64 years. BotSoc News 77: 2-3.
Aplet, G.H., R.D. Laven, M.B. Falkner, and R.B. Shaw. 1994. Population and site characteristics of a recently discovered disjunct population of *Croton alabamensis* (Euphorbiaceae). Sida 16: 37-55.
Appel, O. 1998. The status of *Teesdaliopsis* and *Teesdalia* (Brassicaceae). Novon 8: 218-219.
Arbo, M.M. 1990. Turneraceae: novedades para la Guayana Venezolana. Ann. Missouri Bot. Gard. 77: 340-352.
——. 1995. Turneraceae – parte 1: *Piriqueta*. Flora Neotropica Monograph 67.
Argus, G.W. 1986. The genus *Salix* (Salicaceae) in the southeastern United States. Systematic Bot. Monographs 9: 1-170.
——. 1997. Infrageneric classification of *Salix* (Salicaceae) in the New World. Systematic Botany Monographs 52: 121.
Armstrong, J.E. 1985. The delimitation of Bignoniaceae and Scrophulariaceae based on floral anatomy, and the placement of problem genera. Am. J. Bot. 72: 755-766.
Arriagada, J.E. 1998. The genera of Inuleae (Compositae; Asteraceae) in the southeastern United States. Harvard Papers in Botany 3: 1-48.
Arriagada, J.E., and N.G. Miller. 1997. The genera of Anthemidae (Compositae; Astaeraceae) in the southeastern United States. Harvard Papers in Botany 2: 1-46.
Ashe, W.W. 1922. The eastern shrubby species of *Robinia*. J. Elisha Mitchell Sci. Soc. 37: 175-177.
Austin, D.F., and Z. Huáman. 1996. A synopsis of *Ipomoea* (Convolvulaceae) in the Americas. Taxon 45: 3-38.
——, and R.S. Bianchini. 1998. Additions and corrections in American *Ipomoea* (Convolvulaceae). Taxon 47: 833-838.
——, G.M. Diggs, Jr., and B.L. Lipscomb. 1997. *Calystegia* (Convolvulaceae) in Texas. Sida 17: 837-840.
Averett, J.E., and D.E. Boufford. 1985. The flavonoids and flavonoid systematics of *Circaea* (Circaeeae, Onagraceae). Systematic Bot. 10: 363-373.
Azuma, H., J.G. García-Franco, V. Rico-Gray, and L.B. Thien. 2001. Molecular phylogeny of the Magnoliaceae: the biogeography of tropical and temperate disjunctions. Am. J. Bot. 88: 2275-2285.
——, L.B. Thien, and S. Kawano. 1999. Molecular phylogeny of *Magnolia* (Magnoliaceae) inferred from cpDNA sequences and evolutionary divergence of the flora scents. J. Plant Res. 112: 291-306.
Baas, P. 1984. Vegetative anatomy and the taxonomic status of *Ilex collina* and *Nemopanthus* (Aquifoliaceae). J. Arnold Arb. 65: 243-250.
Bacigalupo, N.M., and E.L. Cabral. 1999. Revisión de las especies americanas del género *Diodia* (Rubiaceae, Spermacoceae). Darwiniana 37: 153-165.
Backlund, A., and N. Pyck. 1998. Diervillaceae and Linnaeaceae, two new families of caprifolioids. Taxon 47: 657-661.
Backlund, M., B. Oxelman, and B. Bremer. 2000. Phylogenetic relationships within Gentianales based on ndhF and rbcL sequences, with particular reference to the Loganiaceae. Am. J. Bot. 87: 1029-1043.
Bailey, V.A. 1962. Revision of the genus *Ptelea* (Rutaceae). Brittonia 14: 1-45.
Ballard, H.E., Jr. 1992. Summary: systematics of *Viola* section *Viola* in north America north of Mexico. Unpublished manuscript.
——, and D.E. Wujek. 1994. Evidence for the recognition of *Viola appalachiensis*. Systematic Bot. 19: 523-538.
——, K.J. Sytsma, and R.R. Kowal. 1999. Shrinking the violets: phylogenetic relationships of infrageneric groups in *Viola* (Violaceae) based on internal transcribed spacer DNA sequences. Systematic Botany 23: 439-458.
——, D.A. Casamatta, Jr., M.M. Hall, R.A. McCauley, M.C. Segovia-Salcedo, and R.G. Verb. 2001. Phenetic analysis shows conspecifity between Hispaniolan *Viola domingensis* Urban and North American *Viola macloskeyi* sensu lato (Violaceae). Brittonia 53: 122-136.
Ballard, R. 1986. *Bidens pilosa* complex (Asteraceae) in North and Central America. Amer. J. Bot. 73: 1452-1465.
Banks, D.J. 1966. Taxonomy of *Paspalum setaceum* (Gramineae). Sida 2: 269-284.
Barber, S.C. 1982. Taxonomic studies in the *Verbena stricta* complex (Verbenaceae). Systematic Bot. 7: 433-456.
Barden, L.S. 1987. Invasion of *Microstegium vimineum* (Poaceae), an exotic, annual, shade-tolerant, C4 grass, into a North Carolina floodplain. Amer. Midland Naturalist 118: 40-45.
Barkley, F.A. 1937. A monographic study of *Rhus* and its immediate allies in North and Central America, including the West Indies. Ann. Missouri Bot. Gard. 24: 265-499.
Barkley, T.M. 1962. A revision of *Senecio aureus* Linn. and allied species. Trans. Kan. Acad. 65: 318-408.
——. 1968. Taxonomy of *Senecio multilobatus* and its allies. Brittonia 20: 267-284.
——. 1978. *Senecio*. N. Amer. Fl. II 10: 50-139.
——. 1980. Taxonomic notes on *Senecio tomentosus* and its allies (Asteraceae). Brittonia 32: 291-308.
——. 1999. The segregates of *Senecio*, s.l., and *Cacalia*, s.l., in the flora of North America north of Mexico. Sida 18: 661-672.
Barkworth, M.E. 1997. Taxonomic and nomenclatural comments on the Triticeae in North America. Phytologia 83: 302-311.
Barneby, R.C. 1964. Atlas of North American *Astragalus*. Mem. New York Bot. Gard. 13: 1-1188.

——. 1977. Daleae imagines, an illustrated revision or *Errazurizia* Philippi, *Psorothamnus* Rydberg, *Marina* Liebmann, and *Dalea* Lucanus emend. Barneby, including all species of Leguminosae tribe Amorpheae Borissova ever referred to *Dalea*. Mem. N.Y. Bot. Garden 27: 1-892.

——. 1991. Sensitivae Censitae: a description of the genus *Mimosa* Linnaeus (Mimosaceae) in the New World. Mem. New York Bot. Garden 65.

——, and E.L. Bridges. 1987. A new species of *Astragalus* (Fabaceae) from Tennessee's Central Basin. Brittonia 39: 358-363.

Barnes, P.G. 1990. A summary of the genus *Shortia*. The Plantsman 12: 23-34.

Barringer, K. 1993. New combinations in North American *Asarum* (Aristolochiaceae). Novon 3: 225-227.

Bartgis, R.L. 1992. The endangered sedge *Scirpus ancistrochaetus* and the flora of sinkhole ponds in Maryland and West Virginia. Castanea 57: 46-51.

——. 1993. The limestone glades and barrens of West Virginia. Castanea 58: 69-89.

——, G.P. Fleming, and R. Wiegand. 1997. The prairie-redroot (*Ceanothus herbaceus* Raf.) in the mid-Atlantic United States. Castanea 62: 127-128.

Baskin, J.M., and C.C. Baskin. 1998. Seed dormancy and germination in the rare plant species *Amaranthus pumilus*. Castanea 63: 493-494.

——, C.C. Baskin, & M.E. Medley. 1983. The historical geographical distribution of *Onosmodium molle* Michaux subsp. *molle* (Boraginaceae). Bull. Torrey Bot. Club 110: 73-76.

——, K.M. Snyder, and C.C. Baskin. 1993. Nomenclatural history and taxonomic status of *Echinacea angustifolia*, *E. pallida*, and *E. tennesseensis* (Asteraceae). Sida 15: 597-604.

——, R.W. Tyndall, M. Chaffins, and C.C. Baskin. 1998. Effect of salinity on germination and viability of nondormant seeds on the federal-threatened species *Aeschynomene virginica* (Fabaceae). J. Torrey Bot. Soc. 125: 246-248.

Bassett, I.J. 1966. Taxonomy of North American *Plantago* L., section *Micropsyllium* Decne. Can J. Bot. 44: 467-479.

——. 1967. Taxonomy of *Plantago* L. in North America: sections *Holopsyllium* Pilger, *Palaeopsyllium* Pilger, and *Lamprosantha* Decne. Can. J. Bot. 45: 565-577.

——, and C.W. Crompton. 1982. The genus *Chenopodium* in Canada. Can. J. Bot. 60: 586-610.

Bateman, R.M., A.M. Pridgeon, and M.W. Chase. 1997. Phylogenetics of subtribe Orchidinae (Orchidoideaea, Orchidaceae) based on nuclear ITS sequences. 2. Infrageneric relationships and reclassification to achieve monophyly of *Orchis* sensu stricto. Lindleyana 12: 113-141.

Bates, D.M. 1967. A reconsideration of *Sidopsis* Rydberg and notes on *Malvastrum* A. Gray (Malvaceae). Rhodora 69: 9-28.

Bates, V.M., and E.T. Browne. 1981. *Azolla filiculoides* new to the southeastern United States. Amer. Fern J. 71: 33-34.

Batson, W.T. 1977. A guide to the genera of native and commonly introduced ferns and seed plants of eastern North America from the Atlantic to the Great Plains from Key West-southern Texas into the Arctic. John Wiley & Sons, New York, N.Y.

Baum, B.R. 1978. The genus *Tamarix*. Israel Acad. of Sciences and Humanities, Jerusalem.

Bayer, C., M.F. Fay, A.Y. de Bruijn, V. Savolainen, C.M. Morton, K. Kubitzki, W.S. Alverson, and M.W. Chase. 1999. Support for an expanded family concept of Malvaceae within a recircumscribed order Malvales: a combined analysis of plastid atpB and rbcL DNA sequences. Bot. J. Linnean Society 129: 267-303.

Bayer, R.J. 1984. Chromosome numbers and taxonomic notes for North American species of *Antennaria* (Asteraceae: Inuleae). Systematic Bot. 9: 74-83.

——. 1985. Investigations into the evolutionary history of the polyploid complexes in Antennaria (Asteraceae: Inuleae). II. The *A. parlinii* complex. Rhodora 87: 321-339.

——, and G.L. Stebbins. 1982. A revised classification of *Antennaria* (Asteraceae: Inuleae) of the eastern United States. Systematic Bot. 7: 300-313.

——, and G.L. Stebbins. 1987. Chromosome numbers, patterns of distribution, and apomixis in *Antennaria* (Asteraceae: Inuleae). Systematic Bot. 12: 305-319.

——, and G.L. Stebbins. 1993. A synopsis with keys for the genus *Antennaria* (Asteraceae: Inuleae: Gnaphaliinae) of North America. Can J. Bot. 71: 1589-1604.

Beadle, C.D. 1913. *Crataegus*. Pp. 532-569 in J.K. Small, Flora of the southeastern United States, being descriptions of the seed-plants, ferns and fern-allies growing naturally in North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, and in Oklahoma and Texas east of the one hundredth meridian. Published by the author, New York, NY. 1394 pp.

——, and F.E. Boynton. 1901. Revision of the species of *Marshallia*. Biltmore Bot. Studies 1: 3-10.

Beal, E.O. 1956. Taxonomic revision of the genus *Nuphar* Sm. of North America and Europe. J. Elisha Mitchell Sci. Soc. 72: 317-346.

——. 1960. *Sparganium* (Sparganiaceae) in the southeastern United States. Brittonia 12: 176-181.

——, and R.M. Southall. 1977. The taxonomic significance of experimental selection by vernalization in *Nuphar* (Nymphaeaceae). Systematic Bot. 2: 49-60.

——, J.W. Wooten, and R.B. Kaul. 1982. Review of the *Sagittaria engelmanniana* complex (Alismataceae) with environmental correlations. Systematic Bot. 7: 417-432.

Beard, L.S. 1963. A taxonomic study of *Mimosa quadrivalvis* L. (Schrankia Willd. nom. cons.). Ph.D. thesis, Univ. of North Carolina at Chapel Hill.

Beardsley, P.M., and R.G. Olmstead. 2002. Redefining Phrymaceae: the placement of *Mimulus*, tribe Mimuleae, and *Phryma*. Amer. J. Bot. 89: 1093-1102.

Beckmann, R.L., Jr. 1979. Biosystematics of the genus *Hydrophyllum* L. (Hydrophyllaceae). Can J. Bot. 66: 1053-1061.
Beitel, J.M. 1979. Clubmosses (*Lycopodium*) in North America. Fiddlehead Forum 6: 1-8.
——, and J.T. Mickel. 1992. The Appalachian firmoss, a new species in the *Huperzia selago* (Lycopodiaceae) complex in eastern North America, with a new combination for the western firmoss. Amer. Fern J. 82: 41-46.
Belden, A., Jr., and N.E. Van Alstine. 2003. Status of the federally listed *Aeschynomene virginica* (L.) BSP. on the James River in Virginia. Castanea 68: 179-181.
Belden, A., Jr., G.R. Fleming, J.C. Ludwig, J.F. Townsend, N.E. Van Alstine, and T.F. Wieboldt. 2004. Noteworthy collections: Virginia. Castanea 69: 144-153.
Bell, A.D. 1974. Rhizome organization in relation to vegetative spread in *Medeola virginiana*. J. Arnold Arb. 55: 458-468.
Bell, C.D. 2004. Preliminary phylogeny of Valerianaceae (Dipsacales) inferred from nuclear and chloroplast DNA sequence data. Molecular Phylogenetics and Evolution 31: 340-350.
Bell, C.R. 1949. A cytotaxonomic study of the Sarraceniaceae of North America. J. Elisha Mitchell Sci. Soc. 65: 137-166.
——. 1952. Natural hybrids in the genus *Sarracenia*. I. History, distribution, and taxonomy. J. Elisha Mitchell Sci. Soc. 68: 55-80.
——, and F.W. Case. 1956. Natural hybrids in the genus *Sarracenia*. II. Current notes on distribution. J. Elisha Mitchell Soc. 72: 142-152.
——. 1963. The genus *Eryngium* in the southeastern United States. Castanea 28: 73-79.
Benson, L. 1982. The cacti of the United States and Canada. Stanford Univ. Press, Stanford, California.
Bicknell, E.P. 1896. The blue-eyed grasses of the eastern United States (genus *Sisyrinchium*). Bull. Torrey Bot. Club 23: 130-133.
——. 1899a. Studies in *Sisyrinchium* – I. Sixteen new species from the southern states. Bull. Torrey Bot. Club 26: 217-231.
——. 1899b. Studies in *Sisyrinchium* – VI. Additional new species from the southern states. Bull. Torrey Bot. Club 26: 605-616.
Bierner, M.W. 1972. Taxonomy of *Helenium* sect. *Tetrodus* and a conspectus of North American Helenium (Compositae). Brittonia 24: 331-355.
——. 1989. Taxonomy of *Helenium* sect. *Amarum* (Asteraceae). Sida 13: 453-459.
Binns, S.E., B.R. Baum, and J.T. Arnason. 2002. A taxonomic revision of *Echinacea* (Asteraceae: Heliantheae). Syst. Bot. 27: 610-632.
Bishop, M., A. Davis, and J. Grimshaw. 2001. Snowdrops: a monograph of cultivated *Galanthus*. Griffin Press, Maidenhead, UK. 364 pp.
Blackwell, W.H., Jr., M.D. Baechle, and G. Williamson. 1978. Synopsis of *Kochia* (Chenopodiaceae) in North America. Sida 7: 248-254.
——, and K.P. Blackwell. 1974. The taxonomy of *Peltandra* (Araceae). J. Elisha Mitchell Sci. Soc. 90: 137-140.
Blattner, F.R. 2004. Phylogenetic analysis of *Hordeum* (Poaceae) as inferred by nuclear rDNA ITS sequences. Molecular Phylogenetics and Evolution 33: 289-299.
Blomquist, H.L. 1948. The grasses of North Carolina. Duke University Press, Durham, N.C.
——. 1957. A revision of *Hexastylis* of North America. Brittonia 8: 255-281.
Bodo Slotta, T.A., and D.M. Porter. 2006. Genetic variation within and between *Iliamna corei* and *I. remota* (Malvaceae): implications for species delimitation. Bot. J. Linn. Soc. 151: 345-354.
Boetsch, J.R. 2002. The Aizoaceae and Molluginaceae of the southeastern United States. Castanea 67: 42-53.
——-, and E. Nielsen. 2003. Notes on the distribution of the Southern Appalachian endemic, *Ilex collina* Alexander. Castanea 68: 232-235.
Bogin, C. 1955. Revision of the genus *Sagittaria* (Alismataceae). Memoirs N.Y. Botanical Garden 9: 179-233.
Bogle, A.L. 1969. The genera of Portulacaceae and Basellaceae in the southeastern United States. J. Arnold Arb. 50: 566-598.
——. 1974. The genera of Nyctaginaceae in the southeastern United States. J. Arnold Arb. 55: 1-37.
Bogler, D.J., and B.B. Simpson. 1995. A chloroplast DNA study of the Agavaceae. Systematic Bot. 20: 191-205.
——-, and B.B. Simpson. 1996. Phylogeny of Agavaceae based on ITS rDNA sequence variation. Amer. J. Bot. 83: 1225-1235.
Bohm, B.A., J.Y. Yang, J.E. Page, and D.S. Soltis. 1999. Flavonoids, DNA and relationships of *Itea* and *Pterostemon*. Biochemical Systematics and Ecology 27: 79-83.
Bohs, L., and R.G. Olmstead. 1997. Phylogenetic relationships in *Solanum* (Solanaceae) based on ndhF sequences. Systematic Bot. 22: 5-18.
Bolle, F. 1933. Eine Übersicht über die Gattung *Geum* L. und ihr nahestehenden Gattungen. Feddes Repertorium 72: 1-119.
Bolli, R. 1994. Revision of the genus *Sambucus*. Dissertationes Botanicae 223. J. Cramer, Berlin. 227 pp.
Bolmgren, K., and B. Oxelman. Generic limits in *Rhamnus* L. s.l. (Rhamnaceae) inferred from nuclear and chloroplast DNA sequences. Taxon 53: 383-390.
Boom, B.M. 1982. Synopsis of *Isoetes* in the southeastern United States. Castanea 47: 38-59.
Boufford, D.E. 1977. *Ammoselinum butleri* (Umbelliferae), new to North Carolina. Sida 7: 220.
——. 1982. Notes on *Peperomia* (Piperaceae) in the southeastern United States. J. Arnold Arb. 63: 317-325.
——. 1983 ["1982"]. The systematics and evolution of *Circaea* (Onagraceae). Ann Mo. Bot. Gard. 69: 804-994.
——. 2005. *Circaea lutetiana* sensu lato (Onagraceae) reconsidered. Harvard papers in Botany 9: 255-256.
——, and S.A. Spongberg. *Calycanthus floridus* (Calycanthaceae) – a nomenclatural note. J. Arnold Arb. 62: 265-266.
——, and E.W. Wood. 1977. An unusual plant community in South Carolina. Castanea 42: 116-119.

Bounds, R.R. 1987. Rare species of *Rhexia* L. Castanea 52: 304-308.
Bown, D. 2000. Aroids: plants of the Arum Family. Timber Press, Portland, OR. 392 pp.
Boyce, P. 2006. The genus *Arum*. Kew Magazine Monograph. Royal Botanic Gardens, Kew. 196 pp.
Bozeman, J.R., and J.F. Logue. 1968. A range extension for *Hudsonia ericoides* in the southeastern United States. Rhodora 70: 289-292.
——, and G.A. Rogers. 1986. "This very curious tree." Tipularia 1: 9-15.
Brandenburg, D.M., and J.W. Thieret. 2000. *Cinna* and *Limnodea* (Poaceae): not congeneric. Sida 19: 195-2000.
——, W.H. Blackwell, and J.W. Thieret. 1991. Revision of the genus *Cinna* (Poaceae). Sida 14: 581-596.
——, J.R. Estes, & S.L. Collins. 1991. A revision of *Diarrhena* (Poaceae) in the United States. Bull. Torrey Bot. Club 118: 128-136.
——, J.R. Estes, & J.W. Thieret. 1991. Hard grass (*Sclerochloa dura*, Poaceae) in the United States. Sida 14: 369-376.
Braun, E.L. 1942. A new species and a new variety of *Solidago* from Kentucky. Rhodora 44: 1-4.
Bremer, B., and L. Struwe. 1992. Phylogeny of the Rubiaceae and the Loganiaceae: congruence or conflict between morphological and molecular data? Am. J. Bot. 79: 1171-1184.
——, K. Bremer, N. Heidari, P. Erixon, R.G. Olmstead, A.A. Arneberg, M. Källersjö, & E. Barkhordarian. 2002. Phylogenetics of asterids based on 3 coding and 3 non-coding chloroplast DNA markers and the utility of non-coding DNA at higher taxonomic levels. Molecular Phylogenetics and Evolution 24: 274-301.
Bremer, K. 1994. Asteraceae: cladistics and classification. Timber Press, Portland, OR. 752 pp.
Bretting, P.K., and S. Nilsson. 1988. Pollen morphology of the Martyniaceae and its systematic implications. Systematic Bot. 13: 51-59.
Bridges, E.L., and S.L. Orzell. 1989. *Evolvulus sericeus* (Convolvulaceae) in Georgia, with floristic and ecological notes. Sida 13: 509-512.
———, and S.L. Orzell. 1992. The rediscovery of *Rhynchospora solitaria* Harper (Cyperaceae) in Georgia. Phytologia 72: 369-372.
——, and S.L. Orzell. 2002. *Euphorbia* (Euphorbiaceae) section *Tithymalus* subsection *Inundatae* in the southeastern United States. Lundellia 5: 59-78.
——, and S.L. Orzell. 2003. Two new species and a new combination in southeastern United States *Xyris* (Xyridaceae) from Florida. Novon 13: 16-25.
——, S.L. Orzell, and J.R. Burkhalter. 1993. *Cladium mariscoides* (Cyperaceae) in the western Florida panhandle and its phytogeographic significance. Phytologia 74: 35-42.
——. [in prep.] Xyridaceae. In: Flora of Florida, Volume 2 – monocots.
Brizicky, G.K. 1964a. The genera of Celastrales in the southeastern United States. J. Arnold Arb. 45: 206-234.
——. 1964b. A further note on *Ceanothus herbaceus* versus *C. ovatus*. J. Arnold Arb. 45: 471-473.
——. 1964c. The genera of Rhamnaceae in the southeastern United States. J. Arnold Arb. 45: 439-463.
——. 1966. The genera of Sterculiaceae in the southeastern United States. J. Arnold Arb. 47: 60-74.
Brooks, R.E., and A.T. Whittemore. 1999. *Juncus anthelatus* (Juncaceae, *Juncus* subg. *Poiophylli*), a new status for a North American taxon. Novon 9: 11-12.
Brouillet, L., and J.C. Semple. 1981. A propos du status taxonomique de *Solidago ptarmicoides*. Can. J. Bot. 59: 17-21.
Brown, C.A. 1959. Vegetation of the Outer Banks of North Carolina. Louisiana State University Studies, Coastal Studies Series No. 4. La. State Univ. Press, Baton Rouge, LA. 179 pp.
Brown, L.E., and S.J. Marcus. 1998. Notes on the flora of Texas with additions and other significant records. Sida 18: 315-324.
Brown, P.M. 1999. Recent taxonomic and distributional notes from Florida. 1. North American Native Orchid Journal 5: 3-16.
——. 2001. Recent taxonomic and distributional notes from Florida 11. *Spiranthes sylvatica* P.M. Brown, a new species of ladies'-tresses from the southeastern United States. North American Native Orchid Journal 7: 193-205.
——. 2003. The wild orchids of North America, north of Mexico. University Press of Florida, Gainesville, FL.
——. 2004. Understanding *Platanthera chapmanii* (Orchidaceae), its origins and hybrids. Sida 21: 853-859.
——. 2006a. Resurrection of the genus *Gymnadeniopsis* Rydberg. North American Native Orchid Journal 12: 33-40.
——. 2006b. Revalidation of *Platanthera conspicua*, the southern white fringed orchis. North American Native Orchid Journal 12: 41-50
——, and R.B. Pike. 2006. *Triphora trianthophora* var. *texensis* (Orchidaceae) a new variety endemic to Texas. North American Native Orchid Journal 12: 5-10.
Bruederle, L.P. 1999. Genetic differentiation of geographicaly marginal populations in *Carex mitchelliana* (Cyperaceae): implications for conservation. J. Torrey Bot. Soc. 126: 1-8.
——, and D.E. Fairbrothers. 1986. Allozyme variation in populations of the *Carex crinita* complex (Cyperaceae). Systematic Bot. 11: 583-594.
——, D.E. Fairbrothers, and S.L. Hanks. 1989. A systematic circumscription of *Carex mitchelliana* (Cyperaceae) with reference to taxonomic status. Am. J. Bot. 76: 124-132.
Brummitt, R.K. 1965. New combinations in North American *Calystegia*. Ann. Missouri Bot. Gard. 52: 214-216.
——. 1980. Further new names in the genus *Calystegia* (Convolvulaceae). Kew Bull. 35: 327-334.
——. 1988. Report of the Committee for Spermatophyta: 34. Taxon 37: 139-140.
——. 1999. Proposals to conserve or reject. Report of the Committee on Spermatophyta. Taxon 48: 367.
——. 2001. Report of the Committee for Spermatophyta: 52. Taxon 50: 1179-1182.

——. 2005. Report of the Committee for Spermatophyta: 57. Taxon 54: 1093-1103.
Brunsfeld, S.J., P.S. Soltis, D.E. Soltis, P.A. Gadek, C.J. Quinn, D.D. Strenge, T.A. Ranker. 1994. Phylogenetic relationships among the genera of Taxodiaceae and Cupressaceae: evidence from rbcL sequences. Systematic Bot. 19: 253-262.
Brunton, D.F., and D.M. Britton. 1996a. Noteworthy collections: Alabama and Georgia. Castanea 61: 398-399.
——, and D.M. Britton. 1996b. The status, distribution, and identification of Georgia Quillwort (*Isoetes georgiana*; Isoetaceae). American Fern Journal 86: 105-113.
——, and D.M. Britton. 1997. Appalachian quillwort (*Isoetes appalachiana*, sp. nov.; Isoetaceae), a new pteridophyte from the eastern United States. Rhodora 99: 118-133.
——, and D.M. Britton. 1998. *Isoetes microvela* (Isoetaceae), a new quillwort from the coastal plain of the southeastern United States. Rhodora 100: 261-275.
——, and D.M. Britton. 1999. Rush quillwort (*Isoetes junciformis*, sp. nov.), a new pteridophyte from southern Georgia. American Fern Journal 89: 187-197.
——, and D.M. Britton. 2006. *Isoetes melanopoda* ssp. *sylvatica* (subsp. nov.), a new quillwort (Isoetaceae) from eastern North America. Castanea 71: 15-30.
——, D.M. Britton, and W.C. Taylor. 1994. *Isoetes hyemalis*, sp. nov. (Isoetaceae): a new quillwort from the southeastern United States. Castanea 59: 12-21.
——, D.M. Britton, and T.F. Wieboldt. 1996. Taxonomy, identity, and status of *Isoetes virginica* (Isoetaceae). Castanea 61: 145-160.
——, W.H. Wagner, Jr., and J.M. Beitel. 1992. Pacific firmoss (*Huperzia miyoshiana*) (Lycopodiaceae) in eastern North America at Gros Morne National Park, Newfoundland. Amer. Fern J. 82: 63-67.
Bryan, F.A., and D.E. Soltis. 1987. Electrophoretic evidence for allopolyploidy in the fern *Polypodium virginianum*. Systematic Bot. 12: 553-561.
Bryson, C.T. 1980. A revision of the North American *Carex* section *Laxiflorae* (Cyperaceae). Ph.D. dissertation, Mississippi State Univ.
——, R. Kral, and J.R. Manhart. 1987. A new species of *Carex* (Cyperaceae: section *Oligocarpae*) from the southeastern United States. Rhodora 89: 357-363.
——, J.R. MacDonald, R. Carter, and S.D. Jones. 1996. Noteworthy *Carex*, *Cyperus*, *Eleocharis*, *Kyllinga*, and *Oxycaryum* (Cyperaceae) from Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Tennessee, and Texas. Sida 17: 501-518.
Buck, W.R. 1977. A new species of *Selaginella* in the *S. apoda* complex. Can. J. Bot. 55: 366-371.
Buddell, G.F. II, and J.W. Thieret. 1985. Notes on *Erigenia bulbosa* (Apiaceae). Bartonia 51: 69-76.
Bunsawat, J., N.E. Elliott, K.L. Hertweck, E. Sproles, and L.A. Alice. 2004. Phylogenetics of *Mentha* (Lamiaceae): evidence from chloroplast DNA sequences. Systematic Botany 29: 959-964.
Burckhalter, R.E. 1992. The genus *Nyssa* (Cornaceae) in North America: a revision. Sida 15: 323-342.
Burk, C.J. 1961. Distribution records and range extensions from the North Carolina Outer Banks. Castanea 26: 138-139.
Burks, K.C. 2002. *Nymphoides cristata* (Roxb.) Kuntze, a recent adventive expanding as a pest plant in Florida. Castanea 67: 206-211.
Cabe, P.R. 1995. The *Trillium pusillum* Michaux (Liliaceae) complex in Virginia. I. Morphological investigations. Castanea 60: 1-14.
——, and C. Werth. 1995. The *Trillium pusillum* Michaux (Liliaceae) complex in Virginia. II. Isozyme evidence. Castanea 60: 15-29.
Calie, P.J. 1981. Systematic studies in *Sedum* section *Ternata* (Crassulaceae). Brittonia 33: 498-507.
——, E.E. Schilling, and D.H. Webb. 1983. Flavonoid chemistry of the generic segregates *Ascyrum* and *Crookea* of Hypericum. Biochem. Syst. and Ecology 11: 107-109.
Callahan, H.S. 1997. Infraspecific differentiation in the *Amphicarpaea bracteata* (Fabaceae) species complex: varieties and ecotypes. Rhodora 99: 64-82.
Camelbeke, K., A.A. Reznicek, and P. Goetghebeur. 2003. Proposal to conserve the name *Scleria reticularis* with a conserved type (Cyperaceae). Taxon 52: 355-356.
Cameron, K.M., and M.W. Chase. 1999. Phylogenetic relationships of Pogoniinae (Vanilloideae, Orchidaceae): an herbaceous example of the eastern North America - eastern Asia phytogeographic disjunction. J. Plant Res. 112: 317-329.
——, K.J. Wurdack, and R.W. Jobson. 2002. Molecular evidence for the common origin of snap-traps among carnivorous plants. Amer. J. Bot. 89: 1503-1509.
——, M.W. Chase, W.M. Whitten, P.J. Kores, D.C. Jarrell, V.A. Albert, T. Yukawa, H.G. Hills, and D.W. Goldman. 1999. A phylogenetic analysis of the Orchidaceae: evidence from rbcL nucleotide sequences. Amer. J. Bot. 86: 208-224.
Camp, W.H. 1935. Studies in the Ericales. I. The genus *Gaylussacia* in North America north of Mexico. Bull. Torrey Bot. Club 62: 129-132.
——. 1938. Studies in the Ericales. III. The genus *Leiophyllum*. Bull. Torrey Bot. Club 65: 99-104.
——. 1945. The North American blueberries with notes on other groups of Vacciniaceae. Brittonia 5: 203-275.
Campbell, C.S. 1983. Systematics of the *Andropogon virginicus* complex (Gramineae). J. Arnold Arb. 64: 171-254.
——. 1985. The subfamilies and tribes of Gramineae (Poaceae) in the southeastern United States. J. Arnold Arb. 66: 123-199.
——. 1986. Phylogenetic reconstructions and two new varieties in the *Andropogon virginicus* complex (Poaceae: Andropogoneae). Syst. Bot. 11: 280-292.

——, P.E. Garwood, and L.P. Specht. 1986. Bambusoid affinities of the north temperate genus *Brachyelytrum* (Gramineae). Bull. Torrey Bot. Club 113: 135-141.
Campbell, G.R. 1952. The genus *Myosurus* L. (Ranunculaceae) in North America. El Aliso 2: 389-403.
Campbell, J.J.N. 2000. Notes on North American *Elymus* species (Poaceae) with paired spikelets: I. *E. macgregorii* sp. nov. and *E. glaucus* ssp. *mackenzii* comb. nov. J. Ky. Acad. Sci. 61: 88-98.
Canne, J.M. 1979. A light and scanning electronic microscope study of seed morphology in Agalinis (Scrophulariaceae) and its taxonomic significance. Systematic Bot. 4: 281-296.
Cantino, P.D. 1982. A monograph of the genus *Physostegia* (Labiatae). Contr. Gray Herb. 211.
——. 1985. Facultative autogamy in *Synandra hispidula* (Labiatae). Castanea 50: 105-111.
——, and S.J. Wagstaff. 1998. A reexamination of North American *Satureja* s.l. (Lamiaceae) in light of molecular evidence. Brittonia 50: 63-70.
Caplen, C.A., and C.R. Werth. 2000a. Isozymes of the *Isoetes riparia* complex, I. Genetic variation and relatedness of diploid species. Syst. Bot. 25: 235-159.
——, and C.R. Werth. 2000b. Isozymes of the *Isoetes riparia* complex, II. Ancestry and relationships of polyploids. Syst. Bot. 25: 260-280.
Carter, R. 1991. *Cyperus entrerianus* (Cyperaceae), an overlooked species in temperate North America. Sida 14: 69-77.
——, and C.T. Bryson. 2000. *Cyperus sanguinolentus* (Cyperaceae) new to the southeastern United States, and its relationship to the supposed endemic *Cyperus louisianensis*. Sida 19: 325-343.
Carulli, J.P., and D.E. Fairbrothers. 1988. Allozyme variation in three eastern United States species of *Aeschynomene* (Fabaceae), including the rare *A. virginica*. Systematic Bot. 13: 559-566.
——, A.O. Tucker, and N.H. Dill. 1988. *Aeschynomene rudis* Benth. (Fabaceae) in the United States. Bartonia 54: 18-20.
Carvell, W.N., and W.H. Eshbaugh. 1982. A systematic study of the genus *Buckleya* (Santalaceae). Castanea 47: 17-37.
Case, F.W., Jr. 2005. Correction to the type citation of *Sarracenia alabamensis* and validation of the name *Sarracenia alabamensis* subsp. *wherryi* (Sarraceniaceae). Sida 21: 2169-2170.
——, and R.B. Case. 1976. The *Sarracenia rubra* complex. Rhodora 78: 270-325.
——, and R.B. Case. 1997. Trilliums. Timber Press, Portland, OR. 285 pp.
Case, M.A., H.T. Mlodozeniec, L.E. Wallace, and T.W. Weldy. 1998. Conservation genetics and taxonomic status of the rare Kentucky lady's slipper: *Cypripedium kentuckiense* (Orchidaceae). Amer. J. Bot. 85: 1779-1786.
Catalani, M. 2004. A field study of *Sarracenia oreophila*. Carnivorous Plant Newsletter 33: 6-12.
Catling, P.M. 1983a. *Spiranthes ochroleuca* (Rydberg ex Britton) Rydberg (Yellow ladies'-tresses Orchid verified in North Carolina. Castanea 48: 48-49.
——. 1983b. *Spiranthes ovalis* var. *erostellata* (Orchidaceae), a new autogamous variety from the eastern United States. Brittonia 35: 120-125.
——. 1991. Systematics of *Malaxis bayardii* and *M. unifolia*. Lindleyana 6: 3-23.
——. 1998. A synopsis of the genus *Proserpinaca* in the southeastern United States. Castanea 63: 408-414.
——. 2004. A synopsis of the genus *Hexalectris* in the United States and a new variety of Hexalectris revoluta. Native Orchid Conference Journal 1: 5-25.
——, L. Dumouchel, and V.R. Brownell. 1998. Pollination of the Miccosukee gooseberry (*Ribes echinellum*). Castanea 63: 402-407.
——, and V.S. Engel. 1993. Systematics and distribution of *Hexalectris spicata* var. *arizonica* (Orchidaceae). Lindleyana 8: 119-125.
——, and K.B. Gregg. 1992. Systematics of the genus *Cleistes* in North America. Lindleyana 7: 57-73.
——, S.M. McKay-Kuja, and G. Mitrow. 1999. Rank and typification in North American dwarf cherries, and a key to taxa. Taxon 48: 483-488.
Caulkins, D.B., and R. Wyatt. 1990. Variation and taxonomy of *Phytolacca americana* and *P. rigida* in the southeastern United States. Bull. Torrey Bot. Club 117: 357-367.
Chafin. L.G. 2000. Field guide to the rare plants of Florida. Florida Natural Areas Inventory, Tallahassee, FL.
Chafin, L.G. 2006 {in prep.}. Field guide to the rare plants of Georgia. State Botanical Garden of Georgia, Athens.
Chamberlain, D.F. 1982. A revision of *Rhododendron*. II. Subgenus *Hymenanthes*. Notes R.B.G. Edinb. 39: 209-486.
Chambers, H. 1993. [add *Pycnanthemum* reference]
——, and J. Hamer. 1992. More about picky Pycnanthemums; can taxonomy be practical after all? Tipularia 7: 19-24.
Chambers, K.L. 1989. The taxonomic relationships of *Allocarya corallicarpa* (Boraginaceae). Madroño 36: 280-281.
——. 2004. Taxonomic notes on *Krigia* (Asteraceae). Sida 21: 225-236.
Channell, R.B. 1957. A revisional study of the genus *Marshallia* (Compositae). Contr. Gray Herbarium Harv. Univ. 181: 41-130.
——, and C.W. James. 1964. Nomenclatural and taxonomic corrections in *Warea* (Cruciferae). Rhodora 66: 18-26.
——, and C.E. Wood, Jr. 1959. The genera of the Primulales of the southeastern United States. J. Arnold Arb. 40: 268-288.
——, and C.E. Wood, Jr. 1962. The Leitneriaceae in the southeastern United States. J. Arnold Arb. 43: 435-438.
——, and C.E. Wood, Jr. 1987. The Buxaceae in the southeastern United States. J. Arnold Arb. 68: 241-257.
Chapman, A.W. 1863. Flora of the southern United States: containing an abridged description of the flowering plants and ferns of Tennessee, North and South Carolina, Georgia, Alabama, Mississippi, and Florida: arranged according to the natural system, first edition. American Book Company, NY.

——. 1878. An enumeration of some plants – chiefly from the semi-tropical regions of Florida – which are either new, or which have not hitherto been recorded as belonging to the flora of the southern states. Botanical Gazette 3: 2-6.
——. . 1883. Flora of the southern United States: containing an abridged description of the flowering plants and ferns of Tennessee, North and South Carolina, Georgia, Alabama, Mississippi, and Florida: arranged according to the natural system, second edition. American Book Company, NY.
——. 1897. Flora of the southern United States: containing an abridged description of the flowering plants and ferns of Tennessee, North and South Carolina, Georgia, Alabama, Mississippi, and Florida: arranged according to the natural system, third edition. American Book Company, NY.
Chase, M.W., and 41 other authors. 1993. Phylogenetics of seed plants: an analysis of nucleotide sequences from the plastid gene rbcL. Ann Mo. Bot. Gard. 80: 528-580.
——, D.E. Soltis, P.S. Soltis, P.J. Rudall, M.F. Fay, W.H. Hahn, S. Sullivan, J. Joseph, M. Molvray, P.J. Kores, T.J. Givnish, K.J. Sytsma, and J.C. Pires. 2000. Higher-level systematics of the monocotyledons: an assessment of current knowledge and a new classification. In: K.L. Wilson & D. A. Morrison, eds., Monocots: systematics and evolution. CSIRO, Melbourne.
——, S. Zmarzty, M.D. Lledó, K.J. Wurdack, S.M. Swensen, and M.F. Fay. 2002. When in doubt, put it in the Flacourtiaceae: a molecular phylogenetic analysis based on rbcL DNA sequences. Kew Bulletin 57: 141-181.
Chaudhri, M.N. 1968. A revision of the Paronychiinae. Drukkerij H. Gianotten N.V., Tilburg. 440 pp.
Cheek, M. 1994. The correct names for the subspecies of *Sarracenia purpurea* L. Carnivorous Plant Newletter 23: 69-73.
——. 2001. Good news: *Drosera longifolia* L. rejected, *Sarracenia purpurea* L. conserved with a new type. Carnivorous Plant Newsletter 30: 29-30.
Chen, Chia Jui, M.G. Mendenhall, and B.L. Turner. 1994. Taxonomy of *Thermopsis* (Fabaceae) in North America. Ann. Missouri Bot. Gard. 81: 714-742.
Cheplick, G.P. 1988. Influence of environment and population origin on survivorship and reproduction in reciprocal transplants of amphicarpic peanutgrass (*Amphicarpum purshii*). Am. J. Bot. 75: 1048-1056.
——. 1989. Nutrient availability, dimorphic seed production, and reproductive allocation in the annual grass *Amphicarpum purshii*. Can J. Bot. 67: 2514-2521.
——, and J.A. Quinn. 1982. *Amphicarpum purshii* and the "pessimistic strategy" in amphicarpic annuals with subterranean fruit. Oecologia 52: 327-332.
——, and J.A. Quinn. 1983. The shift in aerial/subterranean fruit ratio in *Amphicarpum purshii*: causes and significance. Oecologia 57: 374-379.
——, and J.A. Quinn. 1986. Self-fertilization in *Amphicarpum purshii*: its influence on fitness and variation in progeny from aerial panicles. Am. Midl. Nat. 116: 394-402.
——, and J.A. Quinn. 1987. The role of seed depth, litter, and fire in the seedling establishment of amphicarpic peanutgrass (*Amphicarpum purshii*). Oecologia 73: 459-464.
——, and J.A. Quinn. 1988a. Quantitative variation of life history traits in amphicarpic peanutgrass (*Amphicarpum purshii*) and its evolutionary significance. Am J. Bot. 75: 123-131.
——, and J.A. Quinn. 1988b. Subterranean seed production and population responses to fire in *Amphicarpum purshii* (Gramineae). J. Ecol. 76: 263-273.
Chester, E.W., B.E. Wofford, R. Kral. 1997. Atlas of Tennessee vascular plants. Vol. 2. Angiosperms: dicots. Misc. Publ. No. 13, Center for Field Biology, Austin Peay State Univ., Clarksville, TN. 242 pp.
——, B.E. Wofford, R. Kral, H.R. DeSelm, and A.M. Evans. 1993. Atlas of Tennessee vascular plants. Vol. 1. Pteridophytes, gymnosperms, angiosperms: monocots. Misc. Publ. No. 9, Center for Field Biology, Austin Peay State Univ., Clarksville, TN.
Choi, H.-K., and J. Wen. 2000. A phylogenetic analysis of *Panax* (Araliaceae): integrating cp DNA restriction site and nuclear rDNA ITS sequence data. Plant Syst. Evol. 224: 109-120.
Chuang, T.I., and L. Constance. 1977. Cytogeography of *Phacelia ranunculacea* (Hydrophyllaceae). Rhodora 79: 115-122.
Church, G.L. 1967. Taxonomic and genetic relationships of eastern North American species of *Elymus* with setaceous glumes. Rhodora 69: 121-162.
Church, S.A. 2003. Molecular phylogenetics of *Houstonia* (Rubiaceae): descending aneuploidy and breeding system evolution in the radiation of the lineage across North America. Molecular Phylogenetics and Evolution 27: 223-238.
——, and D.R. Taylor. 2005. Speciation and hybridization among *Houstonia* (Rubiaceae) species: the influence of polyploidy on reticulate evolution. Amer. J. Botany 92: 1372-1380.
Churchill, J.A., and E. Schell. 1992. Noteworthy collections: Tennessee. Castanea 57: 293.
——, N. Churchill, M.J. Waterway, S. de Blois, and C. Schell. 1992. Noteworthy collections: Tennessee. Castanea 57: 151.
Cialdella, A.M., and L.M. Giussani. 2002. Phylogenetic relationships of the genus *Piptochaetium* (Poaceae, Pooideae, Stipeae): evedence from morphological data. Ann. Missouri Bot. Gard. 89: 305-336
Clancy, K., and M. Sullivan. 1990. Distribution of the needle palm, *Rhapidophyllum hystrix*. Castanea 55: 31-39.
Clark, R.B. 1942. A revision of the genus *Bumelia* in the United States. Ann. Missouri Bot. Gard. 29:155-182.
Clark, R.C. 1971. The woody plants of Alabama. Annals Missouri Bot. Garden 58: 99-242.
——, C.G. Hewins, J.D. Husband, C.T. Kirk, and R.W. Long. 1997. Noteworthy collections: Kentucky. Castanea 62: 288.
——, R.L. Jones, T.J. Weckman, R.L. Thompson, J.W. Thieret, Kentucky Nature Preserves Commission, and K. Freeman. 2005. State records and other noteworthy collections for Kentucky. Sida 21: 1909-1916.
Clausen, R.T. 1939. *Silene caroliniana*. Rhodora 41: 575-584.

——. 1975. *Sedum* of North America north of the Mexican plateau. Cornell Univ. Press, Ithaca, NY.
Clay, K. 1983. Myrmechory in the trailing arbutus (*Epigaea repens* L.). Bull. Torrey Bot. Club 110: 166-169.
——. 1995. Noteworthy collections: North Carolina. Castanea 60: 84-85.
Clayton, W.D., and S.A. Renvoize. 1986. Genera graminum; grasses of the world. Kew Bulletin Additional Series 13. Her Majesty's Stationery Office, London.
Clemants, S.E. 1990. Juncaceae (Rush Family) of New York State. New York State Museum Bulletin 475: 1-67.
Clements, R.K., J.M. Baskin, and C.C. Baskin. 1998. The comparative biology of the two closely-related species *Penstemon tenuiflorus* Pennell and *P. hirsutus* (L.) Willd. (Scrophulariaceae, section *Graciles*): I. Taxonomy and geographical distribution. Castanea 63: 138-153.
Clevinger, J.A. 2004. New combinations in *Silphium* (Asteraceae; Heliantheae). Novon 14: 275-277.
Clewell, A.F. 1966a. Native North American species of *Lespedeza* (Leguminosae). Rhodora 68: 359-405.
——. 1966. Identification of the Lespedezas in North America. Bull. Tall Timbers Research Station 7.
——. 1985. Guide to the vascular plants of the Florida Panhandle. University Presses of Florida, Tallahassee, FL. 605 pp.
——. 1990. Establishment of *Lespedeza virgata* (Leguminosae) in the southeastern United States. J. Elisha Mitchell Sci. Soc. 106: 32-37.
——, and J.W. Wooten. 1971. A revision of *Ageratina* (Compositae: Eupatorieae) from eastern North America. Brittonia 23: 123-143.
Cochrane, T.S. 1976. Taxonomic status of the *Onosmodium molle* complex (Boraginaceae) in Wisconsin. Michigan Botanist 15: 103-110.
Coffey, V.J., and S.B. Jones, Jr. 1980. Biosystematics of *Lysimachia* section *Seleucia* (Primulaaceae). Brittonia 32: 309-322.
Coile, N.C. 1988. Taxonomic studies on the deciduous species of *Ceanothus* L. (Rhamnaceae). Ph.D. dissertation, Univ. of Georgia, Athens.
Coker, W.C. 1919. The distribution of *Rhododendron catawbiense*, with remarks on a new form. J. Elisha Mitchell Sci. Soc. 25: 76-82.
——. 1943. *Magnolia cordata* Michaux. J. Elisha Mitchell Sci. Soc. 59: 81-88.
——, and H.R. Totten. 1945. Trees of the southeastern United States, including Virginia, North Carolina, South Carolina, Tennessee, Georgia, and northern Florida. Univ. of North Carolina Press, Chapel Hill, NC.
Coleman, J.R. 1966. A taxonomic revision of section *Ximenesia* of the genus *Verbesina* (Compositae). Amer. Midl. Naturalist 76: 475-481.
Collins, J.L. 1976. A revision of the annulate *Scutellaria* (Labiatae). Ph.D. dissertation, Vanderbilt Univ.
——, and T.F. Wieboldt. 1992. *Trifolium calcaricum* (Fabaceae), a new clover from limestone barrens of eastern United States. Castanea 57: 282-286.
Collins, S.L., and W.H. Blackwell, Jr. 1979. *Bassia* (Chenopodiaceae) in North America. Sida 8: 57-64.
Columbus, J.T. 1999. An expanded circumscription of *Bouteloua* (Gramineae: Chloridoideae): new combinations and names. Aliso 18: 61-65.
Compton, J.A., A. Culham, and S.L. Jury. 1998. Reclassification of *Actaea* to include *Cimicifuga* and *Souliea* (Ranunculaceae): phylogeny inferred from morphology, nrDNA, ITS, and cpDNA trnL-F sequence variation. Taxon 47: 593-634.
Constance, L. 1940. The genus *Ellisia*. Rhodora 42: 33-39.
——. 1941. The genus *Nemophila* Nutt. Univ. of Cal. Publ. in Bot. 19: 341-398.
——. 1942. The genus *Hydrophyllum* L. Amer. Midl. Nat. 27: 710-731.
——. 1949. A revision of *Phacelia* subgenus *Cosmanthus* (Hydrophyllaceae). Contr. Gray Herb. 168: 1-48.
——. 1963. Chromosome number and classification in Hydrophyllaceae. Brittonia 15: 273-285.
Cook, R.E., and J.C. Semple. 2004. A new name and a new combination in *Solidago* subsect. *Glomeruliflorae* (Asteraceae: Astereae). Sida 21: 221-244.
Cooper, A.W., and E.P. Mercer. 1977. Morphological variation in *Fagus grandifolia* Ehrh. in North Carolina. J. Elisha Mitch. Sci. Soc. 93: 136-149.
Cooperrider, T.S. 1985. *Thaspium* and *Zizia* in Ohio. Castanea 50: 116-119.
——. 1995. The Dicotyledonae of Ohio. Part 2. Linaceae through Campanulaceae. Ohio State University Press, Columbus. 656 pp.
——, and G.A. McCready. 1975. On separating Ohio specimens of *Lindernia dubia* and *L. anagallidea* (Scrophulariaceae). Castanea 40: 191-197.
Core, E.L. 1936. The American species of *Scleria*. Brittonia 2: 1-105.
Correa, M.D., and R.L. Wilbur. 1969. A revision of the genus *Carphephorus* (Compositae-Eupatoriae). J. Elisha Mitch. Sci. Soc. 85: 79-91.
Correll, D.S. 1936. *Epidendrum conopseum* in North Carolina. J. Elisha Mitchell Sci. Soc. 52: 91-92.
——. 1937. The orchids of North Carolina. J. Elisha Mitchell Sci. Soc. 53: 139-172.
——. 1950. Native orchids of North America north of Mexico. Chronica Botanica Cp., Waltham, MA. 399 pp.
——, and H.B. Correll. 1982. Flora of the Bahama Archipelago (including the Torks and Caicos Islands). J. Cramer, Vaduz. 1692 pp.
Costea, M., G.L. Nesom, and S. Stefanović. 2006a. Taxonomy of the *Cuscuta pentagona* complex (Convolvulaceae) in North America. Sida 22: 151-176.

——, G.L. Nesom, and S. Stefanović. 2006b. Taxonomy of the *Cuscuta gronovii* and *Cuscuta umbrosa* (Convolvulaceae). Sida 22: 197-208.
——, G.L. Nesom, and S. Stefanović. 2006c. Taxonomy of the *Cuscuta indecora* (Convolvulaceae) complex in North America. Sida 22: 209-226.
——, A. Sanders, and G. Waines. 2001a. Preliminary results toward a revision of the *Amaranthus hybridus* species complex (Amaranthaceae). Sida 19: 931-974.
——, A. Sanders, and G. Waines. 2001b. Notes on some little known *Amaranthus* taxa (Amaranthaceae) in the United States. Sida 19: 975-992.
——, and F.J. Tardif. 2003a. Nomenclatural changes in the genus *Polygonum* section *Polygonum* (Polygonaceae). Sida 20: 987-997.
——, and F.J. Tardif. 2003b. Conspectus and notes on the genus *Amaranthus* in Canada. Rhodora 105: 260-281.
——, and F.J. Tardif. 2003c. *Polygonum aviculare* subsp. *rurivagum* (Polygonaceae) in North America. Sida 20: 1709-1711.
Coulter, J.M., and J.N. Rose. 1900. Monograph of the North American Umbelliferae. Contr. U.S. Nat. Herb. 7: 1-256.
Crane, E.H. 1997. A revised circumscription of the genera of the fern family Vittariaceae. Systematic Bot. 22: 509-517.
Cranfill, R. 1983. The distribution of *Woodwardia areolata*. Amer. Fern J. 73: 46-52.
Crawford, D.J., and E.B. Smith. 1984. Allozyme divergence and intraspecific variation in *Coreopsis grandifolia* (Compositae). Systematic Bot. 9: 219-225.
——, and M.E. Mort. 2005. Phylogeny of eastern North American *Coreopsis* (Asteraceae – Coreopsideae): insights from nuclear and plastid sequences, and comments on character evolution. Amer. J. Bot. 92: 330-336.
Crins, W.J. 1989a. Status of the few-flowered club-rush, *Scirpus verecundus* (Cyperaceae), in Canada. Can. Field-Naturalist 103: 57-60.
——. 1989b. The Tamaricaceae in the southeastern United States. J. Arnold Arb. 70: 403-425.
——. 1991. The genera of Paniceae (Gramineae: Panicoideae) in the southeastern United States. J. Arnold Arb., Supplementary Series 1: 171-312.
——, and P.W. Ball. 1983. The taxonomy of the *Carex pensylvanica* complex (Cyperaceae) in North America. Can. J. Bot. 61: 1692-1717.
Cronquist, A. 1945. Studies in the Sapotaceae, III. *Dipholis* and *Bumelia*. J. Arnold Arbor. 26:435-471.
——. 1947. Notes on the Compositae of the northeastern United States – V. Astereae. Bull. Torrey Bot. Club 74: 142-150.
——. 1980. Asteraceae, Volume I, Vascular flora of the Southeastern United States. University of North Carolina Press, Chapel Hill, N.C.
——. 1981. An integrated system of classification of flowering plants. New York Botanical Garden, N.Y. 1262 pp.
——. 1982. Reduction of *Pseudotaenidia* to *Taenidia* (Apiaceae). Brittonia 34: 365-367.
——. 1985. *Eupatorium godfreyanum* (Asteraceae), a "new" species from eastern United States. Brittonia 37: 237-242.
Croom, H.B. 1837. A catalogue of plants, native or naturalized, in the vicinity of New Bern, North Carolina, with remarks and synonyms. G.P. Scott, New York, NY.
Crow, G.E. 1978. A taxonomic revision of *Sagina* (Caryophyllaceae) in North America. Rhodora 80: 1-91.
——, and C.B. Hellquist. 2000a. Aquatic and wetland plants of northeastern North America: a revised and enlarged edition of Norman C. Fassett's A Manual of Aquatic Plants. Vol. 1. Pteridophytes, gymnosperms, and angiosperms: dicotyledons. Univ. of Wisconsin Press, Madison, WI.
——, and C.B. Hellquist. 2000b. Aquatic and wetland plants of northeastern North America: a revised and enlarged edition of Norman C. Fassett's A Manual of Aquatic Plants. Vol. 2. Angiosperms: monocotyledons. Univ. of Wisconsin Press, Madison, WI.
Cruden, R.W. 1991. A revision of *Isidrogalvia* (Liliaceae): recognition of Ruíz and Pavón's genus. Systematic Bot. 16: 270-282.
Cullen, J. 1980. A revision of *Rhododendron*. I. Subgenus *Rhododendron* sections *Rhododendron* & *Pogonanthum*. Notes R.B.G. Edinb. 39: 1-207.
Cullings, K.W., and L. Hileman. 1997. The Monotropoideae is a monophyletic sister group to the Arbutoideae (Ericaceae): a molecular test of Copeland's hypothesis. Madroño 44: 297-304.
Culwell, D.E. 1970. A taxonomic study of the section *Hypericum* in the eastern United States. Ph.D. dissertation, University of North Carolina at Chapel Hill.
Curtis, M.A. 1843. An account of some new and rare plants of North Carolina. Amer J. Sci. 44: 80-84.
——. 1860. The woody plants of North Carolina. Holden, Raleigh NC
Cusick, A.W. 1985. *Lithospermum* (Boraginaceae) in Ohio, with a new taxonomic rank for *Lithospermum croceum* Fernald. Mich. Botanist 24: 63-69.
——. 1987. A binomial for a common hybrid *Lycopodium*. Amer. Fern J. 77: {}.
——. 1992. *Carex* section *Acrocystis* (Cyperaceae) in Ohio. Michigan Botanist 31: 99-108.
——. 1994. Noteworthy collections: West Virginia. Castanea 59: 79-80.
——. 1996. Notes on the genus *Carex* (Cyperaceae) in West Virginia. Castanea 61: 161-167.
——. 2002. A binomial for the hybrid *Polypodium* of eastern North America. Amer. Fern J. 92: 240-241.
D'Arcy, W.G., and E.H. Eshbaugh. 1974. New World peppers [*Capsicum* - Solanaceae] north of Colombia: a résumé. Baileya 19: 93-105.
Dahlgren, R.M.T., and H.T. Clifford. 1982. The monocotyledons: a comparative study. Academic Press, London. 378 pp.

——, H.T. Clifford, and P.F. Yeo. 1985. The families of the monocotyledons: structure, evolution, and taxonomy. Springer-Verlag, Berlin. 520 pp.
Dane, F., and P. Lang. 2004. Sequence variation at cpDNA regions of watermelon and related wild species: implications for the evolution of *Citrullus* haplotypes. Amer. J. Bot. 91: 1922-1929.
Danin, A., and L.C. Anderson. 1986. Distribution of *Portulaca oleracea* L. (Portulacaceae) subspecies in Florida. Sida 11: 318-324.
Daoud, H.S., and R.L. Wilbur. 1965. A revision of the North American species of *Helianthemum* (Cistaceae). Rhodora 67: 63-312 (pagination interrupted).
Darbyshire, S.J. 1993. Realignment of *Festuca* subgenus *Schedonardus* with the genus *Lolium* (Poaceae). Novon 3: 239-243.
——, and L.E. Pavlick. 1997. Nomenclatural notes on North American grasses. Phytologia 82: 73-78.
Davidian, H.H. 1982. The *Rhododendron* species. Volume I: Lepidotes. Timber Press, Portland, OR.
Davidson, J.F. 1950. The genus *Polemonium* (Tournefort) L. Univ. California Publ. Bot. 23: 209-282.
Davison, P.G. 1997. Noteworthy collections: Georgia and South Carolina. Castanea 62: 129.
Davies, P.A. 1952. Geographical variation in *Shortia galacifolia*. Rhodora 54: 121-124.
Davis, R.J. The North American perennial species of *Claytonia*. Brittonia 18: 285-303.
de Wet, J.M.J. 1978. Systematics and evolution of *Sorghum* sect. *Sorghum* (Gramineae). Amer. J. Bot. 65: 477-484.
——, J.R. Harlan, and D.E. Brink. 1982. Systematics of *Tripsacum dactyloides* (Gramineae). Amer. J. Botany 69: 1251-1257.
Decker-Walters, D.S., S.-M. Chung, J.E. Staub, H.D. Quemada, and A.I. López-Sesé. 2002. The origin and genetic affinities of wild populations of melon (*Cucumis melo*, Cucurbitaceae) in North America. Plant. Syst. Evol. 233: 183-197.
Degtjareva, G.V., T.E. Kramina, D.D. Sokoloff, T.H. Samigullin, C.M. Valiejo-Roman, and A.S. Antonov. 2006. Phylogeny of the genus *Lotus* (Leguminosae, Loteae): evidence from nrITS sequaences and morphology. Can. J. Bot. 84: 813-830.
DeJong, D.C.D. 1965. A systematic study of the genus *Astranthium* (Compositae, Astereae). Publ. Mus. Michigan State Univ. Biol. Ser. 2: 429-528.
del Castillo, R. F. 1994. Factors influencing the genetic structure of *Phacelia dubia*, a species with a seed bank and large fluctuations in population size. Heredity 72: 446-458.
——. 1998. Fitness consequences of maternal and nonmaternal components of inbreeding in the gynodioecious *Phacelia dubia*. Evolution 52: 44-60.
Delahoussaye, A.J., and J.W. Thieret. 1967. *Cyperus* subgenus *Kyllinga* (Cyperaceae) in the continental United States. Sida 3: 128-136.
DeLaney, K.R., N. Bissett, and J.D. Weidenhamer. 1999. A new species of *Carphephorus* (Asteraceae; Eupatorieae) from peninsular Florida. The Botanical Explorer 1: 1-15.
——, R.P. Wunderlin, and J.C. Semple. 2003. *Chrysopsis delaneyi* (Asteraceae, Astereae), another new species from peninsular Florida. Botanical Explorer 3: 1-37.
Dellinger, B. 1989. Noteworthy collections: North Carolina: *Trientalis borealis*. Castanea 54: 127.
Dempster, L.T. 1978. The genus *Galium* (Rubiaceae) in Mexico and Central America. Univ. of Calif. Publ. in Botany 73: 1-33
——. 1981. The genus *Galium* (Rubiaceae) in South America. II. Allertonia 2: 393-426.
Dennis, W.M. 1980. *Sarracenia oreophila* (Kearney) Wherry in the Blue Ridge Province of northeastern Georgia. Castanea 45: 101-103.
——, and D.H. Webb. 1981. The distribution of *Pilularia americana* A. Br. (Marsileaceae) in North America, north of Mexico. Sida 9: 19-24.
DePoe, C.E., and E.O. Beal. 1969. Origin and maintenance of clinal variation in *Nuphar* (Nymphaeaceae). Brittonia 21: 15-28.
Des Marais, D.L., A. R. Smith, D.M. Britton, and K.M. Pryer. 2003. Phylogenetic relationships and evolution of extant horsetails, *Equisetum*, based on chloroplast DNA sequence data (rbcL and trnL-F). Int. J. Plant Sci. 164: 737-751.
Detling, L.E. 1939. A revision of the North American species of *Descurainia*. Amer. Midland Nat. 22: 481-520.
DeVore, M.L. 1991. The occurrence of *Acicarpha tribuloides* (Calyceraceae) in eastern North America. Rhodora 93: 26-35.
Dhillion, S.S., and R.C. Anderson. 1999. Growth and photosynthetic response of first-year garlic mustard (*Alliaria petiolata*) to varied irradiance. J. Torrey Bot. Soc. 126: 9-14.
Diamond, A.R., Jr., and R.S. Boyd. 2004. Distribution, habitat characteristics amd population trends of the rare southeastern endemic *Rudbeckia auriculata* (Perdue) Kral (Asteraceae). Castanea 69: 249-264.
Diamond, P. 1999. *Paederia foetida* (Rubiaceae), new to the flora of North Carolina. Sida 18: 1273-1276.
Diane, N., H. Förther, & H.H. Hilger. 2002. A systematic analysis of *Heliotropium*, *Tournefortia*, and allied taxa of the Heliotropiaceae (Boraginales) based on ITS1 sequences and morphological data. Amer. J. Botany 89: 287-295
Dibble, A.C., and C.S. Campbell. 1995. Distribution and conservation of Nantucket shadbush, *Amelanchier nantucketensis* (Rosaceae). Rhodora 97: 339-349.
Dietrich, W., and W.L. Wagner. 1988. Systematics of *Oenothera* section *Oenothera* subsection *Raimannia* and subsection *Nutantigemma* (Onagraceae). Systematic Bot. Monographs 24: 1-91.
Dietrich, W., W.L. Wagner, and P.H. Raven. 1997. Systematics of *Oenothera* section *Oenothera* subsection *Oenothera* (Onagraceae). Systematic Bot. Monographs 50: 1-234.
Digital Flora of Texas. 2005. Texas vascular plant image gallery. http://www.csdl.tamu.edu/FLORA/gallery.htm . Accessed 5 December 2005.
Dirr, M.A. 2004. Hydrangeas for American gardens. Timber Press, Portland. 236 pp.
Dore, W.G. 1964. Two kinds of blue cohosh. Ontario Naturalist.

Dorn, R.D. 1984. Vascular plants of Wyoming. Mountain West Publishing, Cheyenne, WY.
——. 1988. Vascular plants of Wyoming, second edition. Mountain West Publishing, Cheyenne, WY.
——. 1995. A taxonomic study of *Salix* section *Cordatae* subsection *Luteae* (Salicaceae). Brittonia 47: 160-174.
——. 2001. Vascular plants of Wyoming, third edition. Mountain West Publishing, Cheyenne, WY.
Dorr, L.J. 1990. A revision of the North American genus *Callirhoe* (Malvaceae). Mem. New York Bot. Garden 56: 1-76.
——, and F.R. Barrie. 1993. Typification of the Linnaean names in *Pyrola* (Ericaceae, Pyroloideae). Brittonia 45: 177-180.
Douglass, C.C. 1980. *Waldsteinia lobata* (Baldw.) T. & G. (Rosaceae) verified for South Carolina. Castanea 45: 228-232.
Downer, R.G., and P.E. Hyatt. 2003. Recommendations concerning the identification of *Carex retroflexa* and *Carex texensis* (Cyperaceae; section Phaestoglochin Dumort.). Castanea 68: 245-253.
Downie, S.R., and J.D. Palmer. 1992. Restriction site mapping of the chloroplast DNA inverted repeat: a molecular phylogeny of the Asteridae. Ann. Missouri Bot. Gard. 79: 266-283.
——, S. Ramanath, D.S. Katz-Downie, and E. Llanas. 1998. Molecular systematics of Apiaceae subfamily Apioideae: phylogenetic analyses of nuclear ribosomal DNA internal transcribed spacer and plastid RPOC1 intron sequences. Am. J. Bot. 85: 563-591.
Doyle, J.D. 1990. Systematics of the *Opuntia humifusa* complex. Ph.D. dissertation, University of North Carolina at Chapel Hill.
Drábková, L., J. Kirschner, O. Seberg, G. Petersen, and Č. Vlček. 2003. Phylogeny of the Juncaceae based on rbcL sequences, with special emphasis on *Luzula* DC. and *Juncus* L. Plant Syst. Evol. 240: 133-147.
Drapalik, D.J. 1969. A biosystematic study of the genus *Matelea* in the southeastern United States. Ph.D. dissertation, University of North Carolina, Chapel Hill. 225 pp.
Dubuisson, J.-Y., S. Hennequin, E.J.P. Douzery, R.B. Cranfill, A.R. Smith, and K.M. Pryer. 2003. *rbcL* phylogeny of the fern genus *Trichomanes* (Hymenophyllaceae), with special reference to neotropical taxa. Int. J. Plant Sci. 164: 753-761.
Dudley, T.R. 1974. The correct authority for *Cardamine clematitis* (Cruciferae). Rhodora 76: 53-57.
Duistermaat, H. 1996. Monograph of *Arctium* L. (Asteraceae): generic delimitation (including Cousinia Cass. p.p.), revision of the species, pollen morphology, and hybrids. Gorteria Spplement 3, Rijksherbarium, Leiden.
Duke, J.A. 1955. Distribution and speciation of the genus *Ludwigia* in North Carolina. J. Elisha Mitchell Sci. Soc. 71: 255-269.
——. 1961. Preliminary revision of the genus *Drymaria*. Ann. Mo. Bot. Gard. 48: 173-268.
Duley, M.L., and M.A. Vincent. 2003. A synopsis of the genus *Cladrastis* (Leguminosae). Rhodora 105: 205-239.
Duncan, T. 1980. A taxonomic study of the *Ranunculus hispidus* Michaux complex in the Western Hemisphere. Univ. of California Publications in Botany, vol. 77.
Duncan, W.H. 1967. Woody vines of the southeastern states. Sida 3: 1-76.
——. 1969. *Celastrus* (Celastraceae) in the southeastern states. Sida 3: 309-310.
——. 1979. Changes in *Galactia* (Fabaceae) of the southeastern United States. Sida 8: 170-180.
——. 1985. Ten additions to the vascular flora of Georgia. Castanea 50: 52-55.
——, and N.E. Brittain. 1966. The genus *Gaylussacia* (Ericaceae) in Georgia. Bull. Georgia Academy of Sci. 24: 13-26.
——, and D.W. Dejong. 1964. Taxonomy and heterostyly of North American *Gelsemium* (Loganiaceae). Sida 1: 346-357.
——, and M.B. Duncan. 1988. Trees of the southeastern United States. University of Georgia Press, Athens.
——, and M.B. Duncan. [in prep.]. Shrubs of the southeastern United States.
——, and R.B. McCartney. 1992. About *Lupinus cumulicola* (Fabaceae). Sida 15: 346-347.
——, and T.M. Pullen. 1962. Lepidote Rhododendrons of the southeastern United States. Brittonia 14: 290-298.
Duvall, M.R., and 10 other authors. 1993. Phylogenetic hypotheses for the monocotyledons constructed from rbcL sequence data. Ann. Mo. Bot. Gard. 80: 607-619.
Easterly, N.W. 1957. A morphological study of *Ptilimnium*. Brittonia 9: 136-145.
Ebinger, J.E. 1974. A systematic study of the genus *Kalmia* (Ericaceae). Rhodora 76: 315-398.
——, D.S. Seigler, and H.D. Clarke. 2002. Notes on the segregates of *Acacia farnesiana* (L.) Willd. (Fabaceae: Mimoisoideae) and related species in North America. Southwestern Naturalist 47: 86-91.
EckenwalderJ.E. 1977. North American cottonwoods (*Populus*, Salicaceae) of sections *Abaso* and *Aigeiros*. J. Arnold Arb. 58: 193-208.
——. 1984. Natural intersectional hybrids between North American species of *Populus* (Salicaceae) in sections *Aigeiros* and *Tacamahaca*. II. Taxonomy. Can. J. Bot. 62: 325-335.
——. 1996. Systematics and evolution of *Populus*. In Stettler, R.F., H.D. Bradshaw, Jr., P.E. Heilman, and T.M. Hinckley, eds. Biology of *Populus* and its implications for management and conservation. NRC Research Press, Ottawa.
Eddie, W.M.M., T. Shulkina, J. Gaskin, R.C. Haberle, and R.K. Jansen. 2003. Phylogeny of Campanulaceae s. str. inferred from ITS sequences of nuclear ribosomal DNA. Ann. Missouri Bot. Gard. 554-575.
Edmondson, J.R. 2005. A new combination in *Oxypolis* Rafinesque (Apiaceae). Novon 15: 109.
Edwards, J.M., J.A. Churchill, and U. Weiss. 1970. A chemical contribution to the taxonomic status of *Lophiola americana*. Phytochem. 9: 1563-1564.
Ehdaie, M., and S.D. Russell. 1984. Megagametophyte development of *Nandina domestica* and its taxonomic implications. Phytomorphology 34: 221-225.
Eigsti, O.J. 1942. A cytological investigation of *Polygonatum* using the colchicine-pollen tube technique. Am. J. Bot. 29: 626-636.

Eiten, G. 1963. Taxonomy and regional variation of *Oxalis* section *Corniculatae*. I. Introduction, keys and synopsis of species. Amer. Midl. Nat. 69: 257-309.
Eleuterius, L.N. 1977?. A revised description of the salt-marsh rush, *Juncus roemerianus*. Sida 7: 355-360.
Elias, T.S. 1971a. The genera of Fagaceae in the southeastern United States. J. Arnold Arb. 52: 159-195.
——. 1971b. The genera of Myricaceae in the southeastern United States. J. Arnold Arb. 52: 305-318.
——. 1972. The genera of Juglandaceae in the southeastern United States. J. Arnold Arb. 53: 26-51.
Ellison, A.M., H.L. Buckley, T.E. Miller, and N.J. Gotelli. 2004. Morphological variation in *Sarracenia purpurea* (Sarraceniaceae): geographic, environmental, and taxonomic correlates. Amer. J. Bot. 91: 1930-1935.
Epling, C. 1942. The American species of *Scutellaria*. Univ. Calif. Publ. in Botany 20: 1-146.
Eriksson, T., and M.J. Donoghue. 1997. Phylogenetic relationships of *Sambucus* and *Adoxa* (Adoxoideae, Adoxacaeae) based on nuclear ribosomal ITS sequences and preliminary morphological data. Systematic Bot. 22: 555-573.
——, M.J. Donoghue, and M.S. Hibbs. 1998. Phylogenetic analysis of *Potentilla* using DNA sequences of nuclear ribosomal internal transcribed spacers (ITS), and implications for the classification of Rosoideae (Rosaceae). Pl. Syst. Evol. 211: 155-179.
——, M.S. Hibbs, A.D. Yoder, C.F. Delwiche, and M.J. Donoghue. 2003. The phylogeny of Rosoideae (Rosaceae) based on sequences of the internal transcribed spacers (ITS) of nuclear ribosomal DNA and the trnL/F region of chloroplast DNA. Int. J. Plant Sci. 164: 197-211.
Ertter, B. 2000. Floristic surprises in North America north of Mexico. Ann. Missouri Bot. Garden. 87: 81--109.
Esselman, E.J., and D.J. Crawford. 1997. Molecular and morphological evidence for the origin of *Solidago albopilosa* (Asteraceae), a rare endemic of Kentucky. Systematic Bot. 22: 245-257.
Esser, H.-J. 2002. A revision of *Triadica* Lour. (Euphorbiaceae). Harvard Papers in Botany 7: 17-21.
Essig, F.B. 1990. The *Clematis virginiana* (Ranunculaceae) complex in the Southeastern United States. Sida 14: 49-68.
Estes, D. 2004. Noteworthy records: middle Tennessee. Castanea 69: 69-74.
——, and J. Beck. 2005. *Sporobolus heterolepis* (Poaceae) new to Tennessee. Sida 21: 1923-1926.
——, and C. Fleming. 2006. *Clematis morefieldii* (Ranunculaceae) new to Tennessee. Sida 22: 821-824.
Evert, D.S. 1957. *Dionaea* transplants in the New Jersey Pine Barrens. Bartonia 29: 3-4.
Evrard, C., and C. Van Hove. 2004. Taxonomy of the American *Azolla* species (Azollaceae): a critical review. Syst. & Geogr. Pl. 74: 301-318.
Eyde, R.H. 1966. The Nyssaceae in the Southeastern United States. J. Arnold Arb. 47: 117-125.
——. 1977. Reproductive structures and evolution in *Ludwigia* (Onagraceae). I. Androecium, placentation, merism. Ann. Mo. Bot. Gard. 64: 644-655.
——. 1978. Reproductive structures and evolution in *Ludwigia* (Onagraceae). II. Fruit and seed. Ann. Mo. Bot. Gard. 65: 656-675.
——. 1981. Reproductive structures and evolution in *Ludwigia* (Onagraceae). III. Vasculature, nectaries, conclusions. Ann. Mo. Bot. Gard. 68: 379-412.
——. 1987. The case for keeping *Cornus* in the broad Linnaean sense. Systematic Botany 12: 505-518.
Faber-Langendoen, D., and D. Tart. 2001. Proposal for revisions to the national standards for physiognomic levels of vegetation classification in the United States. Federal Geographic Data Committee, Vegetation Subcommitee, Washington, DC.
Fairbrothers, D.E., and J.R. Gray. 1972. *Microstegium vimineum* (Trin.) A. Camus (Gramineae) in the United States. Torreya 99: 97-100.
Fairey, J.E, III. 1967. The genus *Scleria* in the southeastern United States. Castanea 32: 37-71.
——, & A.T. Whittemore. 1999. Proposal to conserve the name *Scleria pauciflora* (Cyperaceae) with a conserrved type. Taxon 48: 575-576.
Fan, C., and Q.-Y. Xiang. 2001. Phylogenetic relationships within *Cornus* (Cornaceae) based on 26S rDNA sequences. Amer. J. Bot. 88: 1131-1138.
Fantz, P.R. 2000. Nomenclatural notes on the genus *Clitoria* for the Flora North American project. Castanea 65: 89-92.
——. 2002a. Distribution of *Centrosema* (Leguminosae: Phaseoleae: Clitoriinae) for the Flora of North America project. Vulpia 1: 41-81.
——. 2002b. Distribution of *Clitoria* (Leguminosae: Phaseoleae: Clitoriinae) for the Flora of North America project. Vulpia 1: 82-132.
Farjon, A. 1998. World checklist and bibliography of conifers. Royal Botanic Gardens, Kew, England.
——. 2005. A monograph of Cupressaceae and *Sciadopitys*. Royal Botanic Gardens, Kew. 643 pp.
Farmer, S.B., and E.E. Schilling. 2002. Phylogenetic analyses of Trilliaceae based on morphological and molecular data. Systematic Botany 27: 674-692.
Farrar, D.R. 1974. Gemmiferous fern gametophytes – Vittariaceae. Am. J. Bot. 61: 146-155.
Farrar, D.R. 1978. Problems in the identity and origin of the Appalachian *Vittaria* gametophyte, a sporophyteless fern of the eastern United States. Am. J. Bot. 65: 1-12.
——. 1992. *Trichomanes intricatum*: the independent *Trichomanes* gametophyte in the eastern United States. Amer. Fern J. 82: 68-74.
——, and J.T. Mickel. 1991. *Vittaria appalachiana*: a name for the "Appalachian Gametophyte." Amer. Fern J. 81: 69-75.
——, J.C. Parks, and B.W. McAlpin. 1983. The fern genera *Vittaria* and *Trichomanes* in the northeastern United States. Rhodora 85: 83-92.

——, and J.F. Wendel. 1996. Eastern moonworts: genetics and relationships [abstract]. Am. J. Bot. 83: 124.
Fassett, N.C. 1935. A study of *Streptopus*. Rhodora 37: 88-113.
——. 1944. *Dodecatheon* in eastern North America. Amer. Midland Naturalist 31: 455-486.
Fay, M.F., and M.W. Chase. 1996. Resurrection of Themidaceae for the *Brodiaea* alliance, and recircumscription of Alliaceae, Amaryllidaceae and Agapanthoideae. Taxon 45: 441-451.
——, P.J. Rudall, S. Sullivan, K.L. Stobart, A.Y. de Bruijn, G. Reeves, F. Qamaruz-Zaman, W.-P. Hong, J. Joseph, W.J. Hahn, J.G. Conran, and M.W. Chase. 2000. Phylogenetic studies of Asparagales based on four plastid DNA regions. In: K.L. Wilson & D. A. Morrison, eds., Monocots: systematics and evolution. CSIRO, Melbourne.
Ferguson, C.J., F. Krämer, and R.K. Jansen. 1999. Relationships of eastern North American *Phlox* (Polemoniaceae) based on ITS sequence data. Systematic Bot. 24: 616-631.
Ferguson, D.M. 1998. Phylogenetic analysis and relationships in Hydrophyllaceae based on ndhF sequence data. Systematic Botany 23: 253-268.
Ferguson, I.K. 1965. The genera of Valerianaceae and Dipsacaceae in the southeastern United States. J. Arnold Arb. 46: 218-231.
——. 1966a. The genera of Caprifoliaceae in the southeastern United States. J. Arnold Arb. 47: 33-59.
——. 1966b. The genera of Sterculiaceae in the southeastern United States. J. Arnold Arb. 47: 60-74.
——. 1966c. Notes on the nomenclature of *Cornus*. J. Arnold. Arb. 47: 100-105.
——. 1966d. The Cornaceae in the southeastern United States. J. Arnold Arb. 47: 106-116.
——, and G.K. Brizicky. 1965. Nomenclatural notes on *Dipsacus fullonum* and *Dipsacus sativus*. J. Arnold Arb. 46: 362-365.
Ferguson, R.L., J.A. Rivera, and L.L. Wood. 1989. Submerged aquatic vegetation in the Albemarle-Pamlico estuarine system. Albemarle-Pamlico Estuarine Study Project No. 88-10.
Fernald, M.L. 1911. The northern variety of *Gaylussacia dumosa*. Rhodora 13: 95-99.
——. 1943. Virginian botanizing under restrictions. Rhodora 45: 357-511 (pagination interrupted)
——. 1950. Gray's manual of botany, eighth (centennial) edition. Corrected printing, 1970. D. Van Nostrand Co., New York, N.Y.
——. 1950b. The North American variety of *Milium effusum*. Rhodora 52:218–222.
——, and B.G. Schubert. 1949. Some identities in *Breweria*. Rhodora 51: 35-43.
Ferry, R.J., Sr., and R.J. Ferry, Jr. 1987. *Calycanthus brockiana* (Calycanthaceae), a new spicebush from north central Georgia. Sida 12: 339-341.
Figlar, R.B., and H.P. Nooteboom. 2004. Notes on Magnoliaceae IV. Blumea 49: 87-100.
Fishbein, M., and W.D. Stevens. 2005. Resurrection of *Seutera* Reichenbach (Apocynaceae, Asclepiadoideae). Novon 15: 531-533.
Fisher, D.D., H.J. Schenk, J.A. Thorsch, and W.R. Ferren, Jr. 1997. Leaf anatomy and subgeneric affiliations of C3 and C4 species of *Suaeda* (Chemopodiaceae) in North America. Am. J. Bot. 84: 1198-1210.
Fisher, T.R. 1957. Taxonomy of the genus *Heliopsis* (Compositae). Ohio J. of Sci. 57: 171-191.
Fleming, G.P., and J.C. Ludwig. 1996. Noteworthy collections: Virginia. Castanea 61: 89-94.
Flora of North America Editorial Committee. 1993a. Flora of North America north of Mexico. Volume 1, introduction. Oxford Univ. Press, New York, NY. 372 pp.
——. 1993b. Flora of North America north of Mexico. Volume 2, pteridophytes and gymnosperms. Oxford Univ. Press, New York, NY. 475 pp.
——. 1997. Flora of North America north of Mexico. Volume 3, Magnoliophyta: Magnoliidae and Hamamelidae. Oxford Univ. Press, New York, NY. 590 pp.
——. 2000. Flora of North America north of Mexico. Volume 22, Magnoliophyta: Alismatidae, Arecidae, Commelinidae (in part), and Zingiberidae. Oxford Univ. Press, New York, NY. 352 pp.
——. 2002a. Flora of North America north of Mexico. Volume 26, Magnoliophyta: Liliidae: Liliales and Orchidales. Oxford Univ. Press, New York, NY. 723 pp.
——. 2002b. Flora of North America north of Mexico. Volume 23, Magnoliophyta: Commelinidae (in part): Cyperaceae. Oxford Univ. Press, New York, NY. 608 pp.
——. 2003a. Flora of North America north of Mexico. Volume 25, Magnoliophyta: Commelinidae (in part): Poaceae, part 2. Oxford Univ. Press, New York, NY. 783 pp.
——. 2003b. Flora of North America north of Mexico. Volume 4, Magnoliophyta: Caryophyllidae, part 1. Oxford Univ. Press, New York, NY. 559 pp.
——. 2005. Flora of North America north of Mexico. Volume 5, Magnoliophyta: Caryophyllidae, part 2. Oxford Univ. Press, New York, NY. 656 pp.
——. 2006a. Flora of North America north of Mexico. Volume 19, Magnoliophyta: Asteridae, part 6: Asteraceae, part 1. Oxford Univ. Press, New York, NY. 579 pp.
——. 2006b. Flora of North America north of Mexico. Volume 20, Magnoliophyta: Asteridae, part 6: Asteraceae, part 2. Oxford Univ. Press, New York, NY. 666 pp.
——. 2006c. Flora of North America north of Mexico. Volume 19, Magnoliophyta: Asteridae, part 6: Asteraceae, part 1. Oxford Univ. Press, New York, NY. 616 pp.
Flores-Cruz, M., H.D. Santana-Lira, S.D. Koch, and R. Grether. 2004. Taxonomic significance of leaflet anatomy in *Mimosa* series *Quadrivalvis* (Leguminosae, Mimosoideae). Systematic Botany 29: 892-902.

Folsom, J.P. 1984. Una reinterpretacion del estatus y relaciones de las taxa del complejo de *Platanthera ciliaris* [a reinterpretation of the status and relationships of taxa of the yellow-fringed orchid complex]. Orquidea (Méx.) 9: 321-345.
Ford, B.A., D.A.R. McQueen, R.F.C. Naczi, and A.A. Reznicek. 1998. Allozyme variation and genetic relationships among species in the *Carex willdenowii* complex (Cyperaceae). Amer. J. Bot. 85: 546-552
Forest, F., and A. Bruneau. 2000. Phylogenetic analysis, organization, and molecular evolution of the nontranscribed spacer of 5S ribosomal RNA genes in *Corylus* (Betulaceae). Int. J. Plant Sci. 161: 793-806.
Fosberg, F.R., and L. Artz. 1953. The varieties of *Monarda fistulosa* L. Castanea 18: 128-130.
Foster, S. 1991. *Echinacea*: nature's immune enhancer. Healing Arts Press, Rochester, VT. 150 pp.
Fox, W.B., R.K. Godfrey, and H.L. Blomquist. 1950. Notes on distribution of North Carolina plants – II. Rhodora 52: 253-271.
—, R.K. Godfrey, and H.L. Blomquist. 1952. Notes on distribution of North Carolina plants – III. Rhodora 54: 165-182.
Franklin, M.A. 2001. Factors affecting seed production in natural populations of Lysimachia *asperulifolia* Poir. (Primulaceae), a rare, self-incompatible plant species. M.S. thesis, Dept. of Botany, N.C. State Univ., Raleigh, NC.
Franklin, M.A. 2004. Natural Heritage Program list of the rare plants of North Carolina. North Carolina Natural Heritage Program, Raleigh, NC.
Franz, N.M, A.S. Weakley, and R.K. Peet. [in prep.] On the use of taxonomic concepts in support of biodoiversity research and taxonomy. New Taxonomy Proceedings (Systematics Association).
Franzke, A., K. Pollmann, W. Bleeker, R. Kohrt, and H. Hurka. 1998. Molecular systematics of *Cardamine* and allied genera (Brassicaceae): ITS and non-coding chloroplast DNA. Folia Geobotanica 33: 225-240.
Freckmann, R.W. 1981. Realignments in the *Dichanthelium acuminatum* complex (Poaceae). Phytologia 48: 99-110.
—, and M.G. Lelong. 2002. Nomenclatural changes and innovations in *Panicum* and *Dichanthelium* (Poaceae, Paniceae). Sida 20: 161-174.
Freeman, C.C. 2004. A new combination in *Persicaria* (Polygonaceae). Sida 21: 291-292.
Freeman, J.D. 1975. Revision of *Trillium* subgenus *Phyllantherum* (Liliaceae). Brittonia 27: 1-62.
Freudenstein, J.V. 1992. Systematics of *Corallorhiza* and the Corallorhizinae (Orchidaceae). Ph.D. dissertation, Cornell University, Ithaca, NY.
—. 1997. A monograph of *Corallorhiza* (Orchidaceae). Harvard Papers in Botany 10: 5-51.
—. 1999a. Relationships and character transformation in Pyroloideae (Ericaceae) based on ITS sequences, morphology, and development. Systematic Botany 24: 398-408.
—. 1999b. A new species of *Corallorhiza* (Orchidaceae) from West Virginia, U.S.A. Novon 9: 511-513.
Freytag, G.F., and D.G. Debouck. 2002. Taxonomy, distribution, and ecology of the genus *Phaseolus* (Leguminosae – Papilionoidae) in North America, Mexico and Central America. Sida, Bot. Misc. 23: 1-300.
Fritsch, P.W., and S.D. Lucas. 2000. Clinal variation in the *Halesia carolina* complex (Styracaceae). Systematic Botany 25: 197-210.
Frodin, D.G., and R. Govaerts. 1996. World checklist and bibliography of Magnoliaceae. Kew Botanic Gardens, Kew, England.
—, and R. Govaerts. 2003. World checklist and bibliography of Araliaceae. Kew Botanic Gardens, Kew, England.
Fross, D., and D. Wilken. 2006. *Ceanothus*. Timber Press, Portland, OR. 272 pp.
Frye, C.T., and C. Lea. 2002. Atlas and annotated list of *Carex* (Cyperaceae) of Maryland and the District of Columbia. The Maryland Naturalist 44: 41-108.
Fryxell, P.A. 2002. An *Abutilon* nomenclator. Lundellia 5: 79-118.
Fu, C., H. Kong, Y. Qiu, and K.M. Cameron. 2005. Molecular phylogeny of the east Asian - North American disjunct *Smilax* sect. *Nemexia* (Smilacaceae). Int. J. Plant Sci. 166: 301-309.
Fuertes Aguilar, J., P.A. Fryxell, and R.K. Jansen. 2003. Phylogenetic relationships and classification of the *Sida* generic alliance (Malvaceae) based on nrDNA ITS evidence. Systematic Botany 28: 352-364.
Furlow, J.J. 1987a. The *Carpinus caroliniana* complex in North America. I. A multivariate analysis of geographical variation. Systematic Bot. 12: 21-40.
—. 1987a. The *Carpinus caroliniana* complex in North America. II. Systematics. Systematic Bot. 12: 416-434.
—. 1990. The genera of Betulaceae in the southeastern United States. J. Arnold Arb. 71: 1-67.
Fusiak, F., and E.E. Schilling. 1984. Systematics of the *Prenanthes roanensis* complex (Asteraceae: Lactuceae). Bull. Torrey Bot. Club 111: 338-348.
Gaddy, L.L. 1981. Two carices new to South Carolina. Castanea 46: 237-238.
—. 1986. A new heartleaf (*Hexastylis*) from Transylvania County, North Carolina. Brittonia 38: 82-85.
—. 1987a. A review of the taxonomy and biogeography of *Hexastylis* (Aristolochiaceae). Castanea 52: 186-196.
—. 1987b. *Hexastylis shuttleworthii* var. *harperi* (Aristolochiaceae), a new variety of heartleaf from Alabama and Georgia. Sida 12: 51-56.
—. 1990. [*Echinacea*]
—. 1995. *Carex radfordii* (section *Laxiflorae*: Cyperaceae), a new species from the Southern Appalachians. Novon 5: 259-261.
—, and D.A. Rayner. 1980. Rare or overlooked? Recent plant collections from the Coastal Plain of South Carolina. Castanea 45: 181-184.
Gadek, P.A., D.L. Alpers, M.M. Heslewood, and C.J. Quinn. 2000. Relationships within Cupressaceae sensu lato: a combined morphological and molecular approach. Am. J. Bot. 87: 1044-1057.
Gale, S. 1944. *Rhynchospora*, section *Eurhynchospora*, in Canada, the United States and the West Indies. Rhodora 46: 89-278.

Ganders, F.R., M. Berbee, and M. Pirseyedi. 2000. ITS base sequence phylogeny in *Bidens* (Asteraceae): evidence for the continental relatives of Hawaiian and Marquesan *Bidens*. Systematic Bot. 25: 122-133.
Gandhi, K.N. 1989. A biosystematic study of the *Schizachyrium scoparium* complex. Ph. D. dissertation, Texas A. & M. Univ.
——. 1999. Nomenclatural novelties for the Western Hemisphere plants. II. Harvard papers in Botany 4: 295-299.
——, R.D. Thomas, and S.L. Hatch. 1987. Cuscutaceae of Louisiana. Sida 12: 361-379.
——, and M.E. Barkworth. 2003. Nomenclatural and taxonomic review of knotroot bristle grass (*Setaria parviflora*, Gramineae). Rhodora 105: 197-204.
——, and B.E. Dutton. 1993. Palisot de Beauvois, the correct combining author of *Erianthus giganteus* (Poaceae). Taxon 42: 855-856.
——, and R.D. Thomas. 1989. Asteraceae of Louisiana. Sida, Bot. Misc. 4: 1-202.
——, and R.D. Thomas. 1991. Additional notes on the Asteraceae of Louisiana. Sida 14: 514-517.
Garrison, J. 1992. The other side of *Lygodium palmatum*. Fiddlehead Forum 19: 10.
Gaskin, J.F., F. Ghahremani-nejad, D.-y. Zhang, and J.P. Londo. 2004. A systematic overview of Frankeniaceae and Tamaricaceae from nuclear rDNA and plastid sequence data. Ann. Missouri Bot. Gard. 401-409.
Gastony, G.J. 1977. Chromosomes of the independently reproducing Appalachian gametophyte – a new source of taxonomic evidence. Systematic Bot. 2: 43-48.
——. 1988. The *Pellaea glabella* complex: electrophoretic evidence for the deivations of the agamosporous taxa and a revised taxonomy. Amer. Fern. J. 78: 44-67.
——, and D.R. Rollo. 1998. Cheilanthoid ferns (Pteridaceae: Cheilanthoideae) in the southwestern United States and adjacent Mexico – a molecular phylogenetic reassessment of generic lines. Aliso 17: 131-144.
——, and D.E. Soltis. 1977. Chromosome studies of *Parnassia* and *Lepuropetalon* (Saxifragaceae) from the eastern United States. A new base number for Parnassia. Rhodora 79: 573-578.
——, and M.C. Ungerer. 1997. Molecular systematics and a revised taxonomy of the onocleoid ferns (Dryopteridaceae: Onocleeae). Am. J. Bot. 84: 840-849.
——, G. Yatskievych, and C.K. Dixon. 1992. Chloroplast DNA restriction site variation in the fern genus *Pellaea*: phytogenetic relationships of the *Pellaea glabella* complex. Am. J. Bot. 79: 1072-1080.
Gattinger, A. 1901. The flora of Tennessee and a philosophy of botany respectfully dedicated to the citizens of Tennessee. Gospel Advocate Publishing Company, Nashville, TN.
Gensel, W.H. 1988. *Rhododendron* subsection *Caroliniana*. Rhododendron Notes & Records vol. 2. Proc. of 3rd Rhododendron Conference, April 29-30, 1985. Rhododendron Species Foundation, Washington, DC.
Geoffroy, M., and W.G. Berendson. 2003. The concept problem in taxonomy: importance, components, approaches. In: W.G. Berendsohn (ed.). MoReTax: handling factual information linked to taxonomic concepts in biology. Schriftenreihe für Vegetationskunde 39: 5-14.
Gernandt, D.S., G. Geada López, S. Ortiz García, and A. Liston. 2005. Phylogeny and classification of *Pinus*. Taxon 54: 29-42.
Gibson, T.C. 1991. Differential escape of insects from carnivorous plant traps. Am. Midl. Nat. 125: 55-62.
Gil-ad, N.L. 1998. The micromorphologies of seed coats and petal trichomes of the taxa of *Viola* subsect. *Boreali-Americanae* (Violaceae) and their utility in discerning orthospecies from hybrids. Brittonia 50: 91-121.
Gill, L.S. 1977. A cytosystematics study of the genus *Monarda* L. (Labiatae) in Canada. Caryologia 30: 381-394.
Gillespie, J.P. 1962. A theory of relationships in the *Lycopodium inundatum* complex. Amer. Fern J. 52: 19-26.
Gillett, G.W. 1964. Genetic barriers in the *Cosmanthus* Phacelias (Hydrophyllaceae). Rhodora 66: 359-368.
——. 1968. Systematic relationships in the *Cosmanthus* Phacelias (Hydrophyllaceae). Brittonia 20: 368-374.
Gillett, J.M. 1957. A revision of the North American species of *Gentianella* Moench. Ann. Mo. Bot. Garden 44: 195-269.
——. 1959. A revision of *Bartonia* and *Obolaria* (Gentianaceae). Rhodora 61: 43-63.
Gillis, W.T. 1971. The systematics and ecology of poison-ivy and the poison-oaks (*Toxicodendron*, Anacardiaceae). Rhodora 73: 72-159, 161-237, 370-443, 465-540.
Ginzbarg, S. 1992. A new disjunct variety of *Croton alabamensis* (Euphorbiceae) from Texas. Sida 15: 41-52.
Gleason, H.A. 1952. The new Britton and Brown illustrated flora of the northeastern United States and adjacent Canada. New York Botanical Garden and Hafner Press, New York, N.Y.
Gleason, H.A., and A. Cronquist. 1991. Manual of vascular plants of northeastern United States and adjacent Canada, second edition. New York Botanical Garden, Bronx, NY.
Godfrey, R.K. 1948. Studies in the Compositae of North Carolina. I. *Liatris*. J. Elisha Mitchell Scientific Society 64: 241-249.
——. 1949. Studies in the Compositae of North Carolina. II. The Compositae of Wake, Durham, and Orange counties. J. Elisha Mitchell Scientific Society 65: 276-305.
———-. 1969. *Pieris phillyreifolia* (Hook.) DC. (Ericaceae) in South Carolina. Sida 3: 447-448.
——. 1988. Trees, shrubs, and woody vines of northern Florida and adjacent Georgia and Alabama. University of Georgia Press, Athens.
——, and P. Adams. 1964. The identity of *Sagittaria isoetiformis* (Alismataceae). Sida 1: 269-273.
——, and R. Kral. 1958. Observations on the Florida flora. Brittonia 10: 166-177.
——, and J.W. Wooten. 1979. Aquatic and wetland plants of southeastern United States, monocotyledons. Univerity of Georgia Press, Athens, Georgia.
——, and J.W. Wooten. 1981. Aquatic and wetland plants of southeastern United States, dicotyledons. Univerity of Georgia Press, Athens, Georgia.

Godt, M.J.W., and J.L. Hamrick. 1995. Low levels of allozyme differentiation between *Pyxidanthera* (pyxie-moss) taxa (Diapensiaceae). Pl. Syst. Evol. 195: 159-168.
——, and J.L. Hamrick. 1999. Genetic divergence among infraspecific taxa of *Sarracenia purpurea*. Systematic Botany 23: 427-438.
Goetsch, L., A.J. Eckert, and B.D. Hall. 2005. The molecular systematics of *Rhododendron* (Ericaceae): a phylogeny based upon RPB2 gene sequences. Systematic Botany 30: 616-626.
Goldblatt, P. 1976. Chromosome number and its significance in *Batis maritima* (Bataceae). J. Arnold Arb. 57: 526-530.
——, and D.J. Mabberley. 2005. *Belamcanda* included in *Iris*, and the new combination *I. domestica* (Iridaceae: Irideae). Novon 15: 128-132.
——, J. Manning, and G. Dunlop. 2004. *Crocosmia* and *Chasmanthe*. Royal Horticultural Society Plant Collector Guide. Timber Press, Portland, OR. 219 pp.
Goldman, D.H. 1998. *Hovenia dulcis* (Rhamnaceae) naturalized in central Texas. Sida 18: 350-352.
——. 1999. Distribution update: *Sabal minor* in Mexico. Palms 43: 40-44.
——, C. van den Berg, and M.P. Griffith. 2004. Morphometric circumscription of species and infraspecific taxa in *Calopogon* R. Br. (Orchidaceae). Plant Syst. Evol. 247: 37-60
Gonsoulin, G.J. 1974. A revision of *Styrax* (Styracaceae) in North America, Central America, and the Caribbean. Sida 5: 191-258.
Goodspeed, T. H. 1954. The genus *Nicotiana*: origins, relationships and evolution of its species in the light of their distribution, morphology and cytogenetics. Chronica Botanica Co., Waltham, Mass. 536 pp.
Gordon, J.E. 1981. *Arachniodes simplicior* new to South Carolina and the United States. Amer. Fern J. 71: 65-68.
Gottlieb, J.E. 2002. *Lycopodium lagopus* new in West Virginia. Amer. Fern J. 92: 241-242.
Gould, F.W. 1967. The grass genus *Andropogon* in the United States. Brittonia 19: 70-76.
——. 1975. The grasses of Texas. Texas A. & M. University Press, College Station, Texas.
——. 1979. The genus *Bouteloua* (Poaceae). Ann. Missouri Bot. Gard. 66: 348-416.
——, and C.A. Clark. 1978. *Dichanthelium* (Poaceae) in the United States and Canada. Ann. Missouri Bot. Gard. 65: 1088-1132.
Gould, K.R. 1996. A new, disjunct variety of *Spigelia gentianoides* (Loganiaceae) from Bibb County, Alabama. Sida 17: 417-421.
Gould, K.R., and M.J. Donoghue. 2000. Phylogeny and biogeography of *Triosteum* (Caprifoliaceae). Harvard Papers in Botany 5: 157-166.
Govaerts, R. 1998. World checklist and bibliography of Fagales (Betulaceae, Corylaceae, Fagaceae and Ticodendraceae). Royal Botanic Gardens, Kew, England.
——, D.G. Frodin, and T.D. Pennington. 2001. World checklist and bibliography of Sapotaceae. Royal Botanical Gardens, Kew, England.
——, D.G. Frodin, and A. Radcliffe-Smith. 2000. World checklist and bibliography of Euphorbiaceae (with Pandaceae). Volumes 1-4. Royal Botanic Gardens, Kew, England.
Govus, T.E. 1987. The occurrence of *Sarracenia oreophila* (Kearney) Wherry in the Blue Ridge Province of southwestern North Carolina. Castanea 52: 310-311.
Graetz, K.E. 1973. Seacoast plants of the Carolinas for conservation and beautification. U.S. Dept. of Agriculture and Soil Conservation Service, Raleigh, NC and Columbia SC.
Graham, S.A. 1966. The genera of Araliaceae in the southeastern United States. J. Arnold Arb. 47: 126-136.
——. 1975. Taxonomy of the Lythraceae in the southeastern United States. Sida 6: 80-103.
——. 1985. A revision of *Ammannia* (Lythraceae) in the western hemisphere. J. Arnold Arb. 66: 395-420.
——, and C.E. Wood, Jr. 1965. The genera of Polygonaceae in the southeastern United States. J. Arnold Arb. 46: 91-121.
——, and C.E. Wood, Jr. 1975. The Podostemaceae of the southeastern United States. J. Arnold Arb. 56: 456-465.
Grant, A.L. 1924. A monograph of the genus *Mimulus*. Ann. Mo. Bot. Garden 11: 99-389.
Grant, E., and C. Epling. 1943. A study of *Pycnanthemum* (Labiatae). Univ. of Calif. Publ. in Botany 20: 195-240.
Grant, V. 1956. A synopsis of *Ipomopsis*. Aliso 3: 351-362.
——. 1997. Nomenclature of subfamilies and tribes in the Polemoniaceae. Phytologia 83: 385-389.
——. 1998. Primary classification and phylogeny of the Polemoniaceae, with comments on molecular cladistics. Amer. J. Bot. 85: 741-752.
——. 2003. Taxonomy of the Polemoniaceae: the subfamilies and tribes. Sida 20: 1371-1385.
Grant, W.F., and B.K. Thompson. 1975. Observations on Canadian birches, *Betula cordifolia*, *B. neoalaskana*, *B. populifolia*, *B. papyrifera*, and *B.* × *caerulea*. Can J. Bot. 53: 1478-1490.
Gray, J.R., and D.E. Fairbrothers. 1971. A clarification of some misconceptions about *Amphicarpum purshii* (Gramineae). Bull. Torrey Bot. Club 98: 174-175.
Grayum, M.H. 1987. A summary of evidence and arguments supporting the removal of *Acorus* from the Araceae. Taxon 36: 723-729.
Grear, J.W. 1978. A revision of the New World species of *Rhynchosia* (Leguminosae-Faboideae). Mem. New York Bot. Gard. 31: 1-168.
Green, E.P., and F. T. Short. 2003. World Atlas of seagrasses. Prepared by the UNEP World Consservation Monitoring Centre. Univ. of Calif. Press, Berkeley, Calif., US.

Green, P.S. 1962. Watercress in the New World. Rhodora 64: 32-43.
——. 1966. Identification of the species and hybrids in the *Lonicera tatarica* complex. J. Arnold Arb. 47: 75-88.
Greene, C.W. 1980. The systematics of *Calamagrostis* (Gramineae) in eastern North America. Ph. D. thesis, Harvard University, Cambridge, Mass.
Greene, E.L. 1892. On certain Spiraeaceae. Pittonia 2: 219-222.
Gregg, K.B. 1991. Defrauding the deceitful orchid: pollen collection by pollinators of *Cleistes divaricata* and *C. bifaria*. Lindleyana 6: 214-220.
Greuter, W., J. McNeill, F.R. Barrie, H.-M. Burdet, V. Demoulin, T. S. Filgueiras, D.H. Nicolson, P.C. Silva, J.E. Skog, P. Trehane, N.J. Turland, and D.L. Hawksworth. 2000. International Code of Botanical Nomenclature (St. Louis Code) adopted by the Sixteenth International Botanical Congress, St. Louis, Missouri, July-August 1999. Regnum Vegetabile 131. Koeltz Scientific Books, Königstein.
Grimes, J.W. 1988. Systematics of New World Psoraleae (Leguminosae-Faboideae). Ph.D. dissertation, Univ. of Texas at Austin.
——. 1990. A revision of the New World species of Psoraleeae (Leguminosae: Papilionoideae). Memoirs N.Y. Bot. Gard. 61: 1-114.
Groves, C.R. 2003. Drafting a conservation blueprint: a practitioner's guide to planning for biodiversity. Island Press. 457 pp.
Guillon, J.-M. 2004. Phylogeny of horsetails (*Equisetum*) based on the chloroplast rps4 gene and adjacent noncoding sequences. Systematic Botany 29: 251-259.
Gusman, G., and L. Gusman. 2002. The genus *Arisaema*: a monograph for botanists and nature lovers. Gantner, Ruggell, Lichtenstein. 438 pp.
Gustafson, D.J., G. Romano, R.E. Latham, and J.K. Morton. 2003. Amplified fragment length polymorphism analysis of genetic relationships among the serpentine barrens endemic *Cerastium velutinum* Rafinesque var. *villosissimum* Pennell (Caryophyllaceae) and closely related *Cerastium* species. J. Torrey Bot. Soc. 130: 218-223.
Gustafsson, M.H.G., V. Bittrich, and P.F. Stevens. 2002. Phylogeny of Clusiaceae based on rbcL sequences. Int. J. Plant Sci. 163: 1045-1054.
Guthrie, W. 1820. A universal geography; or, a view of the present state of the known world. Benj. Warner, Philadelphia, PA.
Hágsater, E. 2000. New names for Florida orchids. North American Native Orchid Journal 6: 299-309.
Haines, A.A. 2002. A new combination in *Lycopodiella* (Lycopodiaceae). Rhodora 104: 296-298.
——. 2003a. The families Huperziaceae and Lycopodiaceae of New England: a taxonomic and ecological reference. V.F. Thomas Co., Bowdoin, ME. 100 pp.
——. 2003b. *Lycopodiella ×gilmanii* (Lycopodiaceae), a new hybrid bog clubmoss from northeastern North America. Amer. Fern J. 93: 196-202.
——. 2004. New combination in *Poa*. Botanical Notes 10: 1-5.
Halda, J.J. 1996. The genus *Gentiana*. SEN, Dobré.
Hall, D.W. 1982. *Sorghastrum* (Poaceae) in Florida. Sida 9: 302-308.
——. 1998. Is Cogon Grass really an exotic? Wildland Weeds 1: 14-15.
Hall, J.C., K.J. Sytsma, and H.H. Iltis. 2002. Phylogeny of Capparaceae and Brassicaceae based on chloroplast sequence data. Amer. J. Botany 89: 1826-1842.
Hämet-Ahti, L. 1980. *Juncus trifidus* L. subsp. *carolinianus* Hämet-Ahti, n. subsp., in eastern North America. Veröff. Geobot. Inst. ETH Stiftung Rübel, Zurich 69: 7-13.
Hamilton, C.W., and S.H. Reichard. 1992. Current practice in the use of subspecies, variety, and forma in the classification of wild plants. Taxon 41: 485-498.
Hamzeh, M., and S. Dayanandan. 2004. Phylogeny of *Populus* (Salicaceae) based on nucleotide sequences of chloroplast trnT-trnF region and nuclear rDNA. Amer. J. Botany 91: 1398-1408.
Hancock, J.F. 2004. Plant evolution and the origin of crop species, second edition. CABI Publishing, Oxon, UK. 313 pp.
Hancock, T.E., and P.E. Hosier. 2003. Ecology of the threatened species *Amaranthus pumilus* Rafinesque. Castanea 68: 236-244.
Hanks, G.R., ed. 2002. Narcissus and daffodil: the genus *Narcissus*. Taylor & Francis, London. 428 pp.
Hansen, B.F., and R.P. Wunderlin. 1988. Synopsis of *Dichanthelium* (Poaceae) in Florida. Ann. Missouri Bot. Gard. 75: 1637-1657.
Hao, G., Y.-M. Yuan, C.-M. Hu, X.-J. Ge, and N.-X. Zhao. 2004. Molecular phylogeny of *Lysimachia* (Myrsinaceae) based on chlorplast trnL-F and nuclear ribosomal ITS sequences. Molecular Phylogenetics and Evolustion 31: 323-339.
Hardin, J.W. 1952. The Juglandaceae and Corylaceae of Tennessee. Castanea 17: 78-89.
——. 1957a. A revision of the American Hippocastanaceae – I. Brittonia 9: 145-171.
——. 1957b. A revision of the American Hippocastanaceae – II. Brittonia 9: 173-195.
——. 1961. A hybrid population of *Habenaria* and variation in *H. blephariglottis*. Castanea 26: 120-123.
——. 1963. *Pachystima canbyi* in North Carolina. Castanea 28: 177-178.
——. 1964a. A comparison of *Phytolacca americana* and *P. rigida*. Castanea 29: 155-164.
——. 1964b. Variation in *Aconitum* of eastern United States. Brittonia 16: 80-94.
——. 1968. *Diervilla* (Caprifoliaceae) of the southeastern United States. Castanea 33: 31-36.
——. 1971a. Studies of the southeastern United States flora. I. Betulaceae. J. Elisha Mitch. Sci. Soc. 87: 39-41.
——. 1971b. Studies of the southeastern United States flora. II. The gymnosperms. J. Elisha Mitchell Sci. Soc. 87: 43-50.

——. 1972. Studies of the southeastern United States flora. III. Magnoliaceae and Illiciaceae. J. Elisha Mitchell Sci. Soc. 88: 30-32.
——. 1973. The enigmatic chokeberries (Aronia, Rosaceae). Bull. Torrey Bot. Club 100: 178-184.
——. 1974. Studies of the southeastern United States flora. IV. Oleaceae. Sida 5: 274-285.
——. 1975. Hybridization and introgression in *Quercus alba*. J. Arnold Arb. 56: 336-363.
——. 1976. Terminology and classification of *Quercus* trichomes. J. Elisha Mitch. Sci. Soc. 92: 151-161.
——. 1979. Stellate and "stellate" trichomes and stellate vestiture. ASB Bulletin 26: 74.
——. 1985. Foliar trichomes in american beech. ASB Bulletin 32: 46.
——. 1990. Variation patterns and recognition of varieties in *Tilia americana* s.l. Systematic Bot. 15: 33-48.
——. 1992. Foliar morphology of the common trees of North Carolina and adjacent states. N.C. Agricultural Research Service Tech. Bull. 298. 135 pp.
——, and R.L. Beckmann. 1982. Atlas of foliar surface features in woody plants. V. *Fraxinus* (Oleaceae) of eastern North America. Brittonia 34: 129-140.
——, and G.P. Johnson. 1985. Atlas of foliar surface features in woody plants, VIII. *Fagus* and *Castanea* (Fagaceae) of eastern North America. Bull. Torrey Bot. Club 112: 11-20.
——, and K.A. Jones. 1989. Atlas of foliar surface features in woody plants, X. Magnoliaceae of the United States. Bull. Torrey Bot. Club 116: 164-173.
——, and L.L. Phillips. 1985a. Atlas of foliar surface features in woody plants, VII. *Rhus* subg. *Rhus* (Anacardiaceae) of North America. Bull. Torrey Bot. Club 112: 1-10.
——, and L.L. Phillips. 1985b. Hybridization in eastern North American Rhus (Anacardiaceae). ASB Bulletin 32: 99-106.
——, and D.E. Stone. 1984. Atlas of foliar surface features in woody plants, VI. *Carya* (Juglandaceae) of North America. Brittonia 36: 140-153.
——, R.L. Kologiski, J.R. Massey, J.F. Matthews, J.D. Pittillo, and A.E. Radford. 1977. Vascular plants. In J.E. Cooper, S.S. Robinson, and J.B. Funderburg (eds.). Endangered and threatened plants and animals of North Carolina: proceedings of a symposium on endangered and threatened biota of North Carolina, Meredith College, Raleigh, November 7-8, 1975.
Harms, V.L. 1974. A preliminary conspectus of *Heterotheca* section *Chrysopsis* (Compositae). Castanea 39: 155-165.
Harper, R.M. 1905. *Mesadenia lanceolata* and its allies. Torreya 5: 182-185.
——. 1906. Some new or otherwise noteworthy plants from the coastal plain of Georgia. Bull. Torrey Bot. Club 33: 229-233.
——. 1944. Notes on *Plantago*, with special reference to *P. cordata*. Castanea 9: 121-130.
Hart, J.A., and R.A. Price. 1990. The genera of Cupressaceae (including Taxodiaceae) in the southeastern United States. J. Arnold Arb. 71: 275-322.
Hartman, R.L., and B.E. Nelson. 1998. Taxonomic novelties from North America north of Mexico: a 20-year vascular plant diversity baseline. Monographs in Systematic Botany from the Missouri Botanical Garden 67: 1-59.
Harvill, A.M., Jr., T.R. Bradley, C.E. Stevens, T.F. Wieboldt, D.M.E. Ware, D.W. Ogle, G.W. Ramsey, and G.P. Fleming. 1992. Atlas of the Virginia flora, third edition. Virginia Botanical Associates, Burkeville, VA.
Haskins, M.L., and W.J. Hayden. 1987. Anatomy and affinities of *Penthorum*. Am. J. Bot. 74: 164-177.
Hatley, J.R. 1977. An analysis of variation in *Shortia galacifolia*. M.S. thesis, Dept. of Botany, North Carolina State University.
Hauber, D.P., and L. Legé. 1999. A survey of allozymic variation among three members of the *Sagittaria graminea* complex (Alismataceae) from the southeastern United States. J. Torrey Bot. Soc. 126: 181-187.
Haufler, C.M., D.E. Soltis, and P.S. Soltis. 1995. Phylogeny of the *Polypodium vulgare* complex: insights from chloroplast DNA restriction site data. Systematic Bot. 20: 110-119.
——, and M.D. Windham. 1991. New species of North American *Cystopteris* and *Polypodium*, with comments on their reticulate relationships. Amer. Fern J. 81: 7-23.
——, M.D. Windham, and E.W. Rabe. 1995. Reticulate evolution in the *Polypodium vulgare* complex. Systematic Bot. 20: 89-109.
——, M.D. Windham, and T.A. Ranker. 1990. Biosystematic analysis of the *Cystopteris tennesseensis* (Dryopteridaceae) Complex. Ann. Missouri Bot. Gard. 77: 314-329.
Hauk, W.D. 1996. Phylogenetics of Ophioglossaceae: the evolutionary consequences of morphological reduction. Ph.D. dissertation, University of North Carolina at Chapel Hill, Biology dept.
——, C.R. Parks, and M.W. Chase. 2003. Phylogenetic studies of Ophioglossaceae: evidence from rbcL and trnL-F plastid DNA sequences and morphology. Molecular Phylogenetics and Evolution 28: 131-151.
Hauke, R.L. 1979. *Equisetum ramosissimum* in North America. Amer. Fern J. 69: 1-5.
——. 1984. *Equisetum ramosissimum* in Louisiana. Amer. Fern J. 74: 61.
——. 1992. Revisiting *Equisetum ramosissimum*. Amer. Fern J. 82: 83-84.
Hayden, W.J., and S.M. Hayden. 1984. Wood anatomy and relationships of *Betula uber*. Castanea 49: 26-30.
Hayes, D.W. 1946. Two remarkable range extensions. Castanea 11: 61-62.
Haynes, R.R. 1971. A monograph of the genus *Conopholis* (Orobanchaceae). Sida 4: 246-264.
——. 1977. The Najadaceae in the southeastern United States. J. Arnold Arb. 58: 161-170.
——. 1978. The Potamogetonaceae in the southeastern United States. J. Arnold Arb. 59: 170-191.
——. 1979. Revision of North and Central American *Najas* (Najadaceae). Sida 8: 34-56.
——. 1987. The Zannichelliaceae in the southeastern United States. J. Arnold Arb. 68: 259-268.
——. 1998. Noteworthy collections: Alabama. Castanea 63: 81-82.

——, and J.R. Burkhalter. 1998. A new species of *Echinodorus* (Alismataceae) from the United States of America. Castanea 63: 180-182
——, and C.B. Hellquist. 1996. New combinations in North American Alismatidae. Novon 6: 370-371.
——, D.H. Les, and M. Král. 1998. Two new combinations in *Stuckenia*, the correct name for *Coleogeton* (Potamogetonaceae). Novon 8: 241.
Hays, J.F. 1998a. Priority of the name *Agalinis harperi* (Scrophulariaceae) over the names *Agalinis delicatula* and *Agalinis pinetorum*. Sida 18: 369-370.
——. 1998b. *Agalinis* (Scrophulariaceae) in the Ozark highlands. Sida 18: 555-577.
Heafner, K.D. 2001. *Pellaea wrightiana* Hooker (Pteridaceae) in North Carolina revisted with a new record for eastern North America and a key to *Pellaea* species in the Carolinas. Castanea 66: 319-326.
Heard, S.B., and J.C. Semple. 1988. The *Solidago rigida* complex (Compositae: Astereae): a multivariate morphometric analysis and chromosome numbers. Can. J. Bot. 66: 1800-1807.
Heiser, C.B., Jr., and B. Pickersgill. 1975. Names for the bird peppers [*Capsicum* - Solanaceae]. Baileya 19: 151-156.
——, Jr, D.M. Smith, S.B. Clevenger, and W.C. Martin, Jr. 1969. The North American sunflowers (*Helianthus*). Mem. Torrey Bot. Club 22: 1-218.
Helfgott, D.M., and R.J. Mason-Gamer. 2004. The evolution of North American *Elymus* (Triticeae, Poaceae) allotetraploids: evidence from phosphoenolpyruvate carboxylase gene sequences. Systematic Botany 29: 850-861.
Henderson, A., G. Galeano, and R. Bernal. 1995. Field guide to the palms of the Americas. Princeton Univ. Press, Princeton, NJ. 352 pp.
Henrard, J.T. 1929. A monograph of the genus *Aristida*. Mededeelingen Rijks-Herb. 58: 1-325.
Henrickson, J. 1987. A taxonomic reevaluation of *Gossypianthus* and *Guilleminea* (Amaranthaceae). Sida 12: 307-337.
——. 1999. Studies in New World *Amaranthus* (Amaranthaceae). Sida 18: 783-807.
Henry, M.G. 1946. A new lily from southern Alabama and northern Florida. Bartonia 24: 1-4.
Hermann, F.J. 1947. A new species of *Carex* from Tennessee. Castanea 12: 113-115
Herndon, A. 1993. Notes on *Chamaesyce* (Euphorbiaceae) in Florida. Rhodora 95: 352-368.
Herrera Arrieta, Y., P.M. Peterson, and M. de la Cerda Lemus. 2004. Revisión de *Bouteloua* Lag. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad y Instituto Politécnico Nacional, Durango, Mexico. 187 pp.
Hershkovitz, M.A., and E.A. Zimmer. 2000. Ribosomal DNA evidence and disjunctions of western American Portulacaceae. Molecular Phylogenetics and Evolution 15: 419-439.
Hess, W.J., and N.A. Stoynoff. 1998. Taxonomic status of *Quercus acerifolia* (Fagaceae) and a morphological comparison of four members of the *Quercus shumardii* complex. Systematic Bot. 23: 89-100.
Hickey, R.J. 1977. The *Lycopodium obscurum* complex in North America. Amer. Fern J. 67: 45-48.
——, and J.M. Beitel. 1979. A name change for *Lycopodium flabelliforme*. Rhodora 81: 137-140.
Hilger, H.H., and N. Diane. 2003. A systematic analysis of Heliotropiaceae (Boraginales) based on trnL and ITS1 sequence data. Bot. Jahrb. Syst. 125: 19-51.
Hill, L.M. 1992. A floristic and chromosomal study of the Fumariaceae in Virginia. Castanea 57: 273-281.
Hill, S.R. 1992. Calciphiles and calcareous habitats of South Carolina. Castanea 57: 25-33.
———-. 1999. The relict flora of ice ponds in South Carolina. Castanea 64: 14-22.
——, and C.N. Horn. 1997. Additions to the flora of South Carolina. Castanea 62: 194-208.
Hillig, K.W., and P.G. Mahlberg. 2004. A chemotaxonomic analysis of cannabinoid variation in *Cannabis* (Cannabaceae). Amer. J. Bot. 91: 966-975.
Hilton, J.L., and R.S. Boyd. 1996. Microhabitat requirements and seed/microsite limitation of the rare granite outcrop endemic *Amphianthus pusillus* (Scrophulariaceae). Bull. Torrey Bot. Club 123: 189-196.
Hilu, K.W. 1980. Noteworthy collections: *Eleusine tristachya*. Madroño 27: 177-178.
Hinton, B.D. 1968. *Parietaria praetermissa* (Urticaceae), a new species from the southeastern United States. Sida 3: 191-194.
Hitchcock, A.S., and A. Chase. 1910. The North American species of *Panicum*. Contr. U.S. Natl. Herb. 15: 1–396.
——, and A. Chase. 1950. Manual of the grasses of the United States, second edition. U.S. Dept. of Agriculture Miscellaneous Publication No. 200 (reprinted in 1971 by Dover Publications, New York).
Hitchcock, C.L. 1944. The *Tofieldia glutinosa* complex of western North America. Amer. Midl. Naturalist 31: 487-498.
Ho, T.-N., and S.-W. Liu. 1990. The infrageneric classification of *Gentiana* (Gentianaceae). Bull. Br. Mus. nat. Hist. (Bot.) 20: 169-192.
——, and S.W. Liu. 2001. A worldwide monograph of *Gentiana*. Science Press, Beijing.
Hodgdon, A.R. 1938. A taxonomic study of *Lechea*. Rhodora 40: 29-69, 87-131.
Hodkinson, T.R., M.W. Chase, M.D. Lledó, N. Salamin, and S.A. Renvoize. 2002. Phylogenetics of *Miscanthus*, *Saccharum*, and related genera (Saccharinae, Andropogoneae, Poaceae) based on DNA sequences from ITS nuclear ribosomal DNA and plastid trnL intron and trnL-F intergenic spacers. J. Plant. Res. 115: 381-392.
Holm, T. 1896. A study of some anatomical characters of North American Gramineae. VII. The genus *Amphicarpum*. Bot. Gazette {}: 403-406.
Holmes, W.C. 1995. Review preparatory to an infrageneric classification of *Mikania* (Tribe: Eupatoriae). In Hind, D.J.N., C. Jeffrey, and G.V. Pope (eds.). Advances in Compositae systematics, pp. 239-254. Royal Botanic Gardens, Kew.
Holmgren, N.H. 1994. Redefinition of *Dodecatheon dentatum* (Primulaceae) and rationale for use of varietal rank. Brittonia 46: 87-94.

Holub, J. 1975a. *Diphasiastrum*, a new genus in Lycopodiaceae. Preslia (Praha) 47: 97-110.
——. 1975b. Notes on some species of *Diphasiastrum*. Preslia (Praha) 47: 232-240.
Homoya, M.A. 1993. Orchids of Indiana. Indiana Academy of Science, Bloomington, IN. 276 pp.
Hoot, S.B., S. Magallón, and P.R. Crane. 1999. Phylogeny of basal eudicots based on three molecular data sets: atpB, rbcL, and 18S nuclear ribosomal DNA sequences. Ann. Missouri Bot. Garden 86: 1-32.
——, N.S. Napier, and W.C. Taylor. 2004. Revealing unknown or extinct lineages within *Isoëtes* (Isoëtaceae) using DNA sequences from hybrids. Amer. J. Bot. 91: 899-204.
——, A.A. Reznicek, and J.D. Palmer. 1994. Phylogenetic relationships in *Anemone* (Ranunculaceae) based on morphology and chloroplast DNA. Systematic Bot. 19: 169-200.
Hopkins, C.O., and W.H. Blackwell, Jr. 1977. Synopsis of *Suaeda* (Chenopodiaceae) in North America. Sida 7: 147-173.
Hopkins, M. 1937. Arabis in eastern and central North America. Rhodora 39: 63-186.
Horn, C.N. 1997. An ecological study of *Frasera caroliniensis* in South Carolina. Castanea 62: 185-193.
——. 1998. Noteworthy collections: North Carolina and Virginia. Castanea 63: 495.
Hornberger, K.L. 1991. The blue-eyed-grasses (*Sisyrinchium*: Iridaceae) of Arkansas. Sida 14: 597-604.
Horton, J.H. 1963. A taxonomic revision of *Polygonella* (Polygonaceae). Brittonia 15: 177-203.
——. 1972. Studies of the southeastern United States flora. IV. Polygonaceae. J. Elisha Mitchell Sci. Soc. 88: 92-102.
Hoshizaki, B.J., and K.A. Wilson. 1999. The cultivated species of the fern genus *Dryopteris* in the United States. American Fern Journal 89: 1-98.
Howard, R.A., and G.W. Staples. 1983. The modern names for Catesby's plants. J. Arnold Arb. 64: 511-546.
Hsiao, J.Y., and M.L. Lin. 1995. A chemotaxonomic study of essential oils from the leaves of genus *Clerodendrum* (Verbenaceae) native to Taiwan. Bot. Bull. Acad. Sin. 36: 247-251.
Hu, Shiu-ying. 1954-56. A monograph of the genus *Philadelphus*. J. Arnold Arb. 35: 276-333; 36: 52-109; 37: 15-90.
——. 1979. *Ailanthus*. Arnoldia 39: 29-50.
Huck, R.B. 1984. Systematics and evolution of *Dicerandra* (Labiatae). Ph.D. dissertation, Univ. of North Carolina at Chapel Hill, Dept. of Biology.
——. 1987. Systematics and evolution of *Dicerandra* (Labiatae). Phanerogamarum Monographiae Tomus XIX. J. Cramer, Berlin. 343 pp.
——, and H.L. Chambers. 1997. Polyploidy: a factor in the evolution of *Dicerandra* Benth. (Labiatae). Edinb. J. Bot. 54: 217-229.
Huft, M.J. 1979. A monograph of *Euphorbia* section *Tithymalopsis*. Ph.D. dissertation, Univ. of Michigan.
Hughes, C. 1998. Monograph of *Leucaena* (Leguminosae-Mimosoideae). Systematic Botany Monographs 55: 1-244.
Hunt, D., ed. 1998. Magnolias and their allies. Proceedings of an international symposium, Royal Holloway, University of London, Egham, Surrey, U.K., 12-13 April 1996. International Dendrological Society and the Magnolia Society.
Hunt, D.M. 1994. Morphology and ecology of *Quercus* series *Laurifoliae*, *Marilandicae* and *Nigrae*. Pp. 99-188 in Ed. A. Miyawaki, K. Iwatsuki, and M. M. Grandtner (eds). Vegetation in eastern North America. Vegetation system and dynamics under human activity in the eastern North American cultural region in comparison with Japan. University of Tokyo Press, Tokyo, Japan. 515 pp.
——. 1990. A systematic review of *Quercus* series *Laurifoliae*, *Marilandicae* and *Nigrae*. Unpublished Ph. D. dissertation, University of Georgia, Athens, GA.
——, and R.E. Zaremba. 1992. The northeastward spread of *Microstegium vimineum* (Poaceae) into New York and adjacent states. Rhodora 94: 167-170.
Hunt, D.R. 1983. New names in Commelinaceae. American Commelinaceae: XI. Kew Bull. 38: 131-133.
——. 1986. *Campelia*, *Rhoeo*, and *Zebrina* united with *Tradescantia*. American Commelinaceae: XIII. Kew Bull. 41: 401-412.
Hunziker, A.T. 2001. Genera Solanacearum: the genera of Solanaceae illustrated, arranged according to a new system. A.R.G. Gantner, Ruggell. 500 pp.
Huttleston, D.G. 1949. The three subspecies of *Arisaema triphyllum*. Bull. Torrey Bot. Club 76: 407-413.
——. 1981. The four subspecies of *Arisaema triphyllum*. Bull. Torrey Bot. Club 108: 479-481.
Iltis, H.H. 1960. Studies in the Capparidaceae – VII. Old World Cleomes adventive in the New World. Brittonia 12: 279-294.
——. 1965. The genus *Gentianopsis* (Gentianaceae): transfers and phytogeographic comments. Sida 2: 129-154.
Irving, R.S. 1980. The systematics of *Hedeoma* (Labiatae). Sida 8: 218-295.
Irwin, H.S., and R.C. Barneby. 1982. The American Cassiinae: a synoptical revision of Leguminosae tribe Cassieae subtribe Cassiinae in the New World. Memoirs N.Y. Bot. Gard. 35: 1-918.
Isely, D. 1973. Leguminosae of the United States. I. Subfamily Mimosoideae. Memoirs N.Y. Bot. Gard. 25: 1-152.
———-. 1975. Leguminosae of the United States. II. Subfamily Caesalpinioideae. Memoirs N.Y. Bot. Gard. 25: 1-228.
——. 1981. Leguminosae of the United States. III. Subfamily Papilionoidae: Tribes Sophoreae, Podalyriaeae, Loteae. Memoirs N.Y. Bot. Gard. 25: 1-264.
——. 1986a. Notes about *Psoralea* sensu auct., *Amorpha*, *Baptisia*, *Sesbania* and *Chamaecrista* (Leguminosae) in the southeastern United States. Sida 11: 429-440.
——. 1986b. Notes on Leguminosae: Papilionoideae of the southeastern United States. Brittonia 38: 352-359.
——. 1990. Leguminosae (Fabaceae), volume 3, part 2, Vascular flora of the southeastern United States. University of North Carolina Press, Chapel Hill, NC.

——. 1998. Native and naturalized Leguminosae (Fabaceae) of the United States (exclusive of Alaska and Hawaii). Monte L. Bean Life Science Museum, Brigham Young Univ., Provo, UT.
——, and F.J. Peabody. 1984. *Robinia* (Leguminosae: Papilionoideae). Castanea 49: 187-202.
Jacono, C.C. 1999. *Salvinia molesta* (Salviniaceae), new to Texas and Louisiana. Sida 18: 927-928.
Jansen, R.K. 1985. The systematics of *Acmella* (Asteraceae-Heliantheae). Systematic Bot. Monographs 8.
Järvinen, P., A. Palmé, L. Orlando Morales, M. Lännenpää, M. Keinänen, T. Sopanen, and M. Lascoux. 2004. Phylogenetic relationships of *Betula* species (Betulaceae) based on nuclear ADH and chloroplast matK sequences. Amer. J. Bot. 91: 1834-1845.
Jefferson-Brown, M.J. 1969. Daffodils and Narcissi: a complete guide to the *Narcissus* family. Faber and Faber, London. 224 pp.
——. 1991. Narcissus. Timber Press, Portland, OR. 224 pp.
Jenne, G.E. 1966. A study of variation in North American *Hamamelis* L. (Hamamelidaceae). Master's thesis, Vanderbilt University, Biology Dept. 204 pp.
Jensen, R.J. 1977. Numerical analysis of the scarlet oak complex (*Quercus* subgen. *Erythrobalanus*) in the eastern United States: relationships above the species level. Systematic Bot. 2: 122-133.
Johansson, J.T. 1998. Chloroplast DNA restriction site mapping and the phylogeny of *Ranunculus* (Ranunculaceae). Pl. Syst. Evol. 213: 1-19.
Johnson, A.F. 1982. Some demographic characteristics of the Florida Rosemary *Ceratiola ericoides* Michx. Amer. Midland Nat. 108: 170-174.
Johnson, G.P. 1988. Revision of *Castanea* section *Balanocastanon* (Fagaceae). J. Arnold Arb. 69: 25-49.
——. 1992. Noteworthy collections: Arkansas. Castanea 57: 150-151.
——. 1994. Noteworthy collections: Arkansas. Castanea 59: 78.
Johnson. M.F. 1980. The genus *Prenanthes* L. (Cichorieae – Asteraceae) in Virginia. Castanea 45: 24-30.
Johnson, R.G. 1968. {*Disporum*}. Castanea 33: 262-266.
Johnson, S.R. 1992. Observations on populations of *Chamaesyce polygonifolia* Small and *C. ingallsii* Small (*Euphorbia ammannioides* HBK) on barrier islands of Virginia and North Carolina. Castanea 57: 291-292.
Johnston, M.C. 1957. Synopsis of the United States species of *Forestiera* (Oleaceae). Southwestern Naturalist 2: 140-151.
Jones, A.G. 1979. A study of wild leek, and the recognition of *Allium burdickii* (Liliaceae). Systematic Bot. 4: 29-43.
——. 1980a. A classification of the New World species of *Aster* (Asteraceae). Brittonia 32: 230-239.
——. 1980b. Data on chromosome numbers in *Aster* (Asteraceae), with comments on the status and relationships of certain North American species. Brittonia 32: 240-261.
——. 1984. Nomenclatural notes on *Aster* (Asteraceae) – II. New combinations and some transfers. Phytologia 55: 373-388.
——. 1992. *Aster* and *Brachyactis* (Asteraceae) in Oklahoma. Sida, Bot. Misc. 8: 1-46.
——, and D.A. Young. 1983. Generic concepts of *Aster* (Asteraceae): a comparison of cladistic, phenetic, and cytological approaches. Systematic Bot. 8: 71-84.
Jones, D.L. 1993. Cycads of the world. Smithsonian Institution Press, Washington, DC. 312 pp.
Jones, G.N. 1939. A synopsis of the North American species of *Sorbus*. Jour. Arnold Arb. 20: 1-43.
——. 1940. A monograph of the genus *Symphoricarpos*. Jour. Arnold Arb. 21: 201-252.
Jones, Q. 1951. A cytotaxonomic study of the genus *Disporum* in North America. Contr. Gray Herb. 173: 1-40.
Jones, R.L. 1983. A systematic study of *Aster* section *Patentes* (Asteraceae). Sida 10: 41-81.
——. 1992. Additional studies of *Aster georgianus*, *A. patens*, and *A. phlogifolius* (Asteraceae). Sida 15: 305-315.
——. 2005. Plant life of Kentucky: an illustrated guide to the vascular flora. Univ. Press of Kentucky. 834 pp.
Jones, S.B., Jr. 1982. The genera of Vernonieae (Compositae) in the southeastern United States. J. Arnold Arb. 63: 489-507.
——, and N.C. Coile. 1988. The distribution of the vascular flora of Georgia. Dept. of Botany, Univ. of Georgia, Athens, Georgia.
Jones, S.D., and G.D. Jones. 1993. A new species of *Carex* (Cyperaceae: Triquetrae) from the Chisos Mountains, Texas, and a key to species of section Triquetrae. Sida 15: 509-518.
——, and A.A. Reznicek. 1995. *Carex conjuncta* (Cyperaceae) verified from Arkansas, and notes on the range of Carex oklahomensis. Sida 16: 772-774.
Joseph, and Heimburger. 1966. [*Anemone*]. Canad. J. Bot. 44: 899-928.
Judd, W.S. 1979. Generic relationships in the Andromedeae (Ericaceae). J. Arnold Arb. 60: 477-503.
———. 1981. A monograph of *Lyonia* (Ericaceae). J. Arnold Arbor. 62: 63-209, 315-436.
——. 1982. A taxonomic revision of *Pieris* (Ericaceae). J. Arnold Arb. 63: 103-144.
——. 1983. The taxonomic status of *Stipulicida filiformis* (Caryophyllaceae). Sida 10: 33-36.
——. 1984. A taxonomic revision of the American species of *Agarista* (Ericaceae). J. Arnold Arb. 65: 255-342.
——. 1996. The Pittosporaceae in the southeastern United States. Harvard Papers in Botany 8: 15-26.
——. 1998. The Smilacaceae in the southeastern United States. Harvard Papers in Botany 3: 147-169.
——. 2000. The Hypoxidaceae in the southeastern United States. Harvard Papers in Botany 5: 79-98.
——. 2003. The genera of Ruscaceae in the southeastern United States. Harvard Papers in Botany 7: 93-149.
——, and I.K. Ferguson. 1999. The genera of Chenopodiaceae in the southeastern United States. Harvard Papers in Botany 4: 365-416.

——, and K.A. Kron. 1993. Circumscription of Ericaceae (Ericales) as determined by preliminary cladistic analyses based on morphological, anatomical, and embryological features. Brittonia 45: 99-114.
——, and K.A. Kron. 1995. A revision of *Rhododendron* VI. Subgenus *Pentanthera* (sections Sciadorhodion, Rhodora and Viscidula). Edinb. J. Bot. 52: 1-54.
——, and K.A. Kron. 1996. Phylogenetic relationships of the *Lyonia*-group of Andromedeae (Ericaceae): evidence from morphology and matK sequence data. Am. J. Bot. 83: 165. [abstract]
——, R.W. Sanders, and M.J. Donoghue. 1994. Angiosperm family pairs: preliminary phylogenetic analyses. Harvard Papers in Botany 5: 1-51.
Judziewicz, E.J., R.J. Soreng, G. Davidse, P.M. Peterson, T.S. Filgueiras, and F.O. Zuloaga. 2000. Catalogue of New World grasses: I. Subfamilies Anomochlooideae, Bambusoideae, Ehrhartoideae, and Pharoideae. Contributions from the U.S. National Herbarium 39: 1-128.
Kadereit, J.W. 2004. The families and genera of vascular plants. VII. Flowering plants - Dicotyledons - Lamiales (except Acanthaceae including Avicenniaceae). Springer, Berlin. 478 pp.
Källersjö, M., G. Bergqvist, and A. Anderberg. 2000. Generic realignment in primuloid families of the Ericales s.l.: a phylogenetic analysis based on DNA sequences from three chloroplast genes and morphology. Am. J. Bot. 87: 1325-1341.
Kartesz, J.T. 1994. A synonymized checklist of the vascular plants of the United States, Canada, and Greenland. Timber Press, Portland, Oregon.
——. 1999. A synonymized checklist and atlas with biological attributes for the vascular flora of the United States, Canada, and Greenland. First Edition. In: Kartesz, J.T., and C.A. Meacham. Synthesis of the North American Flora, Version 1.0. North Carolina Botanical Garden, Chapel Hill, NC.
——. In prep. Common names for the North American flora. Timber Press, Portland, Oregon.
——, and K.N. Gandhi. 1991. *Cymophyllus fraserianus* (Ker-Gawler) Kartesz & Gandhi (Cyperaceae), the correct name for Fraser's sedge. Rhodora 93: 136-140.
——, and K.N. Gandhi. 1992. Nomenclatural notes for the North American flora. X. Phytologia 72: 80-92.
——, and K.N. Gandhi. 1994. Nomenclatural notes for the North American flora. XIII. Phytologia 76: 441-457.
——, and K.N. Gandhi. 1995. Nomenclatural notes for the North American flora. XIV. Phytologia 78: 1-17.
Kato, H., S. Kawano, R. Terauchi, M. Ohara, and F.H. Utech. 1995. Evolutionary biology of *Trillium* and related genera (Trilliaceae). I. Restriction site mapping and variation of chloroplast DNA and its systematic implications. Plant Species Biol. 10: 17-29.
Kauffman, G.E., G.L. Nesom, A.S. Weakley, T.E. Govus, and L.M. Cotterman. 2004. A new species of *Symphyotrichum* (Asteraceae: Astereae) from a serpentine barren in western North Carolina. Sida 21: 827-839.
Kawano, S., and H.H. Iltis. 1963. Cytotaxonomy of the genus *Polygonatum* (Liliaceae). I. Karyotype analysis of some eastern North American species. Cytologia 28: 321-330.
——, and H. Kato. 1995. Evolutionary biology of *Trillium* and related genera (Trilliaceae). II. Cladistic analyses on gross morphological characters, and phylogeny and evolution of the genus Trillium. Plant Species Biol. 10: 169-183.
Kazempour Osaloo, S., F.H. Utech, M. Ohara, and S. Kawano. 1999. Molecular systematics of Trilliaceae. I. Phylogenetic analyses of *Trillium* using matK gene sequences. J. Plant Res. 112: 35-49.
Keating, R.C. 2004. Vegetative anatomical data and its relationship to a revised classification of the genera of the Araceae. Ann. Missouri Bot. Gard. 91: 485-494.
Keener, B.R., and R. Kral. 2003. A new species of *Solidago* (Asteraceae: Astereae) from north central Alabama. Sida 20: 1589-1593.
Keener, C.S. 1967. A biosystematic study of *Clematis* section *Integrifoliae* (Ranunculaceae). J. Elisha Mitchell Sci. Soc. 83: 1-41.
——. 1975. Studies in the Ranunculaceae of the southeastern United States. III. *Clematis* L. Sida 6: 33-47.
——. 1976. Studies in the Ranunculaceae of the southeastern United States. V. *Ranunculus* L. Sida 6: 266-283.
——. 1977. Studies in the Ranunculaceae of the southeastern United States. VI. Miscellaneous genera. Sida 7: 1-12.
——. 1981. The status of *Thalictrum hepaticum* Greene (Ranunculaceae). Castanea 46: 43-49.
——, E.T. Dix, and B.E. Dutton. 1996. The identity of *Anemone riparia* (Ranunculaceae). Bartonia 59: 37-47.
——, and S.B. Hoot. 1987. *Ranunculus* section *Echinella* (Ranunculaceae) in the southeastern United States. Sida 12: 57-68.
Kelloff, C.L., and C.R. Werth. 1998. Allozyme evidence for genetic divergence between two eastern North American varieties (*angustum* and *asplenioides*) of the *Athyrium filix-femina* complex [abstract]. Am. J. Bot. 85 [supplement]: 101.
——, J. Skog, L. Adamkewicz, and C.R. Werth. 2002. Differentiation of eastern North American *Athyrium filix-femina* taxa: evidence from allozymes and spores. Amer. Fern J. 92: 185-213.
Kelly, L.M. 1997. A cladistic analysis of *Asarum* (Aristolochiaceae) and implications for the evolution of herkogamy. Am. J. Bot. 84: 1752-1765.
——. 1998. Phylogenetic relationships in *Asarum* (Aristolochiaceae) based on morphology and ITS sequences. Am. J. Bot. 85: 1454-1467.
——, and F. González. 2003. Phylogenetic relationships in Aristolochiaceae. Systematic Botany 28: 236-249.
Kesler, T.R., L.C. Anderson, and S.M. Hermann. 2003. A taxonomic reevaluation of *Aristida stricta* (Poaceae) using anatomy and morphology. Southeastern Naturalist 2: 1-10.
Kessler, J.W. 1987. A treatment of *Scleria* (Cyperaceae) for North America north of Mexico. Sida 12: 391-407.

Kiers, A.M., T.H.M. Mes, R. van der Meijden, and K. Bachmann. 1999. Morphologically defined *Cichorium* (Asteraceae) species reflect lineages based on chloroplast and nuclear (ITS) DNA data. Systematic Bot. 24: 645-659.
Kiger, R.W. 1971. *Arthraxon hispidus* (Gramineae) in the United States: taxonomy and floristic status. Rhodora 73: 39-46.
Kilpatrick, E.S., and P.D. McMillan. 2003. Noteworthy collections: South Carolina. Castanea 68: 182.
Kim, K.-J., and B.L. Turner. 1992. Systematic overview of *Krigia* (Asteraceae - Lactuceae). Brittonia 44: 173-198.
Kim, S.-C., D.C. Crawford, M. Tadesse, M. Berbee, F.R. Ganders, M. Pirseyedi, and E.J. Esselman. 1999. ITS sequences and phylogenetic relationships in *Bidens* and *Coreopsis* (Asteraceae). Systematic Botany 24: 480-493.
——, C.-W. Park, Y.-D. Kim, and Y. Suh. 2001. Phylogenetic relationships in family Magnoliaceae inferred from ndhF sequences. Am. J. Bot. 88: 717-728.
Kim, Y.-D. 1998. Chloroplast DNA restriction site variation and phylogeny of the Berberidaceae. Amer. J. Bot. 85: 1766-1778.
——, and R.K. Jansen. 1996. Phylogenetic implications of rbcL and ITS sequence variation in the Berberidaceae. Systematic Botany 21: 381-396.
——, S.-H. Kim, and L.R. Landrum. 2004. Taxonomic and phytogeographic implications from ITS phylogeny in *Berberis* (Berberidaceae). J. Plant Res. 117: 175-182.
Kimball, R.T., D.J. Crawford, J.R. Page, and P.J. Harmon. 2002. Inter-simple sequence repeat (ISSR) diversity within *Monarda fistulosa* var. *brevis* (Lamiaceae) and divergence between var. *brevis* and var. *fistulosa*. Brittonia 53: 511-518.
King, R.M., and H. Robinson. 1987. The genera of the Eupatoriae (Asteraceae). Monographs in Systematic Botany 22: 1-581.
Kintsch, J.A., and D.L. Urban. 2002. Focal species, community representation, and physical proxies as conservation strategies: a case study in the Amphibolite Mountains, North Carolina, U.S.A. Conservation Biology 16: 936-947.
Kirkman, W.B., and J.R. Ballington. 1990. Creeping blueberries (Ericaceae: *Vaccinium* sect. *Herpothamnus*) – a new look at *V. crassifolium* including *V. sempervirens*. Systematic Bot. 15: 679-699.
——, T.R. Wentworth, and J.R. Ballington. 1989. The ecology and phytosociology of the creeping blueberries, *Vaccinium* section *Herpothamnus*. Bull. Torrey Bot. Club 116: 114-133.
Kirschner, J., et al. 2002a. Juncaceae 1: *Rostkovia* to *Luzula*. Species Plantarum: Flora of the World 6: 1-237.
——, et al. 2002b. Juncaceae 2: *Juncus* subg. *Juncus*. Species Plantarum: Flora of the World 7: 1-336.
——, et al. 2002c. Juncaceae 3: *Juncus* subg. *Agathryon*. Species Plantarum: Flora of the World 8: 1-192.
Knapp, S., M.W. Chase, and J.J. Clarkson. 2004. Nomenclatural changes and a new sectional classification in *Nicotiana* (Solanaceae). Taxon 53: 73-82.
Knapp, W.M. 2004. Taxonomic status of *Juncus longii*, a putative taxon within the *Juncus marginatus* complex (Juncaceae sect. Graminifolii) [abstract]. Southeastern Biology 51: 134.
——, and D. Estes. 2006. *Gratiola brevifolia* (Plantaginaceae) new to the flora of Delaware, the Delmarva Peninsula, and the mid-Atlantic. Sida 22: 825-829.
Knepper, D.A., D.M. Johnson, and L.J. Musselman. 2002. *Marsilea mutica* in Virginia. Amer. Fern J. 92: 243-244.
Knobloch, I.W., and D.B. Lellinger. *Cheilanthes castanea* and its allies in Virginia and West Virginia. Castanea 34: 59-61.
Knox, J.S. 1987. An experimental garden test of characters used to distinguish *Helenium virginicum* Blake from *H. autumnale* L. Castanea 52: 52-58.
——, M.J. Gutowski, D.C. Marshall, and O.G. Rand. 1995. Tests of the genetic bases of character differences between *Helenium virginicum* and *H. autumnale* (Asteraceae) using common gardens and transplant studies. Systematic Bot. 20: 120-131.
——. 1997. A nine year demographic study of *Helenium virginicum* (Asteraceae), a narrow endemic seasonal wetland plant. J. Torrey Bot. Soc. 124: 236-245.
Koch, E.W., and R.J. Orth. 2003. The seagrasses of the mid-Atlantic coast of the United States. Pp. 216-223 in E.P. Green and F. T. Short. 2003. World Atlas of seagrasses. Prepared by the UNEP World Consservation Monitoring Centre. Univ. of Calif. Press, Berkeley, Calif., US.
Koch, M., and I.A. Al-Shehbaz 2002. Molecular data indicate complex intra- and intercontinental differentiation of American *Draba* (Brassicaceae). Ann. Missouri Bot. Gard. 89: 88-109.
——, and I. A. Al-Shehbaz. 2004. Taxonomic and phylogenetic evaluation of the American "*Thlaspi*" species: identity and relationship to the Eurasian genus *Noccaea* (Brassicaceae). Systematic Botany 29: 375-384
——, J. Bishop, and T. Mitchell-Olds. 1999. Molecular systematics and evolution of *Arabidopsis* and *Arabis*. Plant Biol. 1: 529-537.
Koch, S.D. 1978. Notes on the genus *Eragrostis* (Gramineae) in the southeastern United States. Rhodora 80: 390-403.
Koperski, M., M. Sauer, W. Braun, and S.R. Gradstein. 2000. Referenzliste der Moose Deutschlands. Schriftenreihe für Vegetationskunde 34: 1-519.
Korall, P., P. Kenrick, and J.P. Therrien. 1999. Phylogeny of Selaginellaceae: evaluation of generic/subgeneric relationships based on rbcL gene sequences. J. Plant Sci. 160: 585-594.
Kott, L.S., and D.M. Britton. 1982. A comparative study of sporophyte morphology of three cytotypes of *Polypodium virginianum* in Ontario. Can. J. Bot. 60: 1360-1370.
——, and D.M. Britton. 1983. Spore morphology and taxonomy of *Isoetes* in northeastern North America. Can. J. Bot. 61: 3140-3163.
Koyama, T. 1987. Grasses of Japan and its neighboring regions: an identification manual. Kodansha Ltd., Tokyo.
Krakow, G.A. 1989. A systematic study of *Ilex ambigua*, *Ilex decidua* and related taxa. M.S. thesis, Univ. of Georgia, Athens.
Král, M. 1966. Die Begrenzung der Gattung *Parageum* Nakai et Hara. Preslia (Praha) 38: 151-153.
Kral, R. 1960. A revision of *Asimina* and *Deeringothamnus* (Annonaceae). Brittonia 12: 233-278.

——. 1966a. *Xyris* (Xyridaceae) of the continental United States and Canada. Sida 2: 177-260.
——. 1966b. Observations on the flora of the southeastern United States with special reference to northern Louisiana. Sida 2: 395-408.
——. 1966c. {Eriocaulaceae} Sida 2: 285-332.
——. 1971. A treatment of *Abildgaardia*, *Bulbostylis*, and *Fimbristylis* (Cyperaceae) for North America. Sida 4: 57-227.
——. 1973. Some notes on the flora of the southern states, particularly Alabama and middle Tennessee. Rhodora 75: 366-410.
——. 1976. A treatment of *Delphinium* for Alabama and Tennessee. Sida 6: 243-265.
——. 1978a. A synopsis of *Fuirena* (Cyperaceae) for the Americas north of South America. Sida 7: 309-354.
——. 1978b. A new species of *Xyris* (sect. *Xyris*) from Tennessee and northwestern Georgia. Rhodora 80: 444-447.
——. 1981a. Notes on some "quill"-leaved umbellifers. Sida 9:124-134.
——. 1981b. Some distributional reports of weedy or naturalized foreign species of vascular plants for the southern states, particularly Alabama and middle Tennessee. Castanea 46: 334-339.
——. 1982. A new phyllodial-leaved *Sagittaria* (Alismaceae) from Alabama. Brittonia 34: 12-17.
——. 1983a. A report on some rare, threatened, or endangered forest-related vascular plants of the South. Vol. I and II. USDA Forest Service Tech. Publ. R8-TP2. Atlanta, GA.
——. 1983b. The Xyridaceae in the southeastern United States. J. Arnold Arb. 64: 421-429.
——. 1992. A new species of *Fimbristylis* (Cyperaceae) from the sandstone and granitic outcrops of Alabama and Georgia. Sida 15: 317-321.
——. 1996. Supplemental notes on *Rhynchospora crinipes* and related species in section *Fuscae* (Cyperaceae). Sida 17: 385-411.
——. 1999. A revised taxonomy for two North American *Rhynchospora* (Cyperaceae) and for two North American Xyris (Xyridaceae). Novon 9: 205-219.
——. 2004. An evaluation of *Anthenantia*. Sida 21: 293-310.
——, and P.E. Bostick. 1969. The genus *Rhexia* (Melastomataceae). Sida 3: 387-440.
——, and R.K. Godfrey. 1958. Synopsis of the Florida species of *Cacalia*. Quart. J. Florida Acad. Sci. 21: 193-206.
——, and G.L. Nesom. 2003. Two new species of *Liatris* series *Graminifoliae* (Asteraceae: Eupatorieae) from the southeastern United States. Sida 20: 1573-1583.
——, and B.A. Sorrie. 1998. Proposal to conserve the name *Eriocaulon lineare* (Erocaulaceae) with a conserved type. Taxon 47: 741-742.
Kramer, K.U., and P.S. Green. 1990. Pteridophytes and Gymnosperms. In K. Kubitzki, ed., The families and genera of vascular plants. Springer-Verlag, Berlin.
Kress, W.J., G.D. Maddox, and C.S. Roesel. 1994. Genetic variation and protection priorities in *Ptilimnium nodosum* (Apiaceae), an endangered plant of the eastern United States. Conservation Biology 8: 271-276.
Krings, A. 2002. Floral variation and disgnosis of *Richardia* (Rubiaceae) in the Carolinas. Castanea 67: 329-330.
——. 2003. Typification and nomenclatural history of *Trachelospermum difforme* (Apocynaceae). Sida 20: 1641-1644.
——. 2005. Neotypification of *Ceropegia palustris* and *Lyonia maritima* (Apocynaceae: Asclepiadoideae). Sida 21: 1507-1513.
——, and J.C. Neal. 2001a. A *Scutellaria* (Lamiaceae) new to North Carolina and a key to the small-flowered Carolina congeners. Sida 19: 735-739.
——, and J.C. Neal. 2001b. South American skullcap (*Scutellaria racemosa*: Lamiaceae) in the southeastern United States. Sida 19: 1171-1179.
——, and R.J. Richardson. 2006. *Cayratia japonica* (Vitaceae) new to North Carolina and an updated key to the genera of Vitaceae in the Carolinas. Sida 22: 813-815.
——, A.S. Weakley, J.C. Neal, and E.C. Swab. 2005. *Ranunculus ficaria* (Ranunculaceae) new to North carolina and an updated key to Carolina congeners. Sida 21: 2429-2437.
——, R. Westbrooks, and J. Lloyd. 2002. *Cirsium nuttallii* (Asteraceae: Cynareae) new to North Carolina and an illustrated key to southeastern congeners. Sida 20: 845-848.
——, and Q.-Y. (Jenny) Xiang, 2004. The *Gonolobus* complex (Apocynaceae: Asclepiadoideae) in the southeastern United States. Sida 21: 103-116.
——, and Q.-Y. (Jenny) Xiang. 2005. Taxonomy of the *Gonolobus* complex (Apocynaceae, Asclepiadoideae) in the southeastern United States: ISSR evidence and parsimony analysis. Harvard Papers in Botany 10: 147-159.
Kron, K.A. 1993. A revision of *Rhododendron* section *Pentanthera*. Edinb. J. Bot. 50: 249-364.
——, and M.W. Chase. 1993. Systematics of the Ericaceae, Empetraceae, Epacridaceae and related taxa based upon rbcL sequence data. Ann. Mo. Bot. Gard. 80: 735-741.
——, and M. Creel. 1999. A new species of deciduous azalea (*Rhododendron* section *Pentanthera*; Ericaceae) from South Carolina. Novon 9: 377-380.
——, and J.M. King. 1996. Cladistic relationships of *Kalmia*, *Leiophyllum*, and *Loiseleuria* (Phyllodoceae, Ericaceae) based on rbcL and nrITS data. Systematic Bot. 21: 17-30.
——, W.S. Judd, P.F. Stevens, D.M. Crayn, A.A. Anderberg, P.A. Gadek, C.J. Quinn, and J.L. Luteyn. 2002. Phylogenetic classification of Ericaceae: molecular and morphological evidence. The Botanical Review 68: 335-423.
Kruijt, R.C. 1996. A taxonomic monograph of *Sapium* Jacq., Anomostachys (Baill.) Hurus., *Duvigneaudia* J. Léonard and *Sclerocroton* Hochst. (Euphorbiaceae tribe Hippomaneae). E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart.

Kubitzki, K., J.G. Rohwer, and V. Bittrich, eds. 1993. The families and genera of vascular plants. II. Flowering plants - Dicotyledons - Magnoliid, Hamamelid and Caryophyllid families. Springer, Berlin. 653 pp.
——, ed. 1998a. The families and genera of vascular plants. III. Flowering plants - Monocotyledons - Lilianae (except Orchidaceae). Springer, Berlin. 478 pp.
——, ed. 1998b. The families and genera of vascular plants. IV. Flowering plants - Monocotyledons - Alismatanae and Commelinanae (except Gramineae). Springer, Berlin. 511 pp.
——, ed. 2004. The families and genera of vascular plants. VI. Flowering plants - Dicotyledons - Celastrales, Oxalidales, Rosales, Cornales, Ericales. Springer, Berlin. 489 pp.
——, and C. Bayer, eds. 2003. The families and genera of vascular plants. V. Flowering plants - Dicotyledons - Malvales, Capparales, and non-betalain Caryophyllales. Springer, Berlin. 418 pp.
Kuijt, J. 1982. The Viscaceae in the southeastern United States. J. Arnold Arb. 63: 401-410.
——. 2003. Monograph of *Phoradendron* (Viscaceae). Systematic Botany Monographs 66: 1-643.
Kurashige, Y., J.I. Etoh, T. Handa, K. Takayanagi, and T. Yukawa. 2001. Sectional relationships in the genus *Rhododendron* (Ericaceae): evidence from matK and trnK intron sequences. Plant Systematics and Evolution 228: 1-14.
Kurz, H., and R.K. Godfrey. 1962. Trees of northern Florida. University Press of Florida, Gainesville, FL. 311 pp.
LaFrankie, J.V., Jr. 1986. Transfer of the species of *Smilacina* to *Maianthemum* (Liliaceae). Taxon 35: 584-589.
Lakela, O. 1937. A monograph of the genus *Tiarella* L. in North America. Amer. J. Bot. 24: 344-351.
Lamb Frye, A.S., and K.A. Kron. 2003. rbcL phylogeny and character evolution in Polygonaceae. Systematic Botany 28: 326-332.
Lamboy, W.F. 1987. *Aster* section *Biotia* (Asteraceae) in New England and the status of Aster glomeratus. Rhodora 89: 299-318.
——. 1988. The status of *Aster commixtus* and a new species of Aster from the southeastern United States. Systematic Botany 13: 187-195.
——. 1992. The taxonomic status and probable origin of *Aster chlorolepis*, a Southern Appalachian endemic. Castanea 57: 52-65.
Lamont, E.E. 1990. A new combination in *Eupatorium* section *Verticillata* (Asteraceae). Phytologia 69: 467-468.
——. 1995. Taxonomy of *Eupatorium* section *Verticillata* (Asteraceae). Memoirs New York Botanical Garden 72: 1-68.
Lance, R. 1995. The hawthorns of the southeastern United States. Published by the author, Fletcher, NC. 136 pp.
Landolt, E. 1980. Key to the determination of taxa within the family of Lemnaceae. Veröffentlichungen des Geobotanischen Institutes der Eidg. Techn. Hochschule, Stiftung Rübel, Zürich 70: 13-21.
——. 1986. The family of Lemnaceae – a monographic study. Veröffentlichungen des Geobotanischen Institutes der Eidg. Techn. Hochschule, Stiftung Rübel, Zürich 71: 1-566.
Lane, C. 2005. Witch hazels. Timber Press & Royal Horticulatural Society Plant Collectors Guide.
Lane, M.A., D.R. Morgan, Y. Suh, B.B. Simpson, and R.K. Jansen. 1996. Relationships of North American genera of Astereae, based on chloroplast DNA restriction site data. Pp. 49-77 in D.J.N. Hind and H.J. Beentje (eds.) Compositae: Systematics. Proceedings of the International Compositae Conference, Kew, 1994, vol. 1.
Larisey. M.M. 1940a. A monograph of the genus *Baptisia*. Ann. Mo. Bot. Garden 27: 119-244.
——. 1940b. A revision of the North American species of the genus *Thermopsis*. Ann. Mo. Bot. Garden 27: 245-258.
Le Duc, A. 1995. A revision of *Mirabilis* section *Mirabilis* (Nyctaginaceae). Sida 16: 613-648.
Leadlay, S.A., and V.H. Heywood. 1990. The biology and systematics of the genus *Coincya* Porta & Rigo ex Rouy (Cruciferae). Bot. J. Linn. Soc. 102: 313-398.
LeBlond, R.J. 1997. Distribution of *Rhynchospora harperi*. Castanea 62: 278-280.
——. 2000. *Solidago villosicarpa* (Asteraceae: Astereae), a rare new southeastern Coastal Plain endemic. Sida 19: 291-300.
——. 2001a. Taxonomy of the *Dichotoma* group of *Dichanthelium* (Poaceae). Sida 19: 821-837.
——. 2001b. Endemic plants of the Cape Fear Arch region. Castanea 66: 83-97.
——, and A.S. Weakley. 2002. *Schizaea pusilla* Pursh (Schizaeaceae) in North Carolina. Rhodora 104: 86-91.
——, A.S. Weakley, A.A. Reznicek, and W.J. Crins. 1994. *Carex lutea* (Cyperaceae), a rare new Coastal Plain endemic from North Carolina. Sida 16: 153-161.
Lee, N.S., T. Sang, D.J. Crawford, S.H. Yeau, S.-C. Kim. 1996. Molecular divergence between disjunct taxa in eastern Asia and eastern North America. Am. J. Bot. 83: 1373-1378.
Lee, Yin-Tse. 1976. The genus *Gymnocladus* and its tropical affinity. J. Arnold Arb. 57: 91-112.
Lellinger, D.B. 1985. A field manual of the ferns and fern allies of the United States and Canada. Smithsonian Institution Press, Washington, D.C.
Lelong, M.G. 1984. New combinations for *Panicum* subgenus *Panicum* and subgenus *Dichanthelium* (Poaceae) of the southeastern United States. Brittonia 36: 262-273.
——. 1986. A taxonomic treatment of the genus *Panicum* (Poaceae) in Mississippi. Phytologia 61: 251-269.
Leonard, E.C. 1927. The North American species of *Scutellaria*. Contr. U.S. National Herbarium 22: 703-748.
Leonard, M.R., R.E. Cook, and J.C. Semple. 2005. A multivariate morphometric study of the aster genus *Sericocarpus* (Asteraceae: Astereae). Sida 21: 1472-1505.
Leonard, S.W. 1971a. The distribution of *Thelypteris torresiana* in the southeastern United States. Amer. Fern J. 62: 97-99.
——. 1971b. Additions to the flora of the Carolinas. J. Elisha Mitchell Sci. Soc. 87: 97-100.
——. 1981a. *Fimbristylis perpusilla* Harper in South Carolina. Castanea 46: 235-236.

——. 1981b. *Fimbristylis perpusilla* Harper in South Carolina. Castanea 46: 341-343.
——. 1987. *Fimbristylis perpusilla* in North Carolina. Castanea 52: 150.
——. 2006. A new species of witch-hazel (*Hamamelis*: Hamamelidaceae) apparently endemic to southern Mississippi. Sida 22: 849-856.
Les, D.H. 1985. The taxonomic significance of plumule morphology in *Ceratophyllum* (Ceratophyllaceae). Systematic Bot. 10: 338-346.
——. 1986. The evolution of achene morphology in *Ceratophyllum* (Ceratophyllaceae), I. Fruit-spine variation and relationships of *C. demersum*, *C. submersum*, and *C. apiculatum*. Systematic Bot. 11: 549-558.
——. 1988a. The evolution of achene morphology in *Ceratophyllum* (Ceratophyllaceae), II. Fruit variation and systematics of the "spiny-margined" group. Systematic Bot. 13: 73-86.
——. 1988b. The evolution of achene morphology in *Ceratophyllum* (Ceratophyllaceae), III. Relationships of the "facially-spined" group. Systematic Bot. 13: 509-518.
——. 1988c. The origin and affinities of the Ceratophyllaceae. Taxon 37: 326-345.
——. 1989. The evolution of achene morphology in *Ceratophyllum* (Ceratophyllaceae), IV. Summary of proposed relationships and evolutionary trends. Systematic Bot. 14: 254-262.
——, G.J. Anderson, and M.A. Cleland. 1995. Sterility in the North American lake cress *Neobeckia aquatica* (Brassicaceae): Inferences from chromosome number. Rhodora 97: 185-200.
——, and D.J. Crawford. 1999. *Landoltia* (Lemnaceae), a new genus of duckweeds. Novon 9: 530-533.
——, and R.P. Wunderlin. 1981. *Hygrophila polysperma* (Acanthaceae) in Florida. Florida Sci. 44: 189-192.
——, R.S. Capers, and N.P. Tippery. 2006. Introduction of *Glossostigma* (Phrymaceae) to North America: a taxonomic and ecological overview. Amer. J. Bot. 93: 927-939.
Levin, G.A. 1999a. Evolution in the *Acalypha gracilens/monococca* complex (Euphorbiaceae): morphological analysis. Systematic Bot. 23: 269-287.
——. 1999b. Notes on *Acalypha* (Euphorbiaceae) in North America. Rhodora 101: 217-233.
Levy, F. 1991a. Morphological differentiation in *Phacelia dubia* and *P. maculata*. Rhodora 93: 11-25.
Levy, F. 1991b. A genetic analysis of reproductive barriers in *Phacelia dubia*. Heredity 67:331-345.
Levy, F. 1997. Non-homeotic meristic flower mutants in *Phacelia dubia*. J. Heredity 88:31-37.
Levy, F. and K. A. Malone. 2001. *Phacelia dubia* in South Carolina: the interface of morphology, genetics and taxonomy. Castanea 66:134-144.
Levy F. and C. L. Neal. 1999. Spatial and temporal genetic structure in chloroplast and allozyme markers in *Phacelia dubia* implicate genetic drift. Heredity 82:422-431.
Levy, F., Antonovics, J., Boynton, J. E. and N. W. Gillham. 1996. A population genetic analysis of chloroplast DNA in *Phacelia*. Heredity 76:143-155.
Lewis, D.Q. 2000. A revision of the New World species of *Lindernia* (Scrophulariaceae). Castanea 65: 93-122.
Lewis, W.H. 2006. *Hedyotis australis* (Rubiaceae) new to Missouri and Florida and related species in the south-central United States. Sida 22: 831-836.
——, and R.L. Oliver. 1965. Realignment of *Calystegia* and *Convolvulus* (Convolvulaceae). Ann. Missouri Bot. Gard. 52: 217-222
——, and R.L. Oliver. 1974. Revision of *Richardia* (Rubiaceae). Brittonia 26: 271-301.
Li, J., and M.J. Donoghue. 1999. More molecular evidence for interspecific relationships in *Liquidambar* (Hamamelidaceae). Rhodora 101: 87-91.
——, J. Alexander III, T. Ward, P. del Tredici, and R. Nicholson. Phylogenetic relationships of Empetraceae inferred from sequences of chloroplast gene matK and nuclear ribosomal DNA ITS region. Molecular Phylogenetics and Evolution 25: 306-315.
——, P. del Tredici, S. Yang, and M.J. Donoghue. 2002. Phylogenetic relationships and biogeography of *Stewartia* (Camellioideae, Theaceae) inferred from nuclear ribosomal DNA ITS sequences. Rhodora 104: 117-133.
——, J. Ledger, T. Ward, and P. del Tredici. 2004. Phylogenetics of Calycanthaceae based on molecular and morphological data, with a special reference to divergent paralogues of the nrDNA ITS region. Harvard Papers in Bot. 9: 69-82.
Libby, G.W., and C.T. Bloom. 1998. *Nestronia umbellula* Rafinesque (Santalaceae) from the Highland Rim of Kentucky. Castanea 63: 161-164.
Lidén, M. 1981. Proposal to change the typification of *Corydalis* nomen conservandum. Taxon 30: 323-325.
——. 1986. Synopsis of Fumarioideae (Papaveraceae) with a monograph of the tribe Fumarieae. Opera Botanica 88: 1-133.
——, T. Fukuhara, J. Rylander, and B. Oxelman. 1997. Phylogeny and classification of Fumariaceae, with emphasis on *Dicentra* s.l., based on the plastid gene rps16 intron. Pl. Syst. Evol. 206: 411-420.
Liede, S. 1997a. Subtribes and genera of the tribe Asclepiadaceae (Apocynaceae, Asclepiadoideae) – a synopsis. Taxon 46: 233-247.
——. 1997b. American *Cynanchum* (Asclepiadaceae) – a preliminary infrageneric classification. Novon 7: 172-181.
——, and U. Meve. 1997. Some clarifications, new species, and new combinations in American Cynanchinae (Asclepiadaceae). Novon 7: 38-45.
——, and U. Meve. 2003. Dissolution of *Cynanchum* sect. *Macbridea* (Apocynaceae – Asclepiadoideae). Nordic J. of Bot. 22: 579–591

——, and A. Täuber. 2002. Circumscription of the genus *Cynanchum* (Apocynaceae – Asclepiadoideae). Systematic Botany 27: 789-800.
Lihová, J., K. Marhold, H. Kudoh, and M.A. Koch. 2006. Worldwide phylogeny and biogeography of *Cardamine flexuosa* (Brassicaceae) and its relatives. Amer. J. Botany 93: 1206-1221.
Lint, H., and C. Epling. 1945. A revision of *Agastache*. Amer. Midl. Nat. 33: 207-230.
Lipow, S.R., and R. Wyatt. 1998. Reproductive biology and breeding system of *Gonolobus* suberosus (Asclepiadaceae). J. Torrey Bot. Soc. 125: 183-193.
Little, D.P., A.E. Schwarzbach, R.P. Adams, and C.-F. Hsieh. 2004. The circumscription and phylogenetic relationships of *Callitropsis* and the newly described genus *Xanthocyparis* (Cupressaceae). Amer. J. Bot. 91: 1872-1881.
Little, E.L., Jr. 1969. Two varietal transfers in *Carya* (Hickory). Phytologia 19: 186-190.
Liu, T.-S. 1971. A monograph of the genus *Abies*. Dept. of Forestry, National Taiwan University, Taipei.
Lledó, M.D., M.B. Crespo, K.M. Cameron, M.F. Fay, and M.W. Chase. 1998. Systematics of Plumbaginaceae based upon cladistic analysis of rbcL sequence data. Systematic Bot. 23: 21-29.
Loconte, H., and W.H. Blackwell. 1981. A new species of blue cohosh (*Caulophyllum*, Berberidaceae) in eastern North America. Phytologia 49: 483.
———, and W.H. Blackwell. 1984. Berberidaceae in Ohio. Castanea 49: 39-43.
——, and W.H. Blackwell. 1985. Intrageneric taxonomy of *Caulophyllum* (Berberidaceae). Rhodora 87: 463-469.
——, and J.R. Estes. 1989a. Generic relationships within Leonticeae (Berberidaceae). Can. J. Bot. 67: 2310-2316
——, and J.R. Estes. 1989b. Phylogenetic systematics of Berberidaceae and Ranunculales (Magnoliidae). Systematic Bot. 14: 565-579.
Long, R.W. 1970. The genera of Acanthaceae in the southeastern United States. J. Arnold Arb. 51: 257-309.
Longhi-Wagner, H.M., and S.A. Renvoize. 2004. The genus *Ctenium* (Poaceae – Cynodonteae) in Bolivia. Kew Bull. 59: 305-309.
Lourteig, A. 1979. Oxalidaceae extra-Austroamericanae. II. *Oxalis* L. Sectio Corniculatae DC. Phytologia 42: 57-198.
Lowden, R.M. 1973. Revision of the genus *Pontederia* L. Rhodora 75: 426-487.
Lowry, P.P., II, and A.G. Jones. 1979. Biosystematic investigations and taxonomy of *Osmorhiza* Section *Osmorhiza* (Apiaceae) in North America. Amer. Midl. Naturalist 101: 21-27.
Ludwig, J.C. 1999. The flora of dolomite and limestone barrens in southwestern Virginia. Castanea 64: 209-230.
Luebke, N.T., and J.M. Budke. 2003. *Isoëtes tennesseensis* (Isoëtaceae), an octoploid quillwort from Tennessee. American Fern J. 93: 184-190.
Luer, C.A. 1972. The native orchids of Florida. New York Botanical Garden, Bronx, New York.
——. 1975. The native orchids of the United States and Canada, excluding Florida. New York Botanical Garden, Bronx, New York.
Luken, J.O., J.W. Thieret, and J.R. Kartesz. 1993. *Erucastrum gallicum* (Brassicaceae): invasion and spread in North America. Sida 15: 569-582.
Luteyn, J.L. 1976. Revision of *Limonium* (Plumbaginaceae) in eastern North America. Brittonia 28: 303-317.
——, W.S. Judd, S.P. Vander Kloet, L.J. Dorr, G.D. Wallace, K.A. Kron, P.F. Stevens, and S.E. Clemants. 1996. Ericaceae of the southeastern United States. Castanea 61: 101-144.
Ma, Yu-Chuan. 1951. *Gentianopsis*: a new genus of Chinese Gentianaceae. Acta Phytotax. Sinica 1: 5-19.
Mabberley, D.J. 1997a. The plant-book: a portable dictionary of the vascular plants. Cambridge Univ. Press, Cambridge, U.K.
——. 1997b. A classification for edible *Citrus* (Rutaceae). Telopea 7: 167-172.
Mackenzie, K.K. 1931-1935. Poales, Cyperaceae, Cypereae (pars). North American Flora, vol. 18, Parts 1-7.
MacRoberts, M.H., and B.R. MacRoberts. 1992. Observations on toothache grass (*Ctenium aromaticum* [Poaceae: Chlorideae]) with particular reference to fire. Phytologia 73: 439-444.
——, and B.R. MacRoberts. 2004. *Sarracenia purpurea* (Sarraceniaceae) in Louisiana, Sida 21: 1149-1152.
——, B.R. MacRoberts, and L.S. Jackson. 2004. Observations on *Parnassia grandifolia* DC. (Saxifragaceae) in the west Gulf Coastal Plain. Phytologia 86: 98-103.
Maddox, D., and R. Bartgis. 1990. Harperella (*Ptilimnium nodosum*) recovery plan. U.S. Fish and Wildlife Service, Newton Corner, MA. 55 pp.
Maguire, B. 1950. Studies in the Caryophyllaceae – IV. a synopsis of the North American species of the subfamily Silenoideae. Rhodora 52: 233-245
Mahler, W.F. 1975. Typification and distribution of the varieties of *Gnaphalium helleri* Britton (Compositae-Inuleae). Sida 6: 30-32.
Mahoney, A. M. 1998. *Packera paupercula* – predatory compilo-species or mare's nest of convergent species-in-progress [abstract]. Am. J. Bot. 85 [supplement]: 109-110.
——, and R.R. Kowal. Four new varieties and one new combination in the *Packera paupercula* complex in eastern North America. Sida [in press].
Manen, J.-F., M.C. Boulter, and Y. Naciri-Graven. 2002. The complex history of the genus *Ilex* L. (Aquifoliaceae): evidence from the comparison of plastid and nuclear DNA sequences and from fossil data. Plant Syst. Evol. 235: 79-98.
——, C. Habashi, D. Jeanmonod, J.-M. Park, and G.M. Schneeweiss. 2004. Phylogeny and infraspecific variability of holoparasitic *Orobanche* (Orobanchaceae) inferred from plastid rbcL sequences. Molec. Phylo. and Evol. 33: 482-500.

Mangaly, J.K. 1968. A cytotaxonomic study of the herbaceous species of *Smilax*: section *Coprosmanthus*. Rhodora 70: 55-82, 247-273.
Manhart, J.R. 1984. A biosystematic study of *Carex* section *Laxiflorae*. Ph.D. dissertation, University of Georgia.
Manitz, H. 1983. Zur Nomenclatur einiger Convolvulaceae und Cuscutaceae. I. Feddes Repert. 94: 173-182.
Manning, W.E. 1950. A key to the hickories north of Virginia with notes on the two pignuts, *Carya glabra* and *C. ovalis*. Rhodora 52: 188-199.
Manning, S.D. 2000. The genera of Bignoniaceae in the southeastern United States. Harvard Papers in Botany 5: 1-77.
Marazzi, B., P.K. Endress, L. P. de Queiroz, and E. Conti. 2006. Phylogenetic relationships within *Senna* (Leguminosae, Cassiinae) based on three chloroplast DNA regions: patterns in the evolution of flora symmetry and extrafloral nectaries. Amer. J. Bot. 93: 288-303.
Maréchal, R., J.-M. Mascherpa, and F. Stainier. 1978. Étude taxonomique d'un groupe complexe d'espèces des genres *Phaseolus* et *Vigna* (Papilionaceae) sur le base de données morphologiques et polliniques, traitées par l'analyse informatique. Boissiera 28: 1-273.
Martínez, M. 1993. The correct application of *Physalis pruinosa* L. (Solanaceae). Taxon 42: 103-104.
Martins, L., C. Oberprieler, and F.H. Hellwig. 2003. A phylogenetic analysis of Primulaceae s.l. based on internal transcribed spacer (ITS) DNA sequence data. Plant. Syst. Evol. 237: 75-85.
Maskas, S.D., and M.B. Cruzan. 2000. Patterns of infraspecific diversification in the *Piriqueta caroliniana* complex in southeastern North America and the Bahamas. Evolution 54: 815-827.
Maslin, B.R., J.T. Miller, and D.S. Seigler. 2003. Overview of the generic status of *Acacia* (Leguminosae: Mimosoideae). Australian Systematic Botany 16: 1-18.
Massey, A.B. 1944. The ferns and fern allies of Virginia. Bull. Va. Polytechnic Institute 37: 1-110
Massey, J.R. 1975. *Fatoua villosa* (Moraceae): additional notes on distribution in the southeastern United States. Sida 6: 116.
———, D.K.S. Otte, T.A. Atkinson, and R.D. Whetstone. 1983. An atlas and illustrated guide to the threatened and endangered vascular plants of the mountains of North Carolina and Virginia. Southeastern Forest Experiment Station General Technical Report SE-20, Asheville, N.C.
Mast, A.R., D.M.S. Feller, S. Kelso, and E. Conti. 2004. Buzz-pollinated *Dodecatheon* originated fro within the heterostylous *Primula* subgenus *Auriculastrum* (Primulaceae): a seven-region cpDNA phylogeny and its implications for floral evolution. Amer. J. Bot. 91: 926-942.
Mathew, B. 1992. A taxonomic and horticultural review of *Erythronium* L. (Liliaceae). Bot. J. Linn. Soc. 109: 453-471.
——. 1996. A review of *Allium* sect. *Allium*. Royal Botanic Gardens, Kew, England.
Mathias, M.E., and L. Constance. 1945. Umbelliferae. North American Flora, vol. 28B: 43-397. N.Y. Botanical Garden, New York.
Matthews, C.R., and J.H. Howard. 1999. Genetic variation in the federally endangered Schweinitz's sunflower, *Helianthus schweinitzii* T. & G. (Asteraceae). Castanea 64: 231-242.
Matthews, J.F., L.S. Barden, and C.R. Matthews. 1997. Corrections of the chromosome number, distribution and misidentifications of the federally endangered sunflower, *Helianthus schweinitzii* T. & G. J. Torrey Botanical Society 124: 198-209.
——, J.R. Allison, R.T. Ware, Sr., and C. Nordman. 2002. *Helianthus verticillatus* Small (Asteraceae) rediscovered and redescribed. Castanea 67: 13-24.
——, W.R. Faircloth, and J.R. Allison. 1991. *Portulaca biloba* Urban (Portulacaceae), a species new to the United States. Systematic Bot. 16: 736-740.
——, and D.W. Ketron. 1991. Two new combinations in *Portulaca* (Portulacaceae). Castanea 56: 304-305.
——, D.W. Ketron, and S.F. Zane. 1992a. The reevaluation of *Portulaca pilosa* and *P. mundula* (Portulacaceae). Sida 15: 71-89.
——, D.W. Ketron, and S.F. Zane. 1992b. *Portulaca umbraticola* Kunth (Portulacaceae) in the United States. Castanea 57: 202-208.
——, D.W. Ketron, and S.F. Zane. 1993. The biology and taxonomy of the *Portulaca oleracea* L. (Portulaceae) complex in North America. Rhodora 95: 166-183.
——, and P.A. Levins. 1985a. The genus *Portulaca* in the southeastern United States. Castanea 50: 96-104.
——, and P.A. Levins. 1985b. *Portulaca pilosa* L., *P. mundula* I.M. Johnst. and *P. parvula* Gray in the Southwest. Sida 11: 45-61.
——, and P.A. Levins. 1986. The systematic significance of seed morphology in *Portulaca* (Portulacaceae) under scanning electron microscopy. Systematic Bot. 11: 302-308.
Matthews, J.F., and A.E. Radford. 1985. New reports of *Calamagrostis porteri* A. Gray from North Carolina. Castanea 50: 202.
Mayfield, M.H. 2002. The varieties of *Liatris elegans* (Asteraceae). Sida 20: 597-603.
Mazzeo, P.M. 1974. *Betula uber* – what is it and where is it? Castanea 39: 273-278.
McAllister, H., and K. Ashburner. 2004. Plate 487. *Betula lenta* forma *uber*; Betulaceae. Curtis's Botanical Magazine 21: 54-60.
McAtee, W.L. 1956. A review of the nearctic *Viburnum*. Privately published by the author, Chapel Hill, NC.
McAvoy, W.A. 2002. *Amaranthus pumilus* Raf. (seabeach amaranth, Amaranthaceae) rediscovered in Sussex County, Delaware. Bartonia 61: 147-148.
McCartney, R.B., K. Wurdack, and J.H. Moore. 1989. The genus *Lindera* in Florida. The Palmetto, Summer 1989: 3-8.
McClintock, E., and C. Epling. 1942. A review of the genus *Monarda* (Labiatae). Univ. of Calif. Publ. in Botany 20: 147-194.

McClintock, E. 1957. A monograph of the genus *Hydrangea*. Proc. Calif. Acad. Sci. 29: 147-256.
McClintock, K.A., and M.J. Waterway. 1994. Genetic differentiation between *Carex lasiocarpa* and *C. pellita* (Cyperaceae) in North America. Am. J. Bot. 81: 224-231.
McClure, F.A. 1963. A new feature in bamboo rhizome anatomy. Rhodora 65: 134-136.
——. 1973. Genera of bamboos native to the New World. Smithsonian Contr. Bot. 9: 1-148.
McCormac, J.S., J.K. Bissell, and S.J. Stine, Jr. 1995. The status of *Fraxinus tomentosa* (Oleaceae) in Ohio with notes on its occurrence in Michigan and Pennsylvania. Castanea 60: 70-78.
McCormick, J.F., and R.B. Platt. 1964. Ecotypic differentiation in *Diamorpha cymosa*. Bot. Gazette 125: 271-279.
McCoy, J.-A. 2004. Noteworthy collections: North Carolina. Castanea 69: 329.
McDade, L.A., and M.L. Moody. 1999. Phylogenetic relationships among Acanthaceae: evidence from noncoding trnL-trnF chloroplast DNA sequences. Amer. J. Bot. 86: 70-80.
——, S.E. Masta, M.L. Moody, and E. Waters. 2000. Phylogenetic relationships among Acanthaceae: evidence from two genomes. Systematic Bot. 25: 106-121.
McDaniel, J.C. 1966. Variations in the sweet bay magnolias. Morris Arboretum Bull. 17: 7-12.
McDaniel, S. 1968. *Harperocallis*, a new genus of the Liliaceae from Florida. J. Arnold Arb. 49: 35-40.
——. 1971. The genus *Sarracenia* (Sarraceniaceae). Tall Timbers Research Station Bull. 9: 1-36.
——. 1986. Taxonomic study of three *Sarracenia* subspecies (*S. rubra* ssp. *alabamensis*, *S. rubra* ssp. *wherryi*, and *S. rubra* ssp. *jonesii*). Report to the U.S. Fish and Wildlife Service.
McDougal, K.M., and C.R. Parks. 1984. Elevational variation in foliar flavonoids of *Quercus rubra* L. (Fagaceae). Am. J. Bot. 71: 301-308.
McDowell, G.W. 1969. American Yew in North Carolina. J. Elisha Mitchell Sci. Soc. 85: 16-17.
——. 1984. Bogbean and shinleaf in North Carolina. Castanea 49: 203.
McGregor, R.L. 1968. The taxonomy of the genus *Echinacea* (Compositae). Univ. Kansas Sci. Bull. 48: 113-142.
McKenney, T.C. 1967. Differentiation of sterile specimens of *Nyssa sylvatica* Marsh. and *Diospyros virginiana* L. Castanea 32: 186-189.
McKenzie, P.M., B. Jacobs, C.T. Bryson, G.C. Tucker, and R. Carter. 1998. *Cyperus fuscus* (Cyperaceae), new to Missouri and Nevada, with comments on its occurrence in North America. Sida 18: 325-333.
——, and D. Ladd. 1995. Status of *Bromus nottowayanus* (Poaceae) in Missouri. Missouriensis 16: 57-68.
——, L.E. Urbatsch, and C. Aulbach-Smith. 1987. *Eustachys caribaea* (Poaceae), a species new to the United States and a key to *Eustachys* in the United States. Sida 12: 227-232.
McKenzie, R.J., E.M. Muller, A.K.W. Skinner, P.O. Karis, and N.P. Barker. 2006. Phylogenetic relationships and generic delimitation in subtribe Arctotidineae (Asteraceae: Arctotideae) inferred by DNA sequence data from ITS and five chloroplast regions. Amer. J. Botany 93: 1222-1235.
McKeown, K. 1999. A review of the taxonomy of the genus *Echinacea*, in J. Janick (ed.). Perspectives on new crops and new uses. ASHS Press, Alexandria, VA. http://www.hort.purdue.edu/newcrop/proceedings1999/pdf/v4-482.pdf. Accessed 8 December 2005.
McKinney, L.E. 1992. A taxonomic revision of the acaulescent blue violets (*Viola*) of North America. Sida Bot. Miscellany 7: 1-60.
——, and N.H. Russell. 2002. Violaceae of the southeastern United States. Castanea 67: 369-379.
McMillan, P.D. 2003. Noteworthy collections: South Carolina. Castanea 68: 345-347.
——, R.K. Peet, R.D. Porcher, and B.A. Sorrie. 2002. Noteworthy botanical collections from the fire-maintained pineland and wetland communities of the coastal plain of the Carolinas and Georgia. Castanea 67: 61-83.
McNamara, J., and J.A. Quinn. 1977. Resource allocation and reproduction in populations of *Amphicarpum purshii* (Gramineae). Am. J. Bot. 64: 17-23.
McNeill, J. 1976. Nomenclature of four perennial species of *Bromus* in eastern North America, with a proposal for the listing of *B. purgans* L. as a rejected name under Article 69. Taxon 25: 611-616.
——. 1979. *Diplachne* and *Leptochloa* (Poaceae) in North America. Brittonia 31: 399-404.
McRoy, C.P., and C. Helfferich, eds. 1977. Seagrass ecosystems: a scientific perspective. Marcel Dekker, Inc., New York, NY. 314 pp.
McVaugh, R. 1936. Studies in the taxonomy and distribution of the eastern North American species of *Lobelia*. Rhodora 38: 241-263, 276-298, 305-329.
——. 1944. The genus *Cnidoscolus*: generic limits and intergeneric groups. Bull. Torrey Bot. Club 71: 457-474.
——. 1945. The genus *Triodanis* Rafinesque, and its relationships to *Specularia* and *Campanula*. Wrightia 1: 13-52.
——. 1948. Generic status of *Triodanis* and *Specularia*. Rhodora 50: 38-49.
——. 1951. A revision of the North American black cherries (*Prunus serotina* Ehrh., and relatives). Brittonia 7: 279-315.
——. 1972. Compositarum Mexicanarum pugillus. Contr. Univ. Michigan Herb. 9: 359-484.
——, M.R. McVaugh, and M. Ayers. 1996. Chapel Hill and Elisha Mitchell the botanist. Occasional Publication No. 1 of the Chapel Hill Historical Society and Contribution No. 1 of the N.C. Botanical Garden. Botanical Garden Foundation, Chapel Hill, NC. 122 pp.
Meacham, C.A. 1980. Phylogeny of the Berberidaceae with an evaluation of classifications. Systematic Bot. 5: 149-172.
Mears, J.A. 1975. The taxonomy of *Parthenium* Section *Partheniastrum* DC. (Asteraceae--Ambrosiinae). Phytologia 31: 463-482.

Medley, M.E. 1989. *Silphium wasiotensis* (Asteraceae), a new species from the Appalachian plateaus in eastern Kentucky. Sida 13: 285-291.
——. 1993. An annotated catalog of the known or reported vascular flora of Kentucky. Ph.D. dissertation, Dept. of Biology, University of Louisville, KY.
——, H. Bryan, J. MacGregor, and J.W. Thieret. 1985. *Achyranthes japonica* (Miq.) Nakai (Amaranthaceae) in Kentucky and West Virginia: new to North America. Sida 11: 92-95.
Mellichamp, T.L., J.F. Matthews, and P.J. Smithka. 1987. New state and regional records of vascular plants in the Carolinas. Castanea 52: 95-111.
——, J.F. Matthews, and P.J. Smithka. 1988. It's *Anthriscus sylvestris*, not *Conioselinum chinensis*, new to North Carolina-Tennessee. Castanea 53: 81-82.
Mellinger, A.C. 1972. Ecological life cycle of *Viguiera porteri* and factors responsible for its endemism to granite outcrops of Georgia and Alabama. Ph.D. thesis, University of North Carolina at Chapel Hill, Botany department.
Menapace, F.J., P.G. Davison, and D.H. Webb. 1998. Noteworthy collections: Mississippi. Castanea 63: 80-81.
Mendenhall, M.G. 1994a. New combinations in *Thermopsis* and *Baptisia*. Phytologia 76: 383-384.
Mendenhall, M.G. 1994b. Phylogeny of *Baptisia* and *Thermopsis* (Leguminosae) as inferred from chloroplast DNA and nuclear ribosomal DNA sequences, secondary chemistry, and morphology. Ph.D. dissertation, Univ. of Texas at Austin.
Meng, S.-W., A.W. Douglas, D.-Z. Li, Z.-D. Chen, H.-X. Liang, and J.-B. Yang. 2003. Phylogeny of Saururaceae based on morphology and five regions from three plant genomes. Ann. Missouri Bot. Gard. 90: 592-602.
Mennema, J. 1989. A taxonomic revision of *Lamium* (Lamiaceae). Leiden Botanical Series 11: 1-196.
Meyer, F.G. 1976. A revision of the genus *Koelreuteria* (Sapindaceae). J. Arnold Arb. 57: 129-166.
——, and J.W. Hardin. 1987. Status of the name *Aesculus flava* Solander (Hippocastanaceae). J. Arnold Arb. 68: 335-341.
Meyer, F.K. 1973. Conspectus der "*Thlaspi*" Arten Europas, Afrikas und Vorderasiens. Feddes Repertorium 84: 449-470.
——. 1979. Kritische Revision der "*Thlaspi*" Arten Europas, Afrikas und Vorderasiens. Feddes Repertorium 90: 129-154.
Mickel, J.T. 1979. How to know the ferns and fern allies. Wm. C. Brown Company, Dubuque, Iowa.
Miller, A.J., D.A. Young, and J. Wen. 2001. Phylogeny and biogeography of *Rhus* (Anacardiaceae) based on ITS sequence data. Int. J. Plant Sci. 162: 1401-1407.
Miller, G.N. 1955. The genus *Fraxinus*, the ashes, in North America, north of Mexico. Memoir 335, Cornell Univ. Agri. Experiment Station, Ithaca, NY.
Miller, K.I., and G.L. Webster. 1967. A preliminary revision of *Tragia* (Euphorbiaceae) in the United States. Rhodora 69: 241-305.
Miller, J.N., and K.L. Chambers. 2006. Systematics of *Claytonia* (Portulacaceae). Systematic Botany Monographs 78: 1-236.
Miller, N.G. 1971a. The genera of the Urticaceae in the southeastern United States. J. Arnold Arb. 52: 40-68.
——. 1971b. The Polygalaceae in the southeastern United States. J. Arnold Arb. 52: 267-284.
——. 1991. The genera of Meliaceae in the southeastern United States. J. Arnold Arb. 71: 453-486.
——, and C.E. Wood, Jr. 2003. The Asian weed *Fatoua villosa* (Moraceae) in New York state and Massachusetts. Rhodora 105: 286-291.
Milne, R.I. 2004. Phylogeny and biogeography of *Rhododendron* subsection *Pontica*, a group with a Tertiary relict distribution. Molecular Phylogenetics and Evolution 33: 389-401.
Mitchell, R.J. 1990. *Trillium*. Part 4 – the pedicellate species of eastern North America. The Plantsman 12: 44-60.
Mitchell, R.S. 1970. A re-evaluation of *Polygonum meisnerianum* in North America. Rhodora 72: 182-188.
——, and J.K. Dean. n.d. Polygonaceae (Buckwheat Family) of New York state. Bulletin Numb. 431. N.Y. State Museum, Albany, NY.
Moldenke, H.N. 1980. A sixth summary of the Verbenaceae, Avicenniaceae, Stilbaceae, Chloanthaceae, Symphoremaceae, Nyctanthaceae, and Eriocaulaceae of the world as to valid taxa, geographic distribution and synonymy. Phytologia Memoirs II. Privately published, Plainfield, NJ.
Montgomery, J.D. 1982. *Dryopteris* in North America. Part II: the hybrids. Fiddlehead Forum 9: 23-30.
——, and E.M. Paulton. 1981. *Dryopteris* in North America. Fiddlehead Forum 8: 25-31.
Moore, M.O. 1991. Classification and systematics of eastern North American *Vitis* L. (Vitaceae) north of Mexico. Sida 14: 339-367.
Moran, R.C. 1982. The *Asplenium trichomanes* complex in the United States and adjacent Canada. Am. Fern J. 72: 5-11.
——. 1983. *Cystopteris tenuis* (Michx.) Desv.: a poorly understood species. Castanea 48: 218-223.
——. 1998. Ferns, flashlights, and Tertiary forests. Fiddlehead Forum 25: 1-7.
——, and A.R. Smith. 1999. *Salvinia adnata* Desv. versus *S. molesta* D.S. Mitch. Am. Fern J. 89: 268-269.
Morden, C.W. and S.L. Hatch. 1989. An analysis of morphological variation in *Muhlenbergia capillaris* (Poaceae) and its allies in the southeastern United States. Sida 13: 303-314.
Morgan, D.R., and D.E. Soltis. 1993. Phylogenetic relationships among members of Saxifragaceae sensu lato based on rbcL sequence data. Ann. Mo. Bot. Gard. {}: 631-660.
Morgan, J.T. 1966. A taxonomic study of the genus *Boltonia* (Asteraceae). Ph.D. dissertation, University of North Carolina at Chapel Hill.
Morse, L.E. 1979. Systematics and ecological biogeography of the genus *Hudsonia* (Cistaceae), the sand heathers. Ph.D. dissertation, Harvard University.

Mort, M.E., and D.E. Soltis. 1999. Phylogenetic relationships and the evolution of ovary position in *Saxifraga* section *Micranthes*. Systematic Botany 24: 139-147.
Morton, C.M., B. Isaac, J. Kartesz, and R. Coxe. 2004. Additions to and noteworthy records for the vascular flora of West Virginia. Sida 21: 481-485.
Morton, C.V. 1968. The genera, subgenera, and sections of the Hymenophyllaceae. Contr. U.S. National Herbarium 38: 153-214.
Morton, G.H. 1973. [dissertation]
Morton, G.H. 1974. A new subspecies and other nomenclatural changes in the *Solidago arguta* complex. Phytologia 28: 1-3.
Mosquin, T. 1966. A new taxonomy for *Epilobium angustifolium* L. (Onagraceae). Brittonia 18: 167-188.
Mosyakin, S.L., and S.E. Clemants. 1996. New infrageneric taxa and combinations in *Chenopodium* L. (Chenopodiaceae). Novon 6: 398-403.
Muasya, A.M., J.J. Bruhl, D.A. Simpson, A. Culham, and M.W. Chase. 2000. Suprageneric phylogeny of Cyperaceae: a combined analysis. In: K.L. Wilson & D. A. Morrison, eds., Monocots: systematics and evolution. CSIRO, Melbourne.
Mullahey, J.J. Tropical soda apple (*Solanum viarum* Dunal), a biological pollutant threatening Florida. Castanea 61: 255-260.
——, M. Nee, R.P. Wunderlin, and K.R. Delaney. 1993. Tropical soda apple (*Solanum viarum*): a new weed threat in subtropical regions. Weed Technology 7: 783-786.
Mulligan, G.A. 1980. The genus *Cicuta* in North America. Can. J. Bot. 58: 1755-1767.
Müller, K., and T. Borsch. 2005. Phylogenetics of *Utricularia* (Lentibulariaceae) and molecular evolutuion of the trnK intron in a lineage with high substitutional rates. Plant Syst. Evol. 250: 39-67.
Müller-Doblies, D., and U. Müller-Doblies. 1996. Tribes and subtribes and some species combinations in Amaryllidaceae J. St.-Hil. emend. R. Dahlgren & al. 1985. Feddes Repertorium 107: 5-6, S.c. 1-S.c. 9.
Mummenhoff, K., and M. Koch. 1994. Chloroplast DNA restriction site variation and phylogenetic relationships in the genus *Thlaspi* sensu lato (Brassicaceae). Systematic Bot. 19: 73-88.
Munz, P.A. 1937. Studies in Onagraceae. X. The subgenus *Kneiffia* (genus *Oenothera*) and miscellaneous new species of *Oenothera*. Bull. Torrey Bot. Club 64: 287-306.
——. 1942. Studies in Onagraceae. XII. A revision of the New World species of *Jussiaea*. Darwiniana 4: 179-284.
——. 1944. Studies in Onagraceae. XIII. The American species of *Ludwigia*. Bull. Torrey Bot. Club 71: 152-165.
——. 1946. *Aquilegia*: the cultivated and wild columbines. Gentes Herb. 7: 1-150.
——. 1965. Onagraceae. N. Amer. Fl. II. 5: 1-278.
Murakami, N., S. Nogami, M. Watanabe, and K. Iwatsuki. 1999. Phylogeny of Aspleniaceae inferred from rbcL nucleotide sequences. Am. Fern J. 89: 232-243.
Murdy, W.H. 1966. The systematics of *Phacelia maculata* and *P. dubia* var. *georgiana*, both endemic to granite outcrop communities. Am. J. Bot. 53: 1028-1036.
——. 1968. Plant speciation associated with granite outcrop communities of the southeastern Piedmont. Rhodora 70: 394-407.
Murray, A.E., Jr. 1970. A monograph of the Aceraceae. Ph.D. thesis, Pennsylvania State University.
Murray, E. 1982. Notae Spermatophytae (Spermatophyta notes). Kalmia 12: 18-28.
Murrell, Z.E. 1993. Phylogenetic relationships in *Cornus* (Cornaceae). Systematic Botany 18: 469-495.
——, P.E. Carroll, S.A. Myers, and P.J. Lawless. 1998. Examination of species boundaries in *Hexastylis contracta* Blomquist and *H. rhombiformis* Gaddy [abstract]. Amer. J. Bot. 85 [supplement]: 146-147.
Musselman, L.J. 1982. The Orobanchaceae of Virginia. Castanea 47: 266-275.
——. 1984. An unusual specimen of *Orobanche* from North Carolina collected by John Ball in 1884. Castanea 49: 91-93.
——. 2001. Georgia quillworts. Tipularia 16: 2-19, 40.
——, R.D. Bray, and D.A. Knepper. 1996. *Isoetes* ×*bruntonii* (*Isoetes engelmannii* × *I. hyemalis*), a new hybrid quillwort from Virginia. Amer. Fern J. 86: 8-15.
——, R.D. Bray, and D.A. Knepper. 1997. *Isoetes* ×*carltaylorii* (*Isoetes acadiensis* × *I. engelmannii*), a new interspecific quillwort hybrid from the Chesapeake Bay. Can. J. Bot. 75: 301-309.
——, W.C. Taylor, and R.D. Bray. 2001. *Isoetes massaponica* (Isoetaceae), a new diploid quillwort from freshwater tridal marshes of Virginia. Novon 11: 200-204.
——, and D.A. Knepper. 1994. Quillworts of Virginia. Amer. Fern J. 84: 48-68.
——, D.A. Knepper, R.D. Bray, C.A. Caplen, and C. Ballou. 1995. A new *Isoetes* hybrid from Virginia. Castanea 60: 245-254.
Myint, T. 1966. Revision of the genus *Stylisma* (Convolvulaceae). Brittonia 18: 97-117.
Mymudes, M.S., and D.H. Les. Morphological and genetic variability in *Plantago cordata* (Plantaginaceae), a threatened aquatic plant. Am. J. Bot. 80: 351-359.
Naczi, R.F.C. 1989. *Carex asynchrona*, a new species of section *Griseae* (Cyperaceae) from Tamaulipas, Mexico. Sida 13: 487-492.
——. 1990. The taxonomy of *Carex bromoides* (Cyperaceae). Contr. Univ. Mich. Herb. 17: 215-222.
——. 1993. *Carex brysonii* and *Carex godfreyi*, new species of *Carex* section *Griseae* (Cyperaceae) from the southeastern United States. Contr. Univ. Michigan Herb. 19: 195-205.
——. 1997. *Carex pigra*, a new species of *Carex* section *Griseae* (Cyperaceae) from the southeastern United States of America. Novon 7: 67-71.
——. 1999a. *Carex planispicata*, a widespread and frequent new species of *Carex* section *Griseae* (Cyperaceae) from the eastern United States of America. J. Ky. Acad. Sci. 60: 37-44.

——. 1999b. Chromosome numbers of some eastern North American species of *Carex* and *Eleocharis* (Cyperaceae). Contr. Univ. Michigan Herb. 22: 105-119.
——, and B.A. Ford. 1998. Systematics of the *Carex jamesii* complex (section *Phyllostachys*, Cyperaceae) [abstract]. Am. J. Bot. 85 [supplement]: 147.
——, and J.W. Thieret. 1996. Invasion and spread of *Coincya monensis* (Brassicaceae) in North America. Sida 17: 43-53.
——, C.T. Bryson, and T.S. Cochrane. 2002. Seven new species and one new combination in *Carex* (Cyperaceae) in North America. Novon 12: 508-532.
——, A.A. Reznicek, and B.A. Ford. 1998. Morphological, geographical, and ecological differentiation in the *Carex willdenowii* complex (Cyperaceae). Am. J. Bot. 85: 434-447.
——, E.M. Soper, F.W. Case, Jr., and R.B. Case. 1999. *Sarracenia rosea* (Sarraceniaceae), a new species of pitcher plant from the southeastern United States. Sida 18: 1183-1206.
Nanda, J.S., and S.D. Sharma, eds. 2003. Monograph on genus *Oryza*. Science Publishers, Inc., Enfield, NH. 400 pp.
Nash, G.V. 1900. Some new grasses from the southern states. N.Y. Bot. Garden Bull. 1: 429-436.
NatureServe. 2003. A working classification of terrestrial ecological systems in the coterminous United States. International terrestrial ecological systems classification. NatureServe, Arlington, VA. 61 pp. plus appendices.
NatureServe. 2005a. International ecological classification standard: terrestrial ecological classifications. NatureServe Central Databases. Arlington, VA. Data current as of March 2005.
NatureServe. 2005b. NatureServe explorer, an online encyclopedia of life. http://www.natureserve.org/explorer/. Accessed 28 November 2005.
Navaro, A.M., and W.H. Blackwell. 1990. A revision of *Paxistima* (Celastraceae). Sida 14: 231-249.
Neinhuis, C., S. Wanke, K.W. Hilu, K. Müller, and T. Borsch. 2005. Phylogeny of Aristolochiaceae based on parsimony, likelihood, and Bayesian analyses of trnL-trnF sequences. Plant Syst. Evol. 250: 7-26.
Nelson, A.D., W.J. Elisens, and D. Benish. 1998. Notes on chromosome numbers in *Chelone* (Scrophulariaceae). Castanea 63: 183-187.
Nelson, G. 1994. The trees of Florida: a reference and field guide. Pineapple Press, Sarasota, FL. 338 pp.
——. 1996. The shrubs and woody vines of Florida: a reference and field guide. Pineapple Press, Sarasota, FL. 391 pp.
——. 2000. The ferns of Florida: a reference and field guide. Pineapple Press, Sarasota, FL. 208 pp.
Nelson, J.B. 1980. *Mitreola* vs. *Cynoctonum*, and a new combination. Phytologia 46: 338-340.
——. 1981. *Stachys* (Labiatae) in Southeastern United States. Sida 9: 104-123.
——. 1993. Noteworthy collections: South Carolina. Castanea 58: 59-63.
——, ed. 2003. South Carolina Plant Atlas. http://cricket.biol.sc.edu/herb/
——, and J.E. Fairey III. 1979. Misapplication of the name *Stachys nuttallii* to a new southeastern species. Brittonia 31: 491-494.
——, and K.B. Kelly. 1997. Noteworthy collections: South Carolina. Castanea 62: 283-288.
——, and D.A. Rayner. 1988. *Isanthus brachiatus* and *Helianthus schweinitzii* in York County, South Carolina. Castanea 53: 82-83.
Nesom, G.L. 1980. *Erigeron tenuis* T. & G. (Asteraceae) distantly disjunct in North Carolina. Castanea 45: 70-71.
——. 1983. *Galax* (Diapensiaceae): geographic variation in chromosome number. Systematic Bot. 8: 1-14.
——. 1989. New species, new sections, and a taxonomic overview of American *Pluchea* (Compositae: Inuleae). Phytologia 67: 158-167.
——. 1990. Taxonomic status of *Gamochaeta* (Asteraceae: Inuleae) and the species of the United States. Phytologia 68: 186-198.
——. 1993a. Taxonomy of *Sericocarpus* (Asteraceae: Astereae). Phytologia 75: 45-54.
——. 1993b. Taxonomic infrastructure of *Solidago* and *Oligoneuron* (Asteraceae: Astereae) and observations on their phylogenetic position. Phytologia 75: 1-44.
——. 1993c. *Sageretia mexicana* (Rhamnaceae), a new species from southwestern Mexico. Phytologia 75: 369-376.
——. 1993d. Taxonomy of *Doellingeria* (Asteraceae: Astereae). Phytologia 75: 452-462.
——. 1994a. Subtribal classification of the Astereae (Asteraceae). Phytologia 76: 193-274.
——. 1994b. Review of the taxonomy of *Aster* sensu lato (Asteraceae: Astereae), emphasizing the New World species. Phytologia 77: 141-297.
——. 1995. Revision of *Chaptalia* (Asteraceae: Mutisieae) from North America and continental Central America. Phytologia 78: 153-188.
——. 1997. Taxonomic adjustments in North American *Aster* sensu latissimo (Asteraceae: Astereae). Phytologia 82: 281-288.
——. 1999. *Gamochaeta simplicicaulis* (Asteraceae: Gnaphalieae) in four southeastern states and new for North America. Sida 18: 1259-1264.
——. 2000a. Noteworthy collections from Herbarium NCU. Castanea 65: 80-83.
——. 2000b. Generic conspectus of the tribe Astereae (Asteraceae) in North America and Central America, the Antilles, and Hawaii. Sida Botanical Miscellany 20: 1-100.
——. 2000c. Callery pear (*Pyrus calleryana* – Rosaceae) naturalized in North Carolina. Rhodora 102: 361-364.
——. 2000d. *Gamochaeta simplicicaulis* (Asteraceae: Gnaphalieae) in Georgia. Sida 19: 413.
——. 2000e. Noteworthy collections: North Carolina. Castanea 65: 170.
——. 2001a. Notes on variation in *Pseudognaphalium obtusifolium* (Asteraceae: Gnaphalieae). Sida 19: 615-619.

——. 2001b. Taxonomic review of *Chrysogonum* (Asteraceae: Heliantheae). Sida 19: 811-820.
——. 2002. New combination in *Salix* (Salicaceae). Sida 20: 523-524.
——. 2004a. Notes on typification in *Pluchea* (Asteraceae: Plucheae). Sida 21: 59-64.
——. 2004b. New species of *Gamochaeta* (Asteraceae: Gnaphalieae) from the eastern United States and comments on similar species. Sida 21: 717-741.
——. 2004c. New distribution records for *Gamochaeta* (Asteraceae: Gnaphalieae) in the United States. Sida 21: 1175-1185.
——. 2004d. Asteraceae from wool mill sites in South Carolina, including new records for North America. Sida 21: 1215-1223.
——. 2005a. Taxonomic review of *Astranthium integrifolium* (Asteraceae: Astereae). Sida 21: 2015-2021.
——. 2005b. Taxonomy of the *Symphyotrichum* (Aster) *subulatum* group and *Symphyotrichum* (Aster) *tenuifolium* (Asteraceae: Astereae). Sida 21: 2125-2140.
——, and V.M. Bates. 1984. Reevaluations of infraspecific taxonomy in *Polygonella* (Polygonaceae). Brittonia 36: 37-44.
——, and J.T. Kartesz. 2000. Observations on the *Ludwigia uruguayensis* complex (Onagraceae) in North America. Castanea 65: 123-125.
——, and P.J.Leary. 1992. A new species of *Ionactis* (Asteraceae: Astereae) from southern Nevada and an overview of the genus. Brittonia 44: 247-252.
——, and B.L. Turner. 1998. Variation in the *Berlandiera pumila* (Asteraceae) complex. Sida 18: 493-502.
Neufeld, H.S. 1986. Ecophysiological implications of tree architecture for two cypress taxa, *Taxodium distichum* (L.) Rich. and *T. ascendens* Brongn. Bull. Torrey Bot. Club 113: 118-124.
Newell, R.E., and R.B. Newell. 1994. *Juncus caesariensis* Coville (New Jersey Rush) in Nova Scotia, Canada. Bartonia 58: 121-124.
Nevling, L.I., Jr. 1962. The Thymelaeaceae in the southeastern United States. J. Arnold Arb. 43: 428-434.
Neyland, R. 2001. A phylogeny inferred from large ribosomal subunit (26S) rDNA sequences suggests that *Cuscuta* is a derived member of Convolvulaceae. Brittonia 53: 108-115.
——, and M.K. Hennigan. 2004. A cladistic analysis of *Monotropa uniflora* (Ericaceae) inferred from large ribosomal subunit (26S) rRNA gene sequences. Castanea 69: 265-271.
Nicely, K.A. 1965. A monographic study of the Calycanthaceae. Castanea 30: 38-81.
Nickrent, D.L., and V. Malécot. 2001. A molecular phylogeny of the Santalales. Presented at the 7th International Parasitic Weed Symposium, Nantes, France, June 5-8, 2001. http://www.parasiticplants.siu.edu/Santalales.IPWC/Sants.IPWC.html. Accessed 10 December 2005.
Nixon, K.C., and J.M. Poole. 2003. Revision of the Mexican and Guatemalan species of *Platanus* (Platanaceae). Lundellia 6: 103-137.
Nordborg, G. 1966. *Sanguisorba* L., *Sarcopoterium* Spach, and *Bencomia* Webb et Berth. Opera Botanica 11: 2. C. Blum, Lund, Sweden.
——. 1967. The genus *Sanguisorba* section *Poterium*. Opera Botanica No. 16. C.W.K. Gleerup, Lund, Sweden.
Noss, R.F., and A.Y. Cooperrider. 1994. Saving nature's legacy: protecting and restoring biodiversity. Island Press, Washington, DC.
Noyes, R.D. 2000. Biogeographical and evolutionary insights on *Erigeron* and allies (Asteraceae) from ITS sequence data. Pl. Syst. Evol. 220: 93-114.
——, and L.H. Rieseberg. 1999. ITS sequence data support a single origin for North American Astereae (Asteraceae) and reflect deep geographic divisions in *Aster* s.l. Amer. J. Bot. 86: 398-412.
O'Kane, S.L., Jr., and I.A. Al-Shehbaz. 1997. A synopsis of *Arabidopsis*. Novon 7: 323-327.
——, and I.A. Al-Shehbaz. 2002. *Paysonia*, a new genus segregated from *Lesquerella* (Brassicaceae). Novon 12: 379-381.
——, and I.A. Al-Shehbaz. 2003. Phylogenetic position and generic limits of *Arabidopsis* (Brassicaceae) based on sequences of nuclear ribosomal DNA. Ann. Missouri Bot. Gard. 90: 603-612.
Ogden, E.C. 1974. *Potamogeton* in New York. N.Y. State Museum Bull. 423.
Ogle, D.W. 1991a. *Spiraea virginiana* Britton: I. Delineation and distribution. Castanea 56: 287-296.
——. 1991b. *Spiraea virginiana* Britton: II. Ecology and species biology. Castanea 56: 297-303.
——, and P. W. Mazzeo. 1976. *Betula uber*, the Virginia round-leaf birch, rediscovered in Southwest Virginia. Castanea 41: 248-256.
Oh, S.-H., and D. Potter. 2005. Molecular phylogenetic systematics and biogeography of tribe Neillieae (Rosaceae) using DNA sequences of cpDNA, rDNA, and *LEAFY*. Amer. J. Botany 92: 179-192.
Ohi-Toma, T., T. Sugawara, H. Murata, S. Wanke, C. Neinhuis, and J. Murata. 2006. Molecular phylogeny of *Aristolochia* sensu lato (Aristolochiaceae) based on sequences of *rbcL*, *matK*, and *phyA* genes, with special reference to differentiation of chromosome numbers. Systematic Bot. 31: 481-492
Øllgaard, B. 1987. A revised classification of the Lycopodiaceae s. lat. Opera Botanica 92: 153-178.
Olmstead, R.G., and P.A. Reeves. 1995. Evidence for the polyphyly of the Scrophulariaceae based on chloroplast rbcL and ndhF sequences. Ann. Missouri Bot. Gard. 82: 176-193.
——, B. Bremer, K.M. Scott, and J.D. Palmer. 1993. A parsimony analysis of the Asteridae sensu lato based on rbcL sequences. Ann. Missouri Bot. Gard. 80: 700-722.
——, and J.D. Palmer. 1997. Implications for the phylogeny, classification, and biogeography of Solanum from cpDNA restriction site variation. Systematic Bot. 22: 19-30.

——, C.W. DePamphilis, A.D. Wolfe, N.D. Young, W.J. Elisons, and P.A. Reeves. 2001. Disintegration of the Scrophulariaceae. Amer. J. Bot. 88: 348-361.
Olsen, J. 1979. Taxonomy of the *Verbesina virginica* complex (Asteraceae). Sida 8: 128-134.
Ortiz-Diaz, J.-J., and A. Culham. 2000. Phylogenetic relationships of the genus *Sporobolus* (Poaceae: Eragrostideae) based on nuclear ribosomal DNA ITS sequences. Pp. 184-188 in S.W.L. Jacobs and J. Everett (eds.) Grasses: systematics and evolution. CSIRO, Melbourne.
Orzell, S.L., and E.L. Bridges. 2002. Notes on *Carphephorus odoratissimus* (Asteraceae) in peninsular Florida, U.S.A. Sida 20: 559-569.
Ownbey, G.B. 1947. Monograph of the North American species of *Corydalis*. Annals. Mo. Bot. Garden 34: 187-251.
Ownbey, R.P. 1944. The liliaceous genus *Polygonatum* in North America. Ann. Mo. Bot. Garden 31: 373-413.
Oxelman, B., M. Backlund, and B. Bremer. 1999. Relationships of the Buddlejaceae s.l. investigated using parsimony jackknife and branch support analysis of chloroplast ndhF and rbcL sequence data. Systematic Botany 24: 164-182.
Packer, J.G. 1993. Two new combinations in *Triantha* (Liliaceae). Novon 3: 278-279.
Padgett, D.J. 1999. Nomenclatural novelties in *Nuphar* (Nymphaeaceae). Sida 18: 823-826.
Paler, M.H., and D.S. Barrington. 1995. The hybrid *Cystopteris fragilis* × *C. tenuis* (Dryopteridaceae) and the relationship between its tetraploid progenitors. Systematic Bot. 20: 528-545.
Palmer, M.W., G.L. Wade, and P. Neal. 1995. Standards for the writing of floras. BioScience 45: 339-345.
Palmer, P.G. 1975. A biosystematic study of the *Panicum amarum--P. amarulum* complex (Gramineae). Brittonia 27: 142-150.
Palomino, G., P. Martínez, C. Bernal, and M. Sousa S. 1993. Diferencias cromosómicas entre algunas especies de los géneros *Sophora* L. y *Styphnolobium* Schott. Ann. Missouri Bot. Gard. 80: 284-290.
Park, Chong-Wook. 1988. Taxonomy of *Polygonum* section *Echinocaulon* (Polygonaceae). Mem. N.Y. Bot. Garden 47: 1-82.
——, and Hyun-Woo Lee. 1996. Taxonomic notes on *Cimicifuga purpurea*, stat. nov. (Ranunculaceae). Novon 6: 93-95.
Park, K. 1998. Monograph of *Euphorbia* sect. *Tithymalopsis* (Euphorbiaceae). Edinb. J. Bot. 55: 161-208.
Park, M.M. 1992. A biosystematic study of *Thalictrum* section *Leucocoma* (Ranunculaceae). Ph.D. dissertation, Pennsylvania State University.
Parker, E.S., and S.B. Jones. 1975. A systematic study of the genus *Balduina* (Compositae, Heliantheae). Brittonia 27: 355-361.
Parker, M.A. 1996. Cryptic species within *Amphicarpaea bracteata* (Leguminosae): evidence from isozymes, morphology, and pathogen specificity. Can J. Bot. 74: 1640-1650.
Parkinson, P.G. 1988. Adansonian nomina rejicienda et nomina conservanda proposita, 1983-1986. Taxon 37: 148-151.
Parks, C.R., and J.W. Hardin. 1963. Yellow Erythroniums of the eastern United States. Brittonia 15: 245-259.
——, and J.F. Wendel. 1990. Molecular divergence between Asian and North American species of *Liriodendron* (Magnoliaceae) with implications for interpretation of fossil floras. Amer. J. Bot. 77: 1243-1256.
——, J.F. Wendel, M.M. Sewell, and Y.-L. Qiu. 1994. The significance of allozyme variation and introgression in the *Liriodendron tulipifera* complex (Magnoliaceae). Amer. J. Bot. 81: 878-889.
Parrish, J.D., D.P. Braun, and R.S. Unnasch. 2003. Are we conserving what we say we are? Measuring ecological integrity within protected areas. BioScience 53: 851-860.
Patrick, T.S. 1986. The trilliums of eastern North America. Published privately by the author, Social Circle, GA.
——, J.R. Allison, G.A. Krakow. 1995. Protected plants of Georgia: an information manual on plants designated by the state of Georgia as endangered, threatened, rare, or unusual. Georgia Dept. of Natural Resources, Social Circle, GA. 246 pp.
Paun, O., C. Lehnebach, J.T. Johansson, P. Lockhart, and E. Hörandl. 2005. Phylogenetic relationships and biogeography of *Ranunculus* and allied genera (Ranunculaceae) in the Mediterranean region and in the European alpine system. Taxon 54: 911-930.
Pavlick, L.E. 1995. *Bromus* L. of North America. Royal British Columbia Museum, Victoria, BC. 160 pp.
Peck, J.H. 2003. Arkansas flora: additions, reinstatements, exclusions, and re-exclusions. Sida 20: 1737-1757.
Peet, R.K. 1993. A taxonomic study of *Aristida stricta* and *A. beyrichiana*. Rhodora 95: 25-37.
Peirson, J.A., P.D. Cantino, and H.E. Ballard, Jr. 2006. A taxonomic revision of *Collinsonia* (Lamiaceae) based on phonetic analyses of morphological variation. Syst. Bot. 31: 398-409.
Pelotto, J.P., and M.A. Del Pero Martínez. 1998. Flavonoids in *Strophostyles* species and the related genus *Dolichopsis* (Phaseolinae, Fabaceae): distribution and phylogenetic significance. Sida 18: 213-222.
Peng, Ching-I. 1984. *Ludwigia ravenii* (Onagraceae), a new species from the Coastal Plain of the southeastern United States. Systematic Bot. 9: 129-132.
——. 1986. A new combination in *Ludwigia* sect. *Microcarpium* (Onagraceae). Ann. Mo. Bot. Gard. 73: 490.
——. 1988. The biosystematics of *Ludwigia* sect. *Microcarpium* (Onagraceae). Ann. Mo. Bot. Gard. 75: 970-1009.
——. 1989. The systematics and evolution of *Ludwigia* sect. *Microcarpium* (Onagraceae). Ann. Mo. Bot. Gard. 76: 221-302.
——, and H. Tobe. 1987. Capsule wall anatomy in relation to capsular dehiscence in *Ludwigia* sect. *Microcarpium* (Onagraceae). Am. J. Bot. 74: 1102-1110.
Pennell, F.W. 1916. Notes on plants of the southern United States – II. Bull. Torrey Bot. Club 43: 407-421.
——. 1935. The Scrophulariaceae of eastern temperate North America. Academy of Natural Sciences of Philadelphia Monograph No. 1.
Pennington, T.D. 1991. The genera of Sapotaceae. Royal Botanic Gardens, Kew & N.Y. Botanical Gardens, Bronx, New York.
Perdue, R.E., Jr. 1957. Synopsis of *Rudbeckia* subgenus *Rudbeckia*. Rhodora 59: 293-299.

Perry, J.E., D.M.E. Ware, and A. McKenney-Mueller. 1998. *Aeschynomene indica* L. (Fabaceae) in Virginia. Castanea 63: 191-194.
Perry, J.P., III, and L.J. Musselman. 1994. *Psilotum nudum* new to North Carolina. Amer. Fern J. 84: 102-104.
Perry, L.M. 1937. Notes on *Silphium*. Rhodora 39: 281-297.
Petersen, G., and O. Seberg. 2003. Phylogenetic analyses of the diploid species of *Hordeum* (Poaceae) and a revised classification of the genus. Syst. Bot. 28: 293-306.
Peterson, P.M., S.L. Hatch, and A.S. Weakley. [in press]. *Sporobolus* in M.E. Barkworth, K.M. Capels, and L.A. Vorobik (eds.), Manual of grasses for the Continental United States and Canada, Department of Agriculture Miscellaneous Publication.
——-, E.E. Terrell, E.C. Uebel, C.A. Davis, H. Scholz, and R.J. Soreng. 1999. *Oplismenus hirtellus* subspecies *undulatifolius*, a new record for North America. Castanea 64: 201-202.
Pfeil, B.E., and M.D. Crisp. 2005. What to do with *Hibiscus*? A proposed nomenclatural resolution for a large and well known genus of Malvaceae and comments on paraphyly. Australian Systyematic Botany 18: 49-60
Pfosser, M., W. Wetschnig, S. Ungar, and G. Prenner. 2003. Phylogenetic relationships among genera of Massonieae (Hyacinthaceae) inferred from plastid DNA and seed morphology. J. Plant Res. 116: 115-132.
Philbrick, C.T., and G.E. Crow. 1983. Distribution of *Podostemum ceratophyllum* Michx. (Podostemaceae). Rhodora 85: 325-341.
——, R.A. Aakjar, Jr., and R.L. Stuckey. 1998. Invasion and spread of *Callitriche stagnalis* (Callitrichaceae) in North America. Rhodora 100: 25-38.
Phipps, J.B. 1988. *Crataegus* (Maloideae, Rosaceae) of the southeastern United States, I. Introduction and series Aestivales. J. Arnold Arb. 69: 401-431.
——. 1998. Synopsis of *Crataegus* series *Apiifoliae*, *Cordatae*, *Microcarpae*, and *Brevispinae* (Rosaceae subfam. Maloideae). Ann. Missouri Bot. Gard. 85: 475-491.
——, R.J. O'Kennon, and R.W. Lance. 2003. Hawthorns and medlars. Royal Horticultural Society Plant Collector Guide. Timber Press, Portland OR. 139 pp.
Pigniotti, L., and L.M. Mariotti. 2004. Micromorphology of *Scirpus* (Cyperaceae) and related genera in south-west Europe. Bot. J. Linn. Soc. 145: 45-58.
Pilatowski, R.E. 1982. A taxonomic study of the *Hydrangea arborescens* complex. Castanea 47: 84-98.
Pinson, J.N., Jr., and W.T. Batson. 1971. The status of *Muhlenbergia filipes* Curtis (Poaceae). J. Elisha Mitchell Sci. Soc. 87: 188-191.
Pippen, R.W. 1978. *Cacalia*. N. Amer. Fl. II 10: 151-159.
Pittillo, J.D., and A.E. Brown. 1988. Additions to the vascular flora of the Carolinas, III. J. Elisha Mitchell Sci. Soc. 104: 1-18.
——, J.H. Horton, and K.E. Herman. 1972. Additions to the vascular flora of the Carolinas. II. J. Elisha Mitchell Sci. Soc. 88: 144-152
——, W.H. Wagner, Jr., D.R. Farrar, and S.W. Leonard. 1975. New pteridophyte records in the Highlands Biological Station area, Southern Appalachians. Castanea 40: 263-272.
Pittman, A.B. 1988. Systematic studies in *Scutellaria* sect. *Mixtae* (Labiatae). Ph.D. dissertation, Vanderbilt Univ.
Plant Information Center. 2005. Virtual herbarium. http://www.ibiblio.org/pic/herbarium.htm. Accessed 27 November 2005.
Platt, S.G., and J.F. Townsend. 1996. Noteworthy collections: South Carolina. Castanea 61: 397-398.
Pohl, R.W. 1969. *Muhlenbergia*, subgenus *Muhlenbergia* (Gramineae) in North America. Amer. Midl. Naturalist 82: 512-542.
Poiani, K.P., B.D. Richter, M.G. Anderson, and H.E. Richter. 2000. Biodiversity conservation at multiple scales: functional sites, landscapes, and networks. BioScience 50:133-146.
Poindexter, D.B. 2006. Eight new plant distributional records to Alleghany County, North Carolina. J. North Carolina Academy Sci. 122: 101-105.
Porter, D.M. 1969. The genus *Kallstroemia* (Zygophyllaceae). Contr. Gray Herb. 198: 41-153.
——. 1976. *Zanthoxylum* (Rutaceae) in North America north of Mexico. Brittonia 28: 443-447.
——, and T.F. Wieboldt. 1991. Vascular plants. In K. Terwilliger, coord., Virginia's endangered species: proceedings of a symposium. McDonald and Woodward Publ. Co., Blacksburg VA.
Possingham, H.P., S.J. Andelman, M.A. Burgman, R.A. Medelin, L.L. Master, and D.A. Keith. 2002. Limits to the use of threatened species lists. Trends in Ecology and Evolution 17: 503-507.
Powell, M., V. Savolainen, P. Cuénoud, J.-F. Manen, and S. Andrews. 2000. The mountain holly (*Nemopanthus mucronatus*: Aquifoliaceae) revisited with molecular data. Kew Bulletin 55: 341-347.
Prance, G.T. 1970. The genera of Chrysobalanaceae in the southeastern United States. J. Arnold Arb. 51: 521-528.
——. 1972. Chrysobalanaceae. Flora Neotropica Monograph No. 9. Hafner Press, New York, NY. 410 pp.
——, and C.A. Sothers. 2003. Chrysobalanaceae 1: *Chrysobalanus* to *Parinari*. Species Plantarum: Flora of the World 9: 1-319.
Prather, L.A., and J.A. Keith. 2003. *Monarda humilis* (Lamiaceae), a new combination for a species from New Mexico, and a key to the species of section *Cheilyctis*. Novon 13: 104-109.
——, C.J. Ferguson, and R.K. Jansen. 2000. Polemoniaceae phylogeny and classification: implications of sequence data from the chloroplast gene ndhF. Am. J. Bot. 87: 1300-1308.
Preston, C.D., M.G. Telfer, H.R. Arnold, and P. Rothery. 2002. The changing flora of Britain, 1930-1999. In C.D. Preston, D.A. Pearman, and T.D. Dines (eds.). New Atlas of the British and Irish flora: an atlas of the vascular plants of Britain, Ireland, the Isle of Man and the Channel Islands. Oxford University Press, Oxford.

Price, R.A. 1989. The genera of Pinaceae in the southeastern United States. J. Arnold Arb. 70: 247-305.
——. 1990. The genera of Taxaceae in the southeastern United States. J. Arnold Arb. 71: 69-91.
——, A. Liston, and S.H. Strauss. 1998. Phylogeny and systematics of *Pinus*. Pp. 49-68 in D.M. Richardson, ed., Ecology and biogeography of *Pinus*. Cambridge Univ. Press. 527 pp.
Pridgeon, A.M., R.M. Bateman, A.V. Cox, J.R. Hapeman, and M.W. Chase. 1997. Phylogenetics of subtribe Orchidinae (Orchidoideae, Orchidaceae) based on nuclear ITS sequences. 1. Intergeneric relationships and polyphyly of *Orchis* sensu lato. Lindleyana 12: 89-109.
——, P.J. Cribb, M.W. Chase, and F.N. Rasmussen. 1999a. Genera orchidacearum. Volume 1: General introduction, Apostasioideae, Cypripedioideae. Oxford Univ. Press.
——, P.J. Cribb, M.W. Chase, and F.N. Rasmussen. 1999b. Genera orchidacearum. Volume 3: Orchidioideae (part 1). Oxford Univ. Press.
——, P.J. Cribb, M.W. Chase, and F.N. Rasmussen. 1999c. Genera orchidacearum. Volume 3: Orchidoideae (part 2), Vanilloideae. Oxford Univ. Press.
——, P.J. Cribb, M.W. Chase, and F.N. Rasmussen. 2005. Genera orchidacearum. Volume 4: Epidendroideae (part 1). Oxford Univ. Press.
Prince, L.M. 2002. Circumscription and biogeographic patterns in the eastern North American – east Asian genus *Stewartia* (Theaceae: Stewartieae): insight from chloroplast and nuclear DNA sequence data. Castanea 67: 290-301.
——, and C.R. Parks. 2001. Phylogenetic relationships of Theaceae inferred from chloroplast DNA sequence data. Amer. J. Bot. 88: 2309-2320.
Pringle, J.S. 1967. Taxonomy of *Gentiana*, section *Pneumonanthe*, in eastern North America. Brittonia 19: 1-32.
——. 1971. Taxonomy and distribution of *Clematis*, sect. *Atragene* (Ranunculaceae), in North America. Brittonia 23: 361-393.
——. 1977. *Gentiana linearis* (Gentianaceae) in the Southern Appalachians. Castanea 42: 1-8.
——. 2002. Nomenclature of the heart-leaved hedge-nettle, *Stachys cordata* (Lamiaceae). Sida 20: 583-584.
——. 2004. Nomenclature of the Virginia bluebell, *Mertensia virginica* (Boraginaceae). Sida 21: 771–775.
——, and A.J. Sharp. 1964. *Gentiana austromontana*, a new species from the Southern Appalachians. Rhodora 66: 402-404.
Pruski, J.F. 1998. *Helianthus porteri* (A. Gray) Pruski (Compositae), a new combination validated for the Confederate Daisy. Castanea 63: 74-75.
——. 2004. *Panphalea heterophylla* (Compositae: Mutisioideae: Nassauvieae), a genus and species new for the flora of North America. Sida 21: 1225-1228.
——, and G.L. Nesom. 2004. *Gamochaeta coarctata*, the correct name for *Gamochaeta spicata* (Asteraceae: Gnaphalieae). Sida 21: 711-714.
Pryer, K.M., and C.H. Haufler. 1993. Isozymic and chromosomal evidence for the allotetraploid origin of *Gymnocarpium dryopteris* (Dryopteridaceae). Systematic Bot. 18: 150-172.
——, and L.R. Phillippe. 1989. A synopsis of the genus *Sanicula* (Apiaceae) in eastern Canada. Can. J. Bot. 67: 694-707.
——, H. Schneider, A.R. Smith, R. Cranfill, P.G. Wolf, J.S. Hunt., and S.D. Sipes. 2001. Horsetails and ferns are a monophyletic group and the closest living relatives to seed plants. Nature 409: 618-622.
——, E. Schuettpelz, P.G. Wolf, H. Schneider, A.R. Smith, and R. Cranfill. 2004. Phylogeny and evolution of ferns (monilophytes) with a focus on the early leptosporangiate divergences. Amer. J. Botany 91: 1582-1598.
Puff, C. 1976. The *Galium trifidum* group (Galium sect. Aparinoides, Rubiaceae). Can. J. Bot. 54: 1911-1925.
——. 1977. The *Galium obtusum* group (Galium sect. Aparinoides, Rubiaceae). Bull. Torrey Bot. Club 104: 202-208.
Pyck, N., A. Van Lysebetten, J. Stessens, and E. Smets. 2002. The phylogeny of Patrineae sensu Graebner (Valerianaceae) revisited: additional evidence from ndhF sequence data. Plant Syst. Evol. 233: 29-46.
Pyšek, P., D.M. Richardson, M. Rejmánek, G.L. Webster, M. Williamson, and J. Kirschner. 2004. Alien plants in checklists and floras: towards better communication between taxonomists and ecologists. Taxon 53: 131-143.
Qualls, D.A. 1984. A revision of the New World species of *Lindernia* Allioni (Scrophulariaceae). M.A. Thesis, Dept. of Biology, Univ. of North Carolina at Chapel Hill, Chapel Hill, NC.
Quinn, J.A., and D.E. Fairbrothers. 1971. Habitat ecology and chromosome numbers of natural populations of the *Danthonia sericea* complex. Amer. Midland Natur. 85: 531-536.
Rabeler, R.K. 1985. *Petrorhagia* (Caryophyllaceae) of North America. Sida 11: 6-44.
——. 1991. *Moenchia erecta* (Caryophyllaceae) in eastern North America. Castanea 56: 150-151.
——, and J.W. Thieret. 1988. Comments on the Caryophyllaceae of the southeastern United States. Sida 13: 149-156.
Radford, A.E., H.E. Ahles, and C.R. Bell. 1968. Manual of the vascular flora of the Carolinas. University of North Carolina Press, Chapel Hill, N.C. 1183 pp.
Ramsey, G.W. 1987. Morphological considerations in the North American *Cimicifuga* (Ranunculaceae). Castanea 52: 129-141.
——. 1988. A comparison of vegetative characteristics of several genera with those of the genus *Cimicifuga* (Ranunculaceae). Sida 13: 57-63.
Randall, J.L., and K.W. Hilu. 1986. Biosystematic studies of North American *Trisetum spicatum* (Poaceae). Systematic Bot. 11: 567-578.
Raven, P.H. 1963. The Old World species of *Ludwigia* (including *Jussiaea*), with a synopsis of the genus (Onagraceae). Reinwardtia 6: 327-427.
——, and D.P. Gregory. 1972. A revision of the genus *Gaura* (Onagraceae) Mem. Torrey Bot. Club 23: 1-96.
——, and W. Tai. 1979. Observations of chromosomes in *Ludwigia* (Onagraceae). Ann. Mo. Bot. Gard. 66: 862-879.

Rayner, D.A., and J. Henderson. 1980. *Vaccinium sempervirens* (Ericaceae), a new species from Atlantic White-cedar bogs in the sandhills of South Carolina. Rhodora 82: 503-507.
Reddoch, A.H., and J.M. Reddoch. 1993. The species pair *Platanthera orbiculata* and *P. macrophylla* (Orchidaceae): taxonomy, morphology, distributions and habitats. Lindleyana 8: 171-188.
Redman, D.E. 1995. Distribution and habitat types for Nepal Microstegium [*Microstegium vimineum* (Trin.) Camus] in maryland and the District of Columbia. Castanea 60: 270-275.
Reed, C.F. 1953. The ferns and fern allies of Maryland and Delaware including District of Columbia. Reed Herbarium, Baltimore, MD.
——. 1961a. *Andrographis*, a genus of Acanthaceae, new to eastern United States. Castanea 26: 128.
——. 1961b. Amaranthaceae new to eastern United States. Castanea 26: 123-127.
——. 1964. A flora of the chrome and manganese ore piles at Canton, in the Port of Baltimore, Maryland and at Newport News, Virginia, with descriptions of genera and species new to the flora of eastern United States. Phytologia 10: 324-406.
Reeder, J.R., and M.A. Ellington. 1960. *Calamovilfa*, a misplaced genus of Gramineae. Brittonia 12: 71-77.
Rehder, A. 1903. Synopsis of the genus *Lonicera*. Missouri Botanical Garden Annual Report 1903: 27-232.
——. 1945. *Carya alba* proposed as nomen ambiguum. J. Arnold Arb. 26: 482-483.
Renner, S.S., L.-B. Zhang, and J. Murata. 2004. A chloroplast phylogeny of *Arisaema* (Araceae) illustrates Tertiary floristic links between Asia, North America, and East Africa. Amer. J. Bot. 91: 881-888.
Rettig, J.H. 1988. A biosystematic study of the *Carex pensylvanica* group (section Acrocystis) in North America. Ph.D. dissertation. Univ. of Georgia, Athens.
——. 1989. Nomenclatural changes in the *Carex pensylvanica* group (section Acrocystis, Cyperaceae) of North America. Sida 13: 449-452.
——. 1990. Achene micromorphology of the *Carex nigromarginata* complex (section Acrocystis, Cyperaceae). Rhodora 92: 70-79.
Reveal, J.L. 1989. A checklist of the Eriogonoideae (Polygonaceae). Phytologia 66: 266-294.
——. 1993a. A splitter's guide to the higher taxa of the flowering plants (Magnoliophyta) generally arranged to follow the sequence proposed by Thorne (1992) with certain modifications. Phytologia 74: 203-263.
——. 1993b. The correct name of the northern expression of *Sarracenia purpurea* L. (Sarraceniaceae). Phytologia 74: 180-184.
——. 1993c. *Streptopus lanceolatus* (Aiton) Reveal, a new name for *Streptopus roseus* Michx. (Convallariaceae). Phytologia 74: 185-189.
——. 2004. Nomenclatural summary of Polygonaceae subfamily Eriogonoideae. Harvard Papers in Bot. 9: 143-230.
——, P.H. Raven, P. Hoch, R.R. Haynes, and C.B. Hellquist. 2003. (1603-1605) Proposals to conserve the name *Ludwigia repens* (Onagraceae) with a conserved type, and to reject the names *Potamogeton oblongifolium* and *P. rotundifolium* (Potamogetonaceae), all published in Forster's Flora Americae Septentrionalis. Taxon 52: 864-866. ——, and F.R. Barrie. 1992. Matelea suberosa (L.) Shinners (Asclepiadaceae) – once again. Bartonia 57: 36-38.
——, and C.S. Keener. 1981. *Virgulus* Raf. (1837), an earlier name for *Lasallea* Greene (1903) (Asteraceae). Taxon 30: 648-651.
——, and M.J. Seldin. 1976. On the identity of *Halesia carolina* L. (Styracaceae). Taxon 25: 123-140.
——, and W.B. Zomlefer. 1998. Two new orders for monocotyledonous plants. Novon 8: 176-177.
Reznicek, A.A. 1993. *Carex pumila* (Cyperaceae) in North America. Castanea 58: 220-224.
——, and P.W. Ball. 1980. The taxonomy of *Carex* section *Stellulatae* in North America north of Mexico. Contr. Univ. Mich. Herb. 14: 153-204.
——, and P.M. Catling. 1986. *Carex striata*, the correct name for *C. walteriana* (Cyperaceae). Rhodora 88: 405-406.
Rhoads, A.F., and W.M. Klein, Jr. 1993. The vascular flora of Pennsylvania: annotated checklist and atlas. American Philosophical Society, Philadelphia, PA.
Richards, E.L. 1968. A monograph of the genus *Ratibida*. Rhodora 70: 348-393.
Richardson, D.M., ed. 1998. Ecology and biogeography of *Pinus*. Cambridge Univ. Press. 527 pp.
Richardson, J.E., M.F. Fay, Q.C.B. Cronk, D. Bowman, and M.W. Chase. 2000a. A phylogenetic analysis of Rhamnaceae using rbcL and trnL-F plastid DNA sequences. Am. J. Bot. 87: 1309-1324.
——, M.F. Fay, Q.C.B. Cronk, and M.W. Chase. 2000b. A revision of the tribal classification of Rhamnaceae. Kew Bulletin 55: 311-340.
Ridsdale, C.E. 1976. A revision of the tribe Cephalantheae (Rubiaceae). Blumea 23: 177-188.
Riggins, R. 1977. A biosystematic study of the *Sporobolus asper* complex (Gramineae). Iowa State J. of Research 51: 287-321.
Ringius, G.S. 1985. [*Solidago*]
Risk, A.C., and D.L. Wyrick. 1996. *Silphium wasiotense* Medley in Tennessee. Castanea 61: 194-196.
Roalson, E.H., and E.A. Friar. 2000. Infrageneric classification of *Eleocharis* (Cyperaceae) revisited: evidence from the internal transcribed spacer (ITS) region of nuclear ribosomal DNA. Syst. Bot. 25: 323-336.
Robbins, H.C. 1968. The genus *Pachysandra*. Sida 3: 211-248.
Roberts, P.R., and H.J. Oosting. 1958. Responses of Venus fly trap (*Dionaea muscipula*) to factors involved in its endemism. Ecol. Monographs 28: 193-218.
Robertson, K.R. 1971. The Linaceae in the southeastern United States. J. Arnold Arb. 52: 649-665.
——. 1973. The Krameriaceae in the southeastern United States. J. Arnold Arb. 54: 322-327.
——. 1974. The genera of Rosaceae in the southeastern United States. J. Arnold Arb. 55: 303-332, 344-401, 611-662.

——. 1975. The Oxalidaceae in the southeastern United States. J. Arnold Arb. 56: 223-239.
——. 1976. The genera of Haemodoraceae in the southeastern United States. J. Arnold Arb. 57: 205-216.
——. 1981. The genera of Amaranthaceae in the southeastern United States. J. Arnold Arb. 62: 267-314.
——, and Yin-Tse Lee. 1976. The genera of Caesalpinioideae (Leguminosae) in the southeastern United States. J. Arnold Arb. 57: 1-53.
——, J.B. Phipps, J.R. Rohrer, and P.G. Smith. 1991. A synopsis of genera in Maloideae (Rosaceae). Systematic Botany 16: 376-394.
Robinson, H. 1978. Studies in the Heliantheae (Asteraceae). XII. Re-establishment of the genus *Smallanthus*. Phytologia 39: 47-53.
Robson, N.K.B. 1977. Studies in the genus *Hypericum* L. (Guttiferae). 1. Infrageneric classification. Bull. Nat. Hist. Mus. Lond. (Bot.) 5: 291-355.
——. 1981. Studies in the genus *Hypericum* L. (Guttiferae). 2. Characters of the genus. Bull. Nat. Hist. Mus. Lond. (Bot.) 8: 55-226.
——. 1987. Studies in the genus *Hypericum* L. (Guttiferae). 7. Section 29. *Brathys* (part 1). Bull. Nat. Hist. Mus. Lond. (Bot.) 16: 1-106.
——. 1990. Studies in the genus *Hypericum* L. (Guttiferae). 8. Sections 29. *Brathys* (part 2) and 30. *Trigynobrathys*. Bull. Nat. Hist. Mus. Lond. (Bot.) 20: 1-151.
——. 1996. Studies in the genus *Hypericum* L. (Guttiferae). 6. Sections 20. *Myriandra* to 28. *Elodes*. Bull. Nat. Hist. Mus. Lond. (Bot.) 26: 75-217.
——. 2000. Studies in the genus *Hypericum* L. (Guttiferae). 4(1). Sections 7. *Roscyna* to 9. *Hypericum* sensu lato (part 1). Bull. Nat. Hist. Mus. Lond. (Bot.) 31: 37-88.
——. 2002. Studies in the genus *Hypericum* L.(Guttiferae). 4(2). Section 9. *Hypericum* sensu lato (part 2): subsection 1. *Hypericum* series 1. *Hypericum*. Bull. Nat. Hist. Mus. Lond. (Bot.) 32: 61-123.
——. 2006. Studies in the genus *Hypericum* L.(Clusiaceae). Section 9. *Hypericum* sensu lato (part 3): subsection 1. *Hypericum* series 2. *Senanensia*, subsection 2. *Erecta* and section 9b. *Graveolentia*. Systematics and Biodoiversity4: 19-98.
——, and P. Adams. 1968. Chromosome numbers in *Hypericum* and related genera. Brittonia 20: 95-106.
Rock, H.F.L. 1957. A revision of the vernal species of *Helenium* (Compositae). Rhodora 59: 101-116, 128-159, 168-178, 203-216.
Rodgers, C.L. 1950. The Umbelliferae of North Carolina and their distribution in the Southeast. J. of the Elisha Mitchell Scientific Socity 66: 195-266.
Rodman, J.E. 1974. Systematics and evolution of the genus *Cakile* (Cruciferae). Contr. Gray Herb. 205: 3-146.
Roecker, R., and T. Socha. 2004. Hawaiian plant threatens South Carolina dunes. Wildland Weeds 7: 19–20.
Rogers, C.M. 1963. Yellow flowered species of *Linum* in eastern North America. Brittonia 15: 97-122.
——. 1984. Linaceae. North American Flora, Series II, Part 12, New York Botanical Garden, Bronx, NY.
Rogers, G.K. 1982a. The Stemonaceae in the southeastern United States. J. Arnold Arb. 63: 327-336.
——. 1982b. The Bataceae in the southeastern United States. J. Arnold Arb. 63: 375-386.
——. 1983. The genera of Alismataceae in the southeastern United States. J. Arnold Arb. 64: 383-420.
——. 1985. The genera of Phytolaccaceae in the southeastern United States. J. Arnold Arb. 66: 1-37.
——. 1986. The genera of Loganiaceae in the southeastern United States. J. Arnold Arb. 67: 143-185.
——. 1987. The genera of Cinchonoideae (Rubiaceae) in the southeastern United States. J. Arnold Arb. 68: 137-183.
——. 2005. The genera of Rubiaceae in the southeastern United States, part II. Subfamily Rubioideae, and subfamily Cinchonoideae revisited (*Chiococca*, *Erithalis*, and *Guettarda*). Harvard Papers in Botany 10: 1-45.
Rollins, R.C. 1941. A monographic study of *Arabis* in western North America. Rhodora 43: 313-325.
——. 1961. A weedy crucifer again reaches North America. Rhodora 63: 345-346.
——. 1993. The Cruciferae of continental North America: systematics of the mustard family from the Arctic to Panama. Stanford Univ. Press, Stanford, CA. 976 pp.
——, and E.A. Shaw. The genus *Lesquerella* (Cruciferae) in North America. Harvard Univ. Press, Cambridge. 288 pp.
Romanowski, N. 2002. Gardening with carnivores: *Sarracenia* pitcher plants in cultivation and in the wild. University Press of Florida, Gainesville, FL. 106 pp.
Ronse De Craene, L. P., and J.R. Akeroyd. 1988. Generic limits in *Polygonum* and related genera (Polygonaceae) on the basis of floral characters. Bot. J. Linn. Soc. 98: 321-371.
——, S.P. Hong, and E.F. Smets. 2004. What is the taxonomic status of *Polygonella*? Evidence of floral morphology. Ann. Missouri Bot. Gard. 91: 320-345.
Rosatti, T.J. 1984. The Plantaginaceae in the southeastern United States. J. Arnold Arb. 65: 533-562.
——. 1986. The genera of Sphenocleaceae and Campanulaceae in the southeastern United States. J. Arnold Arb. 67: 1-64.
——. 1987a. The genera of Pontederiaceae in the southeastern United States. J. Arnold Arb. 68: 35-71.
——. 1987b. Field and garden studies of *Arctostaphylos uva-ursi* (Ericaceae) in North America. Systematic Bot. 12: 61-77.
——. 1989. The genera of the suborder Apocynineae (Apocynaceae and Asclepiadaceae) in the Southeastern United States. J. Arnold Arb. 70: 443-514.
Rose, J.N. 1911. Two new species of *Harperella*. Contr. U.S. Nat. Herb. 13: 289-290.
——, and P.C. Standley. 1911. The genus *Talinum* in Mexico. Contr. U.S. Nat. Herb. 13: 281-288.

Rosendahl, C.O., F.K. Butters, and O. Lakela. 1936. A monograph on the genus *Heuchera*. Minnesota Studies in Plant Science 2: 1-180.
Rossetto, M., B.R. Jackes, K.D. Scott, and R.J. Henry. 2002. Is the genus *Cissus* (Vitaceae) monophyletic? Evidence from plastid and nuclear ribosomal DNA. Systematic Botany 27: 522-533.
Rossignol, L., M. Rossignol, and R. Haicour. 1987. A systematic revision of *Phyllanthus* subsection Urinaria (Euphorbiaceae). Am. J. Bot. 74: 1853-1862.
Rothrock, P.E., A.A. Reznicek, and L.R. Ganion. 1997. Taxonomy of the *Carex straminea* complex (Cyperaceae). Can. J. Bot. 75: 2177-2195.
Rudall, P.J., K.L. Stobart, W.-P. Hong, J.G. Conran, C.A. Furness, G.C. Kite, and M.W. Chase. 2000. Consider the lilies: systematics of Liliales. In: K.L. Wilson & D. A. Morrison, eds., Monocots: systematics and evolution. CSIRO, Melbourne.
Rudd, V.E. 1955. The American species of *Aeschynomene*. Contr. U.S. National Herbarium 32: 1-172.
——. 1972. Leguminosae-Faboideae-Sophoreae. North American Flora Series II, Part 7.
Russell, N.H. 1965. Violets (*Viola*) of central and eastern United States: an introductory survey. Sida 2: 1-113.
Rydberg, P.A. 1915. Cardulaes. Carduaceae. Heleniae, Tageteae. North American Flora 34, Part 2: 81-180.
Saarela, J.M., P.M. Peterson, R.J. Soreng, and R.E. Chapman. 2003. A taxonomic revision of the eastern North American and eastern Asian disjunct genus *Brachyelytrum* (Poaceae): evidence from morphology, phytogeography, and AFLPs. Systematic Botany 28: 674-692.
Saltonstall, K. 2002. Cryptic invasion by a non-native genotype of the common reed, *Phragmites australis*, into North America. Proceedings of the National Academy of Sciences, USA 99(4): 2445-2449.
——, P.M. Peterson, and R.J. Soreng. 2004. Recognition of *Phragmites australis* subsp. *americanus* (Poaceae: Arundinoideae) in North America: evidence from morphological and genetic anlyses. Sida 21: 683-692.
Samuel, R., W. Gutermann, T.F. Stuessy, C.F. Ruas, H.-W. Lack, K. Tremetsberger, S. Talavera, B. Hermanowski, and F. Ehrendorfer. 2006. Molecular phylogenetics reveals *Leontodon* (Asteraceae, Lactuceae) to be diphyletic. Amer. J. Botany 93: 1193-1205.
Sanders, R.W. 1987. Identity of *Lantana depressa* and *L. ovatifolia* (Verbenaceae) of Florida and the Bahamas. Syst. Botany 12: 44-60.
——. 2006. Taxonomy of *Lantana* sect. *Lantana* (Verbenaceae): I. Correct application of *Lantana camara* and associated names. Sida 22: 381-421.
——, and W.S. Judd. 2000. Incorporating phylogenetic results into floristic treatments. Sida 18: 97-112.
Sargent, C.S. 1918. Notes on North American trees. II. *Carya*. Bot. Gazette 66: 229-258.
——. 1921. Notes on North American trees. VIII. J. Arnold Arb. 2: 164-174.
Sauer, J.D. 1955. Revision of the dioecious amaranths. Madroño 13: 5-46.
——. 1972. Revision of *Stenotaphrum* (Gramineae: Paniceae) with attention to its historical geography. Brittonia 24: 202-222.
Saunders, R.M.K. 2001. Schisandraceae. Species Plantarum: Flora of the World 4: 1-62.
Savolainen, V., M.F. Fay, D.C. Albach, A. Backlund, M. van der Bank, K.M. Cameron, S.A. Johnson, M.D. Lledó, J.-C. Pintaud, M. Powell, M.C. Sheahan, D.E. Soltis, P.S. Soltis, P. Weston, W.M. Whitten, K..J. Wurdack, and M.W. Chase. 2000. Phylogeny of the eudicots: a nearly complete familial analysis based on rbcL gene sequences. Kew Bulletin 55: 257-309.
Schafale, M.P., and A.S. Weakley. 1990. Classification of the natural communities of North Carolina, third approximation. North Carolina Natural Heritage Program, Raleigh, N.C.
Schanzer, I.A. 1994. Taxonomic revision of the genus *Filipendula* Mill. (Rosaceae). J. Jpn. Bot. 69: 290-319.
Scheen, A-C., C. Brochmann, A.K. Brysting, R. Elvar, A. Morris, D.E. Soltis, P.S. Soltis, and V.A. Albert. 2004. Northern hemisphere biogeography of *Cerastium* (Caryophyllaceae): insights from phylogenetic analysis of noncoding plastid nucleotide sequences. Amer. J. Bot. 91: 943-952.
Schell, C.M., and M.J. Waterway. 1992. Allozyme variation and the genetic structure of populations of the rare sedge *Carex misera* (Cyperaceae). Plant Species Biol. 7: 141-150.
Schilling, E.E. 1981. Systematics of *Solanum* sect. *Solanum* (Solanaceae) in North America. Systematic Bot. 6: 172-185.
——, C.R. Linder, R.D. Noyes, and L.H. Rieseberg. 1998. Phylogenetic relationships in *Helianthus* (Asteraceae) based on nuclear ribosomal DNA internal transcribed spacer region sequence data. Systematic Bot. 23: 177-187.
Schlessman, M.A. 1985. Floral biology of American ginseng (*Panax quinquefolium*). Bull. Torrey Bot. Club 112: 129-133.
Schmidt, G.J., and E.E. Schilling. 2000. Phylogeny and biogeography of *Eupatorium* (Asteraceae: Eupatorieae) based on nuclear ITS sequence data. Amer. J. Botany 87: 716-726.
Schnabel, A., and J.F. Wendel. 1998. Cladistic biogeography of *Gleditsia* (Leguminosae) based on ndhF and rpl16 chloroplast gene sequences. Amer. J. Bot. 85: 1753-1765.
Schneider, H., S.J. Russell, C.J. Cox, F. Bakker, S. Henderson, F. Rumsey, J. Barrett, M. Gibby, and J.C. Vogel. 2004. Chloroplast phylogeny of Asplenioid ferns based on rbcL and trnL-F spacer sequences (Polypodiidae, Aspleniaceae) and its implication for biogeography. Systematic Botany 29: 260-274.
Schnell, D.E. 1976. Carnivorous plants of the United States and Canada. John F. Blair, Winston-Salem, NC. 125 pp.
——. 1977. Infraspecific variation in *Sarracenia rubra* Walt.: some observations. Castanea 42: 142-170.
——. 1979. A critical review of published variants of *Sarracenia purpurea* L. Castanea 44: 47-59.
——. 1980a. *Pinguicula caerulea* Walt. forma *leucantha*: a new form. Castanea 45: 56-60.
——. 1980b. Notes on the biology of *Sarracenia oreophila* (Kearney) Wherry. Castanea 45: 166-170.
——. 1981. *Sarracenia purpurea* L. ssp. *venosa* (Raf.) Wherry: variations in the Carolinas Coastal Plain. Castanea 46: 225-234.

——. 1993. *Sarracenia purpurea* L. ssp. *venosa* (Raf.) Wherry var. *burkii* Schnell (Sarraceniaceae) – a new variety of the Gulf Coastal Plain. Rhodora 95: 6-10.
——. 1995. *Drosera filiformis* Raf.: one species or two? Carnivorous Plant Newsletter 24: 11-15.
——. 1998. A pitcher key to the genus *Sarracenia* L. (Sarraceniaceae). Castanea 63: 489-492.
——. 2002a. *Sarracenia minor* Walt. var. *okeefenokeensis* Schnell: a new variety. Carnivorous Plant Newsletter 31: 36-39.
——. 2002b. Carnivorous plants of the United States and Canada. 2nd edition. Timber Press, Portland, OR. 468 pp.
——, and R.O. Determann. 1997. *Sarracenia purpurea* L. ssp. *venosa* (Raf.) Wherry var. *montana* Schnell & Determann (Sarraceniaceae): a new variety. Castanea 62: 60-62.
Scholz, U. 1981. Monographie der Gattung *Oplismenus* (Gramineae). Phanerog. Monog. 13. J. Cramer, Vaduz, Germany. 217 pp.
Schrader, J.A., and W.R. Graves. 2002. Infraspecific systematics of *Alnus maritima* (Betulaceae) from three widely disjunct populations. Castanea 67: 380-401.
——, and W.R. Graves. 2004. Systematics of *Dirca* (Thymelaeaceae) based on ITS sequences and ISSR polymorphisms. Sida 21: 511-524.
Schultheis, L.M., and M.J. Donoghue. 2004. Molecular phylogeny and biogeography of *Ribes* (Grossulariaceae), with an emphasis on gooseberries (subg. *Grossularia*). Systematic Botany 29: 77-96.
Schumacher, A. 1947. Die Moorlilien (*Narthecium*)-Arten Europas. Archiv für Hydrobiologie 41:112-195.
Schuyler, A.E. 1962. A new species of *Scirpus* in the northeastern United States. Rhodora 64: 43-49.
——. 1967. A taxonomic revision of North American leafy species of *Scirpus*. Proc. Acad. Nat. Sci. Phila. 119: 295-323.
——. 1974. Typification and application of the names *Scirpus americanus* Pers., *S. olneyi* Gray, and *S. pungens* Vahl. Rhodora 76: 51-52.
——. 1975. *Scirpus cylindricus*: an ecologically restricted eastern North American tuberous bulrush. Bartonia 43: 29-37.
——. 1989. Intertidal variants of *Bacopa rotundifolia* and *B. innominata* in the Chesapeake Bay drainage. Bartonia 55: 18-22.
——. 1996. Taxonomic status of *Panicum hirstii* Swallen. Bartonia 59: 95-96.
Schweitzer, J.A., and K.C. Larson. 1999. Greater morphological plasticity of exotic honeysuckle species may make them better invaders than native species. J. Torrey Bot. Soc. 126: 15-23.
Scora, R.W. 1967. Interspecific relationships in the genus *Monarda* (Labiatae). Univ. of Calif. Publ. in Botany 41: 1-69.
Scott, P.J., and R.T. Day. 1983. Diapensiaceae: a review of the taxonomy. Taxon 32: 417-423.
Seigler, D.S., and J.E. Ebinger. 2005. New combinations in the genus *Vachellia* (Fabaceae: Mimosaoideae) from the New World. Phytologia 87: 139-178
Seine, R., and W. Barthlott. 1994. Some proposals on the infrageneric classification of *Drosera* L. Taxon 43: 583-589.
Semple, J.C. 1981. A revision of the goldenaster genus *Chrysopsis* (Nutt.) Ell. nom. cons. (Compositae-Astereae). Rhodora 83: 323-384.
——. 1983. Range expansion of *Heterotheca camporum* (Compositae: Astereae) in the southeastern United States. Brittonia 35: 140-146.
——. 1996. A revision of *Heterotheca* sect. *Phyllotheca* (Nutt.) Harms (Compositae: Astereae): the prairie and montane goldenasters of North America. Univ. of Waterloo Biological Series 37.
——. 2003. New names and combinations in goldenrods, *Solidago* (Asteraceae: Astereae). Sida 20: 1605-1616.
——. 2004. Miscellaneous nomenclatural changes in Astereae (Asteraceae). Sida 21: 759-765.
——, and L. Brouillet. 1980a. A synopsis of North American asters: the subgenera, sections, and subsections of *Aster* and *Lasallea*. Am. J. Bot. 67: 1010-1026.
——, and L. Brouillet. 1980b. Chromosome numbers and satellite morphology in *Aster* and *Lasallea*. Am. J. Bot. 67: 1027-1039.
——, and F.D. Bowers. 1985. A revision of the goldenaster genus *Pityopsis* Nutt. (Compositae: Astereae). Univ. of Waterloo Biological Series 29: 1-34.
——, J.G. Chmielewski, and M.A. Lane. 1989. Chromosome number determinations in fam. Compositae, tribe Astereae. III. Additional counts and comments on generic limits and ancestral base numbers. Rhodora 91: 296-314.
——, S.B. Heard, and ChunSheng Xiang. 1996. The asters of Ontario (Compositae: Astereae): *Diplactis* Raf., *Oclemena* E.L. Greene, *Doellingeria* Nees and *Aster* L. (including *Canadanthus* Nesom, *Symphyotrichum* Nees, and *Virgulus* Raf.). Univ. of Waterloo Biology Series 38.
——, G.S. Ringius, and J.J. Zhang. 1999. The goldenrods of Ontario: *Solidago* L. and *Euthamia* Nutt. 3rd Edition. Univ. Waterloo Biol. Ser. 39: 1-90.
Sennblad, B., and B. Bremer. 1996. The familial and subfamilial relationships of Apocynaceae and Asclepiadaceae evaluated with rbcL data. Pl. Syst. Evol. 202: 153-175.
Senters, A.E., and D.E. Soltis. 2003. Phylogenetic relationships in *Ribes* (Grossulariaceae) inferred from ITS sequence data. Taxon 52: 51-66.
Serviss, B.E., S.T. McDaniel, and C.T. Bryson. 2000. Occurrence, distribution, and ecology of *Alocasia*, *Caladium*, *Colocasia*, and *Xanthosoma* (Araceae) in the southeastern United States. Sida 19: 149-174.
Shaw, J., and R.L. Small. 2004. Addressing the "hardest puzzle in American pomology:" phylogeny of *Prunus* sect. *Prunocerasus* (Rosaceae) based on seven noncoding chloroplast DNA regions. Amer. J. Bot. 91: 985-996.
Shaw, J.M.H. 2000. A taxonomic revision of *Podophyllum* in the wild and in cultivation. The New Plantsman 7: 30-41, 103-113, 142-159, 220-235.

——. 2002. Podophyllum. In Stearn, W.T. 2002. The genus *Epimedium* and other herbaceous Berberidaceae, including the genus *Podophyllum*. Timber Press, Portland, OR.
Shaw, R.B., and R.D. Webster. 1987. The genus *Eriochloa* (Poaceae: Paniceae) in North and Central America. Sida 12: 165-207.
Shen, Chung-Fu. 1992. A monograph of the genus *Fagus* Tourn. ex L. (Fagaceae). Ph.D. dissertation, Biology dept., City University of New York. 390 pp.
Sherff, E.E., and E.J. Alexander. 1955. Compositae – Heliantheae – Coreopsidinae. North American Flora, series II, part 2. New York Botanical Garden.
Shetler, S.G. 1982. Variation and evolution of the Nearctic harebells (*Campanula* subsect. *Heterophylla*). Phanerogamarum Monographiae XI. J. Cramer, Vaduz. 516 pp.
——, and N.R. Morin. 1986. Seed morphology in North American Campanulaceae. Ann. Mo. Bot. Gard. 73: 653-688.
——, and S.S. Orli. 2000. Annotated checklist of the vascular plants of the Washington-Baltimore area. Part I: ferns, fern allies, gymnosperms, and dicotyledons. Dept. of Botany, National Museum of Natural History, Smithsonian Institution, Washington, DC.
——, and S.S. Orli. 2002. Annotated checklist of the vascular plants of the Washington-Baltimore area. Part I: monocotyledons. Dept. of Botany, National Museum of Natural History, Smithsonian Institution, Washington, DC.
Sheviak, C.J. 1991. Morphological variation in the compilospecies *Spiranthes cernua* (L.) L.C. Rich.: ecologically-limited effects of gene flow. Lindleyana 6: 228-234.
——. 1994. *Cypripedium parviflorum* Salisb. I. The small-flowered varieties. Amer. Orchid Soc. Bull. 63: 664-669.
——, and P.M. Catling. 1980. The identity and status of *Spiranthes ochroleuca* (Rydberg) Rydberg. Rhodora 82: 525-562.
Shinners, L.H. 1946. Revision of the genus *Kuhnia* L. Wrightia 1: 122-144.
——. 1957. Synopsis of the genus *Eustoma* (Gentianaceae). Southwestern Naturalist 2: 38-43.
——. 1962a. *Calamintha* (Labiatae) in the southern United States. Sida 1: 69-75.
——. 1962b. Synopsis of *Collinsonia* (Labiatae). Sida 1: 76-83.
——. 1962c. *Drosera* (Droseraceae) in the southeastern United States: an interim report. Sida 1: 53-59.
——. 1962d. Synopsis of United States *Bonamia*, including *Breweria* and *Stylisma* (Convolvulaceae). Castanea 27: 65-77.
——. 1962e. Vegetative key to woody Labiatae of the southeastern Coastal Plain. Sida 1: 92-93.
——. 1962f. *Micromeria brownei* and its allies. Sida 1: 94-97.
——. 1962g. Synopsis of *Conradina*. Sida 1: 84-88.
——. 1971. *Kuhnia* L. transferred to *Brickellia* Ell. (Compositae). Sida 4: 274.
Shinwari, Z.K., R. Terauchi, F.H. Utech, and S. Kawano. 1994. Recognition of the New World *Disporum* section *Prosartes* as *Prosartes* (Liliaceae) based on the sequence data of the rbcL gene. Taxon 43: 353-366.
Shulkina, T.V., J.F. Gaskin, and W.M.M. Eddie. 2003. Morphological studies toward an improved classification of Campanulaceae s. str. Ann. Missouri Bot. Gard. 90: 576-591.
Siedo, S.J. 1999. A taxonomic treatment of *Sida* sect. *Ellipticifoliae* (Malvaceae). Lundellia 2: 100-127.
Sieren, D.J. 1981. The taxonomy of the genus *Euthamia*. Rhodora 83: 551-579.
Silberhorn, G.M. 1998. Invasion of *Cuscuta indecora* Choisy (Convolvulaceae) in a tidal brackish marsh in Virginia. Castanea 63: 190-191.
Silveus, W.A. 1942. Grasses: classification and description of species of *Paspalum* and *Panicum* in the United States. Published by the author, San Antonio, Texas.
Simmers, R.W., and R. Kral. 1992. A new species of *Blephilia* (Lamiaceae) from northern Alabama. Rhodora 94: 1-14.
Simpson, B.B,, A. Weeks, D.M. Helfgott, and L.L. Larkin. 2004. Species relationships in *Krameria* (Krameriaceae) based on ITS sequences and morphology: implications for character utility and biogeography. Systematic Botany 29: 97-108.
Simpson, M.G. 1983. Pollen ultrastructure of the Haemodoraceae and its taxonomic significance. Grana 22: 79-103.
——, and W.C. Dickison. 1981. Comparative anatomy of *Lachnanthes* and *Lophiola* (Haemodoraceae). Flora 171: 95-113.
Singhurst, J.R., and W.C. Holmes. 2004. Comments on the rediscovery and distribution of *Cunila origanoides* (Lamiaceae) in Texas. Sida 21: 1161-1163.
——, E.L. Keith, and W.C. Holmes. 2005. Three species of vascular plants new to Texas. Phytologia 87: 124-128.
Siripun, K.C., and E.E. Schilling. 2006. Molecular confirmation of the hybrid origin of *Eupatorium godfreyanum* (Asteraceae). Amer. J. Bot. 93: 319-325.
Sipple, W.S. 2002. Pine-barren golden-heather (*Hudsonia ericoides* L.) reported for the first time in Maryland. Bartonia 61: 149-150.
Skeen, J.N., P.D. Doerr, and D.H. Van Lear. 1993. Oak-hickory-pine forests. In W.H. Martin, S.G. Boyce, and A.C. Echternacht, eds. Biodiversity of the southeastern United States. John Wiley & Sons, New York, NY.
Skinner, M.W., and B.A. Sorrie. 2002. Conservation and ecology of *Lilium pyrophilum*, a new species of Liliaceae from the Sandhills region of the Carolinas and Virginia, U.S.A. Novon 12: 94-105.
Škoda, B. 1997. Taxonomic comments on the "Flora of North America north of Mexico," vol. 2, with some nomenclatural combinations for Pteridophyta. Preslia, Praha 68: 341-359.
Skog, J.T., and N.H. Nickerson. 1972. Variation and speciation in the genus *Hudsonia*. Ann Mo. Bot. Gard. 59: 454-464.
Skvortsov, A.K. 1979. Taxonomy and distribution of *Circaea* (Onagraceae) in the U.S.S.R. Ann Mo. Bot. Club 66: 880-892.
Sleumer, H. 1967a. Die Gattung *Gaylussacia* H.B.K. Botanische Jahrbücher Syst. 86: 309-384.
——. 1967b. Monographia Clethracearum. Botanische Jahrbücher Syst. 87: 36-175.

Small, E. 1978. A numerical and nomenclatural analysis of morpho-geographic taxa of *Humulus*. Systematic Bot. 3: 37-76.
Small, J.K. 1903. Flora of the southeastern United States, being descriptions of the seed-plants, ferns and fern-allies growing naturally in North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, and in Oklahoma and Texas east of the one hundredth meridian. Published by the author, New York, NY.
——. 1913. Flora of the southeastern United States, being descriptions of the seed-plants, ferns and fern-allies growing naturally in North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, and in Oklahoma and Texas east of the one hundredth meridian, second edition. Published by the author, New York, NY. 1394 pp.
——. 1924. A new bog-asphodel from the mountains. Torreya 24: 86-87.
——. 1933. Manual of the southeastern flora, being descriptions of the seed plants growing naturally in Florida, Alabama, Mississippi, eastern Louisiana, Tennessee, North Carolina, South Carolina, and Georgia. University of North Carolina Press, Chapel Hill, N.C.
——. 1938. Ferns of the southeastern states. The Science Press, Lancaster, Pa.
Smedmark, J.E.E. 2006. Recircumscription of *Geum* L. (Coluriae: Rosaceae). Bot. Jahrb. Syst. 126: 1-9.
——, and T. Eriksson. 2002. Phylogenetic relationships of *Geum* (Rosaceae) and relatives inferred from the nrITS and trnL-trnF regions. Syst. Bot. 27: 303-317.
Smith, A.C. 1944. Araliaceae. North American Flora 28B: 3-41. N.Y. Botanical Garden, New York.
Smith, A.R. 1992. A review of the fern genus *Micropolypodium* (Grammitidaceae). Novon 2: 419-425.
——, and R.B. Cranfill. 2002. Intrafamilial relationships of the thelypteroid ferns (Thelypteridaceae). Amer. Fern J. 92: 131-149.
——, K.M. Pryer, E. Schuettpelz, P. Korall, H. Schneider, & P.G. Wolf. 2006. A classification of extant ferns. Taxon 55: 705-731.
Smith, B.D., J.B. beck, A.T. Denham, and P.J. Calie. 2004. High resolution GIS mapping and current status of the ten viable populations of Short's goldenrod (*Solidago shortii* – Asteraceae) in Kentucky. Sida 21: 1121-1130.
Smith, E.B. 1976. A biosystematic survey of *Coreopsis* in eastern United States and Canada. Sida 6: 123-215.
——. 1981. New combinations in *Croptilon* (Compositae - Asteraceae). Sida 9: 59-63.
——. 1982a. Juvenile and adult leaflet phases in *Aralia spinosa* (Araliaceae). Sida 9: 330-332.
——. 1982b. A new variety of *Cardamine angustata* (Cruciferae) from the Ouachita Mountains of Arkansas. Brittonia 34: 376-380.
——. 1988. An atlas and annotated list of the vascular plants of Arkansas, second edition. Published by the author. Fayetteville, AR. 489 pp.
Smith, G.L., and W.S. Flory. 1990. Studies on *Hymenocallis henryae* (Amaryllidaceae). Brittonia 42: 212-220.
——, and M.A. Garland. 1996. Taxonomic status of *Hymenocallis choctawensis* and *Hymenocallis puntagordensis* (Amaryllidaceae). Sida 17: 305-319.
——, and M.A. Garland. 2003. Nomenclature of *Hymenocallis* taxa (Amaryllidaceae) in the southeastern United States. Taxon 52: 805-817
Smith, L.B., and C.E. Wood, Jr. 1975. The genera of Bromeliaceae in the southeastern United States. J. Arnold Arb. 56: 375-397.
Smith, M., and N. Parker. 2005. *Quercus montana* (Fagaceae), new to Missouri. Sida 21: 1921-1922.
Smith, R.R., and D.B. Ward. 1976. Taxonomy of the genus *Polygala* series *Decurrentes* (Polygalaceae). Sida 6: 284-310.
Smith, S.D., R.S. Cowan, K.B. Gregg, M.W. Chase, N. Maxted, and M.F. Fay. 2004. Genetic discontinuities among populations of *Cleistes* (Orchidaceae, Vanilloideae) in North America. Bot. J. Linn. Soc. 145: 87-95.
Smith, S.G. 1995. New combinations in North American *Schoenoplectus*, *Bolboschoenus*, *Isolepis*, and *Trichophorum* (Cyperaceae). Novon 5: 97-102.
——, and E. Hayasaka. 2002. New combinations within North American *Schoenoplectus smithii* and *S. purshianus* (sect. *Actaeogeton*, Cyperaceae) and comparsion with eastern Asian allies. Novon 12: 106-111.
Smith, T.W., J.T. Donaldson, T.F. Wieboldt, G.L. Kauffman, and M.J. Waterway. 2006. The geographic and ecological distribution of the Roan Mountain sedge, *Carex roanensis* (Cyperaceae). Castanea 71: 45-53.
Snoeijer, W. 1996. *Catharanthus roseus*, the Madagascar Periwinkle, a review of its cultivars. Wageningen Agricultural University Papers 96-3: 47-120.
Snow, N. 1998. Caryopsis morphology of *Leptochloa* sensu lato (Poaceae, Chloridioideae). Sida 18: 271-282.
Snyder, D. 1996. The genus *Rhexia* in New Jersey. Bartonia 59: 55-70.
Snyder, L.H., Jr., and J.G. Bruce. 1986. Field guide to the ferns and other pteridophytes of Georgia. Univ. of Georgia Press, Athens, GA. 270 pp.
Socorro González-Elizondo, M., and P.M. Peterson. 1997. A classification of and key to the supraspecific taxa in *Eleocharis* (Cyperaceae). Taxon 46: 433-449.
Soejima, A., and J. Wen. 2006. Phylogenetic analysis of the grape family (Vitaceae) based on three chloroplast markers. Amer. J. Bot. 93: 278-287.
Soják, J. 1992. Generische problematik der Selaginellaceae. Preslia, Praha 64: 151-158.
——. 2004. *Potentilla* L. (Rosaceae) and related genera in the former USSR (identification key, checklist and figures). Notes on Potentilla XVI. Bot. Jahrb. Syst. 125: 253-340.

Soltis, D.E. 1980. A biosystematic study of *Sullivantia* and related studies in the Saxifragaceae. Ph.D. thesis, Indiana University. 236 pp.
——. 1985. Allozymic differentiation among *Heuchera americana*, *H. parviflora*, *H. pubescens*, and *H. villosa* (Saxifragaceae). Systematic Bot. 10: 193-198.
——, B.A. Bohm, and G.L. Nesom. 1983. Flavonoid chemistry of cytotypes in *Galax* (Diapensiaceae). Systematic Bot. 8: 15-23.
——, P.S. Soltis, M.W. Chase, M.E. Mort, D.C. Albach, M. Zanis, V. Savolainen, W.H. Hahn, S.B. Hoot, M.F. Fay, M. Axtell, S.M. Swensen, L.M. Prince, W.J. Kress, K.C. Nixon, and J.S. Farris. 2000. Angiosperm phylogeny inferred from 18S rDNA, rbcL, and atpB sequences. Bot. J. Linn. Soc. 133: 381-461.
——, Qiu-Yun Xiang, and L. Hurford. 1995. Relationships and evolution of Hydrangeaceae based on rbcL sequence data. Am. J. Bot. 82: 504-514.
——, R.K. Kuzoff, E. Conti, R. Gornall, and K. Ferguson. 1996. matK and rbcL gene sequence data indicate that *Saxifraga* (Saxifragaceae) is polyphyletic. Am. J. Bot. 83: 371-382.
Somers, P., and W.R. Buck. 1975. *Selaginella ludoviciana*, *S. apoda*, and their hybrids in the southeastern United States. Am. Fern J. 65: 76-82.
Soreng, R.J. 1998. An infrageneric classification for Poa in North America, and other notes on sections, species, and subspecies of *Poa*, *Puccinellia*, and *Dissanthelium* (Poaceae). Novon 8: 187-202.
——, and E.E. Terrell. 1997. Taxonomic notes on *Schedonorus*, a segregate genus from *Festuca* or *Lolium*, with a new nothogenus, ×*Schedololium*, and new combinations. Phytologia 83: 85-88.
——, P.M. Peterson, G. Davidse, E.J. Judziewicz, F.O. Zuloaga, T.S. Filgueiras, and O. Morrone. 2003. Catalogue of New World grasses (Poaceae): IV. Subfamily Pooideae. Contr. U.S. National Herbarium 48: 1-730.
Sorrie, B.A. 1997. Notes on *Lycopus cokeri* (Lamiaceae). Castanea 62: 119-126.
——. 1998a. Distribution of *Drosera filiformis* and *D. tracyi* (Droseraceae): phytogeographic implications. Rhodora 100: 239-260.
——. 1998b. Noteworthy collections: Georgia. Castanea 63: 496-500.
——. 2000. *Rhynchospora leptocarpa* (Cyperaceae), an overlooked species of the southeastern United States. Sida 19: 139-147.
——, and R.J. LeBlond. 1997. Vascular plants new to the Bahamas and Andros Island. Bahamas J. of Science 4: 14-18.
——, and S.W. Leonard. 1999. Noteworthy records of Mississippi vascular plants. Sida 18: 889-908.
——, and P. Somers. 1999. The vascular plants of Massachusetts: a county checklist. Massachusetts Division of Fisheries and Wildlife, Natural Heritage & Endangered Species Program, Westborough, MA. 187 pp.
——, and A.S. Weakley. 2001. Coastal plain vascular plant endemics: phytogeographic patterns. Castanea 66: 50-82.
——, and A.S. Weakley. [in press]. Developing a blueprint for conservation of the endangered longleaf pine ecosystem based on centers of Coastal Plain endemism. Applied Vegetation Science.
——, M.H. MacRoberts, B.R. MacRoberts, and S.B. Walker. 2003. *Oxypolis ternata* (Apiaceae) deleted from the Texas flora. Sida 20: 1323-1324.
——, B. van Eerden, M.J. Russo. 1997. Noteworthy plants from Fort Bragg and Camp MacKall, North Carolina. Castanea 62: 239-259.
Sousa S., M., and V.E. Rudd. 1993. Revisión del género *Styphnolobium* (Leguminosae: Papilionoideae: Sophoreae). Ann. Missouri Bot. Gard. 80: 270-283.
South Carolina Heritage Trust. 1993. Rare, threatened, and endangered species of South Carolina. S.C. Heritage Trust, Columbia, SC.
Southall, R.M., and J.W. Hardin. 1974. A taxonomic revision of *Kalmia* (Ericaceae). J. Elisha Mitchell Sci. Soc. 90: 1-23.
Spalik, K. 1996. Species boundaries, phylogenetic relationships, and ecological differentiation in *Anthriscus* (Apiaceae). Pl. Syst. Evol. 199: 17-32.
Spangler, R.E., and R.G. Olmstead. 1999. Phylogenetic analysis of Bignoniaceae based on the cpDNA gene sequences rbcL and ndhF. Ann. Missouri Bot. Gard. 86: 33-46.
Speer, W.D., and K.W. Hilu. 1999. Relationships between two infraspecific taxa of *Pteridium aquilinum* (Dennstaedtiaceae). I. Morphological evidence. Systematic Bot. 23: 305-312.
——, C.R. Werth, and K.W. Hilu. 1999. Relationships between two infraspecific taxa of *Pteridium aquilinum* (Dennstaedtiaceae). II. Isozyme evidence. Systematic Bot. 23: 313-325.
Spongberg, S.A. 1971. The Staphyleaceae in the southeastern United States. J. Arnold Arb. 52: 196-203.
——. 1972. The genera of Saxifragaceae in the southeastern United States. J. Arnold Arb. 53: 409-498.
——. 1974. A review of deciduous-leaved species of *Stewartia* (Theaceae). J. Arnold Arb. 55: 182-214.
——. 1977. Ebenaceae hardy in temperate North America. J. Arnold Arb. 58: 146-160.
——. 1998. Magnoliaceae hardy in cooler temperate regions. In D. Hunt, ed. Magnolias and their allies. Proceedings of an international symposium, Royal Holloway, University of London, Egham, Surrey, U.K., 12-13 April 1996. International Dendrological Society and the Magnolia Society.
Spooner, D.M. 1984. Infraspecific variation in *Gratiola viscidula* Pennell (Scrophulariaceae). Rhodora 86: 79-87.
——, and J.S. Shelly. 1983. The national historical distribution of *Platanthera peramoena* (A. Gray) A. Gray (Orchidaceae) and its status in Ohio. Rhodora 85: 55-64.
——, A.W. Cusick, G.F. Hall, and J.M. Baskin. 1985. Observations on the distribution and ecology of *Sida hermaphrodita* (L.) Rusby (Malvaceae). Sida 11: 215-225.
Stace, C. 1997. New flora of the British Isles, second edition. Univ. of Cambridge Press, Cambridge. 1130 pp.

Staff of the Bailey Hortorium. 1976. Hortus third: a concise dictionary of plants cultivated in the United States and Canada. MacMillan, NY.
Stalter, R., and E. Lamont. 1996. Noteworthy collections: Virginia. Castanea 61: 396-397.
Standley, L.A. 1983. A clarification of the status of *Carex crinita* and *C. gynandra* (Cyperaceae). Rhodora 85: 229-241.
——, J.L. Dudley, and L.P. Bruederle. 1991. Electrophoretic variability in the rare sedge, *Carex polymorpha* (Cyperaceae). Bull. Torrey Bot. Club 118: 444-450.
Stanford, A.M. 1998. The biogeography and phylogeny of *Castanea*, *Fagus*, and *Juglans* based on MATK and ITS sequence data. Ph.D. dissertation, Biology Departement, University of North Carolina at Chapel Hill.
Stanford, A.M., R. Harden, and C.R. Parks. 2000. Phylogeny and biogeography of *Juglans* (Juglandaceae) based on matK and ITS sequence data. Am. J. Bot. 87: 872-882.
Staples, G.W., J.H. Wiersema, N.A. Chambers, and D.F. Austin. 2005. The restoration of *Ipomoea muricata* (L.) Jacq. (Convolvulaceae). Taxon 54: 1075-1079.
Steane, D.A., R.P.J. de Kok, and R.G. Olmstead. 2004. Phylogenetic relationships betrween *Clerodendrum* (Lamiaceae) and other Ajugoid genera inferred from nuclear and chloroplast DNA sequence data. Molecular Phylogenetics and Evolution 32: 39-45.
——, R.W. Scotland, D.J. Mabberley, and R.G. Olmstead. 1999. Molecular systematics of *Clerodendrum* (Lamiaceae): ITS sequences and total evidence. Amer. J. Bot. 86: 98-107.
Stearn, W.T. 2002. The genus *Epimedium* and other herbaceous Berberidaceae, including the genus *Podophyllum*. Timber Press, Portland, OR.
Stefanović, S., L. Krueger, and R.G. Olmstead. 2002. Monophyly of the Convolvulaceae and circumscription of their major lineages based on DNA sequences of multiple chloroplast loci. Amer. J. Bot. 89: 1510-1522.
——, D.F. Austin, and R.G. Olmstead. 2003. Classification of Convolvulaceae: a phylogenetic approach. Systematic Botany 28: 791-806.
Stein, J., D. Binion, and R. Acciavatti. 2003. Field guide to native oak species of eastern North America. Forest Health Technology Enterprise Team Publ. 2003-01.
Stephenson, S.N. 1971. The biosystematics and ecology of the genus *Brachyelytrum* in Michigan. Mich. Bot. 10: 19-33.
Steury, B.W. 1999. Noteworthy collections: Maryland. Castanea 64: 271-272.
——. 2004a. Noteworthy collections: District of Columbia and Maryland. Castanea 69: 154-157
——. 2004b. Noteworthy collections: Virginia. Castanea 69: 241-242.
——, R.W. Tyndall, and G. Cooley. 1996. Noteworthy collections: Maryland. Castanea 61: 392-396.
Stevens, P.F. 2006. Angiosperm Phylogeny Website. Version 7, May 2006 [and more or less continuously updated since]. http://www.mobot.org/MOBOT/research/APweb/
Stevenson, D.W. 1991. The Zamiaceae in the southeastern United States. J. Arnold Arboretum, Supp. Series 1: 367-384.
Steyermark, J.A. 1949. *Lindera melissaefolia*. Rhodora 51: 153-162.
——. 1951. A glabrous variety of *Silphium terebinthinaceum*. Rhodora 53: 133-135.
——, and C.S. Steyermark. 1960. *Hepatica* in North America. Rhodora 62: 223-232.
Stiles, B.J., and C.L. Howel. 1998. Floristic survey of Rabun County, Georgia, part II. Castanea 63: 154-160.
Stone, D.E. 1961. Ploidal level and stomatal size in the American hickories. Brittonia 13: 293-302.
——. 1968. Cytological and morphological notes on the southeastern endemic *Schisandra glabra* (Schisandraceae). J. Elisha Mitchell Sci. Soc. 84: 351-356.
——, and J.L. Freeman. 1968. Cytotaxonomy of *Illicium floridanum* and *I. parviflorum* (Illiciaceae). J. Arnold Arb. 49: 41-51.
——, G.A. Adrouny, and R.H. Flake. 1969. New World Juglandaceae. II. Hickory nut oils, phenetic similarities, and evolutionary implications in the genus *Carya*. Am. J. Bot. 56: 928-935.
Stoynoff, N., and W.J. Hess. 1990. A new status for *Quercus shumardii* var. *acerifolia* (Fagaceae). Sida 14: 267-271.
Straley, G.B. 1977. Systematics of *Oenothera* sect. *Kneiffia* (Onagraceae). Ann. Missouri Bot. Gard. 64: 381-424.
Strand, A.E., and R. Wyatt. 1991. Geographical variation and biosystematics of sand myrtle, *Leiophyllum buxifolium* (Ericaceae). Systematic Bot. 16: 529-545.
Strausbaugh, P.D., and E.L. Core. 1978. Flora of West Virginia, second edition, Seneca Books, Grantsville, WV.
Stritch, L.R. 1984. Nomenclatural contributions to a revision of the genus *Wisteria*. Phytologia 56: 183-184.
Strong, M.T. 1994. Taxonomy of *Scirpus*, *Trichophorum*, and *Schoenoplectus* (Cyperaceae) in Virginia. Bartonia 58: 29-68.
Struwe, L., and V.A. Albert, eds. 2002. Gentianaceae: systematics and natural history. Cambridge Univ. Press, Cambridge. 652 pp.
——, V.A. Albert, and B. Bremer. 1994. Cladistics and family level classification of the Gentianales. Cladistics 10: 175-206.
——, J.W. Kadereit, J. Klackenberg, S. Nilsson, M. Thiv, B. von Hagen, and V.A. Albert. 2002. Systematics, character evolution, and biogeography of Gentianaceae, including a new tribal and tribal classification. In L. Struwe and V.A. Albert, eds. 2002. Gentianaceae: systematics and natural history. Cambridge Univ. Press, Cambridge. 652 pp.
Sugawara, T. 1987. Cytotaxonomic study of *Asarum* senso lato. Proc. Sino-Jpn. Symposium Pl. Chromos. {}: 147-150.
Sullivan, J.R. 1978. Putative hybridization in the genus *Eupatorium* (Compositae). Rhodora 80: 513-527.
——. 1985. Systematics of the *Physalis viscosa* complex (Solanaceae). Systematic Bot. 10: 426-444.
——. 2004. The genus *Physalis* (Solanaceae) in the southeastern United States. Rhodora 106: 305-326.
Sundberg, S.D. 2004. New combinations in North American *Symphyotrichum* subgenus *Astropolium* (Asteraceae: Astereae). Sida 21: 903-910.

Sundell, E., R.D. Thomas, C. Amason, R.L. Stuckey, and J. Logan. 1999. Noteworthy vascular plants from Arkansas. Sida 18: 877-887.

Sutter, R., L. Mansberg, and J. Moore. 1983. Endangered, threatened, and rare plant species of North Carolina: a revised list. Association of Southeastern Biologists Bulletin 30:153-163.

Sutton, D.A. 1988. A revision of the tribe Antirrhineae. British Museum (Natural History), Oxford Univ. Press, London.

Swallen, J.R. 1961. A new species of *Panicum* from New Jersey. Rhodora 63: 235-236.

Sweeney, C.R. 1970. Monograph of the genus *Silphium*. I. *Silphium compositum* Michaux (Compositae). Ohio J. of Sci. 70: 226-233.

Sweeney, P.W., and R.A. Price. 2000. Polyphyly of the genus *Dentaria* (Brassicaceae): evidence from trnL intron and ndhF sequence data. Systematic Botany 25: 468-478.

——, and R.A. Price. 2001. A multivariate morphological analysis of the *Cardamine* concatenata alliance (Brassicaceae). Brittonia 53: 82-95.

Sytsma, K.J., J. Morawetz, J.C. Pires, M. Nepokroeff, E. Conti, M. Zjhra, J.C. Hall, and M.W. Chase. 2002. Urticalean rosids: circumscription, rosid ancestry, and phylogenetics based on rbcL, trnL-F, and ndhF sequences. Amer. J. Botany 89: 1531-1546.

Takahashi, M., and S. Kawano. 1989. Pollen morphology of the Melanthiaceae and its systematic implications. Ann. Mo. Bot. Gard. 76: 863-876.

Takhtajan, A. 1986. Floristic regions of the world. Univ. of Calif. Press, Berkeley, CA. 522 pp.

Takhtajan, A. 1997. Diversity and classification of flowering plants. Columbia Univ. Press, NY. 643 pp.

Tamura , M.N., J. Yamashita, S. Fuse, and M. Haraguchi. 2004. Molecular phylogeny of monocotyledons inferred from combined analysis of plastid matK and rbcL gene sequences. J. Plant Res. 117: 109-120.

Tank, D.C., P.M. Beardsley, S.A. Kelchner, and R.G. Olmstead. 2006. review of the systematics of Scrophulariaceae s.l. and their current disposition. Australian Systematic Botany: 19: 289-307..

Taylor, C.E.S., and R.J. Taylor. 1983. New species, new combinations and notes on the goldenrods (*Euthamia* and *Solidago* – Asteraceae). Sida 10: 176-183.

Taylor, C.M. 1994. Revision of *Tetragonia* (Aizoaceae) in South America. Systematic Bot. 19: 575-589.

Taylor, P. 1989. The genus *Utricularia* – a taxonomic monograph. Her Majesty's Stationery Office, London.

Taylor, S. I. and F. Levy. 2002. Responses to soils and a test for preadaptation to serpentine in *Phacelia dubia* (Hydrophyllaceae). New Phytologist 155:437-447.

Terrell, E.E. 1959. A revision of the *Houstonia purpurea* group (Rubiaceae). Rhodora 61: 157-181, 188-207.

——. 1978. Taxonomic notes on *Houstonia purpurea* var. *montana* (Rubiaceae). Castanea 43: 25-29.

——. 1986. Taxonomic and nomenclatural notes on *Houstonia nigricans* (Rubiaceae). Sida 11: 471-481.

——. 1991. Overview and annotated list of North American species of *Hedyotis*, *Houstonia*, *Oldenlandia*, and related genera. Phytologia 71: 212-243.

——. 1996. Revision of *Houstonia* (Rubiaceae-Hedyotidae). Systematic Bot. Monographs 48: 1-118.

——. 2001. Taxonomy of *Stenaria* (Rubiaceae: Hedyotitideae), a new genus including *Hedyotis nigricans*. Sida 19: 591-614.

——, and J.L. Reveal. 1996. Noteworthy collections: Maryland. Castanea 61: 95-96.

——, and H. Robinson. 2006. Taxonomy of North American species of *Oldenlandia* (Rubiaceae). Sida 22: 305-329.

——, P.M. Peterson, J.L. Reveal, and M.R. Duvall. 1997. Taxonomy of North American species of *Zizania* (Poaceae). Sida 17: 533-549.

Tharp, B.C., and M.C. Johnston. 1961. Recharacterization of *Dichondra* (Convolvulaceae) and a revision of the North American species. Brittonia 13: 346-360.

Therman, E. 1950. Chromosome numbers in American *Polygonatum* species. Am. J. Bot. 37: 407-413.

——. 1953. Chromosomal evolution in the genus *Polygonatum*. Hereditas 39: 277-288.

——. 1956. Cytotaxonomy of the tribe Polygonatae. Am. J. Bot. 43: 134-142.

Thien, L.B., E.G. Ellgaard, M.S. Devall, S.E. Ellgaard, and P.F. Ramp. 1994. Population structure and reproductive biology of *Saururus cernuus* L. (Saururaceae). Plant Species Biol. 9: 47-55.

Thieret, J.W. 1971. The genera of Orobanchaceae in the southeastern United States. J. Arnold Arb. 52: 404-434.

——. 1972. The Phrymaceae in the southeastern United States. J. Arnold Arb. 53: 226-233.

——. 1975. The Mayacaceae in the southeastern United States. J. Arnold Arb. 56: 248-255.

——. 1977. The Martyniaceae in the southeastern United States. J. Arnold Arb. 58: 25-39.

——. 1982. The Sparganiaceae in the southeastern United States. J. Arnold Arb. 63: 341-355.

——. 1988. The Juncaginaceae in the southeastern United States. J. Arnold Arb. 69: 1-23.

——, and J.R. Baird. 1985. *Thlaspi alliaceum* (Cruciferae) in Kentucky and Indiana. Trans. Kentucky Academy of Science 46: 145-146.

——, and J.O. Luken. 1996. The Typhaceae in the southeastern United States. Harvard Papers in Botany 8: 27-56.

Thomas, J.L. 1960. A monographic study of the Cyrillaceae. Contr. Gray Herb. Harvard Univ. 186: 1-114.

Thomas, R.D., and C.M. Allen. 1993. Atlas of the vascular flora of Louisiana. Volume I: Ferns & fern allies, conifers, & monocotyledons. Louisiana Dept. of Wildlife and Fisheries, Natural Heritage Program, Baton Rouge, LA.

——, and C.M. Allen. 1996. Atlas of the vascular flora of Louisiana. Volume II: Dicotyledons, Acanthaceae-Euphorbiaceae. Louisiana Dept. of Wildlife and Fisheries, Natural Heritage Program, Baton Rouge, LA.

——, and C.M. Allen. 1998. Atlas of the vascular flora of Louisiana. Volume III: Dicotyledons, Fabaceae-Zygophyllaceae. Louisiana Dept. of Wildlife and Fisheries, Natural Heritage Program, Baton Rouge, LA.
——, and P.S. Marx. 1979. Notes on three species of *Ophioglossum* from North Carolina. Sida 8: 113.
Thomas, W.W. 1984. The systematics of *Rhynchospora* section *Dichromena*. Mem. New York Bot. Garden 37.
Thomson, P.M., and R.H. Mohlenbrock. 1979. Foliar trichomes of *Quercus* subgenus *Quercus* in the eastern United States. J. Arnold Arb. 60: 350-366.
Thompson, S.W., and T.G. Lammers. 1997. Phenetic analysisof morphological variation in the *Lobelia cardinalis* complex (Campanulaceae: Lobelioideae). Systematic Botany 22: 315-331.
Thorne, R.F. 1992. Classification and geography of the flowering plants. Bot. Review 58: 225-348.
Threadgill, P.F., and J.M. Baskin. 1978. *Swertia caroliniensis* or *Frasera caroliniensis*? Castanea 43: 20-22.
Threlkeld, S.J., and E.D. Soehren. 2003. Noteworthy collections: Alabama. Castanea 68: 182-183.
Timmerman-Erskine, M., and R.S. Boyd. 1999. Reproductive biology of the endangered plant *Clematis socialis* (Ranunculaceae). J. Torrey Bot. Soc. 126: 107-116.
——, R.R. Dute, and R.S. Boyd. 2002. Morphometric analysis of the *Trillium pusillum* Michaux complex (Trilliaceae) of the southeastern United States. Castanea 67: 109-119.
Tobe, H., and R.C. Keating. 1985. The morphology and anatomy of *Hydrastis* (Ranunculales): systematic reevaluation of the genus. Bot Mag. Tokyo 98: 291-316.
Tobe, J.D. 1998. The phylogeny of *Magnolia* in eastern North America. In D. Hunt, ed. Magnolias and their allies. Proceedings of an international symposium, Royal Holloway, University of London, Egham, Surrey, U.K., 12-13 April 1996. International Dendrological Society and the Magnolia Society.
Tomb, A.S. 1980. Taxonomy of *Lygodesmia* (Asteraceae). Systematic Botany Monographs 1: 1-51.
Tomlinson, P.B. 1986. The biology of trees native to tropical Florida. Published by the author. 480 pp.
Towe, L.C. 2004. American azaleas. Timber Press, Portland, OR. 146 pp.
Townsend, J.F., and V. Karaman-Castro. 2006. A new species of *Boltonia* (Asteraceae) from the Ridge and Valley physiographic province, U.S.A. Sida 22: 873-886.
——, R. Carter, R.D. Porcher, and P.D. McMillan. 2000. Noteworthy Collections: Georgia and South Carolina. Castanea 65: 231-232.
Trapnell D.W., J.L. Hamrick, and D.E. Giannasi. 2004. Genetic variation and species boundaries in Calopogon (Orchidaceae). Systematic Botany 29: 308-315.
Trauth-Nare, A.E., and R.F.C. Naczi. 1998. Taxonomic status of the varieties of Seneca snakeroot, *Polygala senega* L. (Polygalaceae) [abstract]. Am. J. Bot 85 [supplement]: 163.
Treiber, M. 1980. Biosystematics of the *Arisaema triphyllum* complex. Ph.D. dissertation, Univ. of North Carolina-Chapel Hill, Department of Botany.
Triplett, J.K., L.G., Clark, and A.S. Weakley. 2006. Hill cane (*Arundinaria appalachiana*), a new species of bamboo (Poaceae: Bambusoideae) from the Southern Appalachian Mountains. Sida 22: 79-95.
Tripp, K.E. 1995. *Cephalotaxus*: the plum yew. Arnoldia 55: 24-39.
Tryon, R.M. 1955. *Selaginella rupestris* and its allies. Annals Mo. Bot. Garden 42: 1-99.
Tucker, A.O., N.H. Dill, T.D. Pizzolato, and R.D. Kral. 1983. Nomenclature, distribution, chromosome numbers, and fruit morphology of *Oxypolis canbyi* and *O. filiformis* (Apiaceae). Systematic Bot. 8: 299-304.
Tucker, G.C. 1984. A revision of the genus *Kyllinga* Rottb. (Cyperaceae) in Mexico and Central America. Rhodora 86: 507-538.
——. 1986. The genera of the Elatinaceae in the southeastern United States. J. Arnold Arb. 67: 471-483.
——. 1987. The genera of Cyperaceae in the southeastern United States. J. Arnold Arb. 68: 361-445.
——. 1988. The genera of Bambusoideae (Gramineae) in the southeastern United States. J. Arnold Arb. 69: 239-273.
——. 1989. The genera of Commelinaceae in the southeastern United States. J. Arnold Arb. 70: 97-130.
——. 1990. The genera of Arundinoideae (Gramineae) in the southeastern United States. J. Arnold Arb. 71: 145-177.
——. 1996. The genera of Poöideae (Gramineae) in the southeastern United States. Harvard Papers in Botany 9: 11-90.
Turner, B.L. 1995a. Synopsis of the genus *Onosmodium* (Boraginaceae). Phytologia 78: 39-60.
——. 1995b. Taxonomic overview of *Hedyotis nigricans* (Rubiaceae) and closely allied taxa. Phytologia 79: 12-21. [with corrected map: Phytologia 80: 142-143]
——. 2006. Overview of the genus *Baptisia* (Leguminosae). Phytologia 88: 253-268.
——, and D. Dawson. 1980. Taxonomy of *Tetragonotheca* (Asteraceae-Heliantheae). Sida 8: 296-303.
——, and M.G.Mendenhall. 1993. A revision of *Malvaviscus* (Malvaceae). Ann. Missouri Bot. Gard. 80: 439-457.
——, and M.I. Morris. 1976. Systematics of *Palafoxia* (Asteraceae: Heleniae). Rhodora 78: 567-628.
——, and M. Whalen. 1975. Taxonomic study of *Gaillardia pulchella* (Asteraceae – Heliantheae). Wrightia 5: 189-192.
——, H. Nichols, G. Denny, and O. Doron. 2003. Atlas of the vascular plants of Texas, Volume 1. Sida, Botanical Miscellany 24.
Turrill, N.L., D.K. Evans, and F.S. Gilliam. 1994. Identification of West Virginia members of the *Dentaria* complex [*D. diphylla* Michx., *D. heterophylla* Nutt., and *D. laciniata* Muhl. ex Willd. (Brassicaceae)] using above-ground vegetative characters. Castanea 59: 22-30.
Tyndall, R.W., B.J. Holt, and G. Lam. 1996. *Aeschynomene virginica* (L.) BSP. in Maryland. Castanea 61: 86-89.
Ulmer, T., and J.M. MacDougal. 2004. *Passiflora*: passionflowers of the world. Timber Press, Portland, OR. 430 pp.

Umber, R.E. 1979. The genus *Glandularia* (Verbenaceae) in North America. Systematic Bot. 4: 72-102.
USDA NRCS. 2005. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Accessed November 2005.
Urbatsch, L.E. 1972. Systematic study of the *Altissimae* and *Giganteae* species groups of the genus *Vernonia* (Compositae). Brittonia 24: 229-238
——, R.P. Roberts, and V. Karaman. 2003. Phylogenetic evaluation of *Xylothamia*, *Gundlachia*, and related genera (Asteraceae, Astereae) based on ETS and ITS NRDNA sequence data. Amer. J. Botany 90: 634-649.
Uttal, L.J. 1974. The varieties of *Spiraea betulifolia*. Bull. Torrey Bot. Club 101: 35-36.
——. 1985. Virginia's two kinds of blue cohosh. Jeffersonia 16: 20-27.
——. 1986a. Once and for all it is *Paxistima*. Castanea 51: 67-68.
——. 1986b. Taxonomic and nomenclatural notes on *Vaccinium* L. section *Cyanococcus* (Ericaceae). Sida 11: 397-399.
——. 1986c. Updating the genus *Vaccinium* L. (Ericaceae) in West Virginia. Castanea 51: 197-201.
——. 1987. The genus *Vaccinium* L. (Ericaceae) in Virginia. Castanea 52: 231-255.
——. 1991. Notes on *Uvularia puberula* Michaux (Liliaceae). Castanea 56: 70.
Valder, P. 1995. Wisterias: a comprehensive guide. Timber Press, Portland, OR. 160 pp.
van Alstine, N.E., W.H. Moorhead III, A. Belden, Jr., T.J. Rawinski, and J.C. Ludwig. 1996. Recently discovered populations of small whorled pogonia (*Isotria medeoloides*) in Virginia. Banisteria 7: 3-7.
van Bergen, M.A. 1996. Revision of Catharanthus G. Don; series of revisions of Apocynaceae XLI. Wageningen Agricultural University Papers 96-3: 1-46.
van de Wouw, M., N. Maxted, and B.V. Ford-Lloyd. 2003. A multivariate and cladistic study of *Vicia* L. ser. *Vicia* (Fabaceae) based on analysis of morphological characters. Plant Syst. Evol. 237: 19-39.
Van der Bank, M., M.F. Fay, and M.W. Chase. 2002. Molecular phylogenetics of Thymelaeaceae, with particular reference to African and Australian genera. Taxon 51: 329-339.
van der Werff, H., and H.G. Richter. 1996. Toward an improved classification of Lauraceae. Ann. Mo. Bot. Garden 83: 409-418.
van Gelderen, C.J., and D.M. van Gelderen. 2004. Encyclopedia of Hydrangeas. Timber Press, Portland, OR. 279 pp.
van Gelderen, D.M., P.C. de Jong, H.J. Oterdoom. 1994. Maples of the world. Timber Press, Portland OR. 458 pp.
van Welzen, P.C. 1981. A taxonomic revision of the genus *Arthraxon* Beauv. Blumea 27: 255-300.
Vander Kloet, S.P. 1977. Potential and actual gene exchange among three sympatric species of *Vaccinium* § *Cyanococcus* in Highlands County, Florida. Can. J. Bot 55: 2668-2672.
———. 1978a. Systematics, distribution, and nomenclature of the polymorphic *Vaccinium* angustifolium. Rhodora 80: 358-376.
——. 1978b. The taxonomic status of *Vaccinium pallidum*, the hillside blueberries including *Vaccinium vacillans*. Can J. Bot. 56: 1559-1574.
——. 1980. The taxonomy of the highbush blueberry, *Vaccinium corymbosum*. Can. J. Bot. 58: 1187-1201.
——. 1982. A note on the occurrence of root-shoots in *Vaccinium corymbosum* L. Rhodora 84: 447-450.
——. 1983a. The taxonomy of *Vaccinium* § *Oxycoccus*. Rhodora 85: 1-43.
——. 1983b. The taxonomy of *Vaccinium* § *Cyanococcus*: a summation. Can J. Bot. 61: 256-266.
——. 1988. The genus *Vaccinium* in North America. Publication 1828, Research Branch, Agriculture Canada, Ottawa.
——, and I.V. Hall. 1981. The biological flora of Canada. 2. *Vaccinium myrtilloides* Michx., velvet-leaf blueberry. Can. Field-Nat. 95: 329-345.
Vega, A.S. 2000. Revisión taxonómica de las especies americanas del género *Bothriochloa* (Poaceae: Panicoideae: Andropogoneae). Darwiniana 38: 127-186.
Veldkamp, J.F. 1999. A revision of *Chrysopogon* Trin. including *Vetiveria* Bory (Poaceae) in Thailand and Malesia with notes on some other species from Africa and Australia. Austrobaileya 5: 503-533.
——, R. de Koning, and M.S.M. Sosef. 1986. Generic delimitation of *Rottboellia* and related genera (Gramineae). Blumea 31: 281-307.
Verdcourt, B. 2004. The variation of *Sida rhombifolia* L. (Malvaceae) in East Africa. Kew Bull.59: 233-239.
Vincent, M.A. 2004. Spread of *Fatoua villosa* (mulberry weed; Moraceae) in North America. J. Ky. Acad. Sci. 65: 67-75.
Virginia Botanical Associates. 2006. Digital Atlas of the Virginia Flora. http://www.biol.vt.edu/digital_atlas/. Accessed 9 February 2006.
Vitt, P., and C.S. Campbell. 1997. Reproductive biology of *Isotria medeoloides* (Orchidaceae). Rhodora 99: 56-63.
Vogelmann, J.E. 1985. Crossing relationships among North American and eastern Asian populations of *Agastache* sect. *Agastache* (Labiatae). Systematic Bot. 10: 445-452.
von Balthazar, M., P.K. Endress, and Y.-L. Qiu. 2000. Phylogenetic relationships in Buxaceae based on internal transcribed spacers and plastid ndhF sequences. Int. J. Plant Sci. 161: 785-792.
Voss, E.G. 1972. Michigan flora: a guide to the identification and occurrence of the native and naturalized seed-plants of the state. Part I, gymnosperms and monocots. Cranbrook Institute of Science Bulletin No. 55 and Univ. of Mich. Herbarium, Bloomfield Hills, MI. 488 pp.
——. 1985. Michigan flora: a guide to the identification and occurrence of the native and naturalized seed-plants of the state. Part II, dicots (Saururaceae-Cornaceae). Cranbrook Institute of Science Bulletin No. 59 and Univ. of Mich. Herbarium, Ann Arbor, MI. 724 pp.

——. 1996. Michigan flora: a guide to the identification and occurrence of the native and naturalized seed-plants of the state. Part III, dicots (Pyrolaceae-Compositae). Cranbrook Institute of Science Bulletin No. 61 and Univ. of Mich. Herbarium, Ann Arbor, MI. 622 pp.
Vuilleumier, B.S. 1969. The tribe Mutisieae (Compositae) in the southeastern United States. J. Arnold Arb. 50: 620-625.
Wagenknecht, B.L. 1960. Revision of *Heterotheca*, section *Heterotheca* (Compositae). Rhodora 62: 61-76, 97-107.
Wagner, W.H., Jr. 1977. Systematic implications of the Psilotaceae. Brittonia 29: 54-63.
——. 1992. *Hiemobotrychium*, a new section of *Botrychium* subgenus *Sceptridium* from the southeastern United States. Novon 2: 267-268.
——, J.M. Beitel, and R.C. Moran. 1989. *Lycopodium hickeyi*: a new species of North American clubmoss. Amer. Fern J. 79: 119-121.
——, and J.M. Beitel. 1992. Generic classification of modern North American Lycopodiaceae. Ann. Mo. Bot. Gard. 79: 676-686.
——, E.M. Bush, C.R. Werth, and R.L. Bartgis. 1991. First records of alternate-leaved spleenwort, *Asplenium ×alternifolium*, in the New World. Castanea 56: 128-134,
——, F.S. Wagner, C.N. Miller, Jr., and D.H. Wagner. 1978. New observations on the royal fern hybrid *Osmunda ×ruggii*. Rhodora 80: 92-106.
Wagner, W.L., and H. Robinson. 2001. *Lipochaeta* and *Melanthera* (Asteraceae: Heliantheae subtribe Ecliptinae): establishing their natural limits and a synopsis. Brittonia 53: 539-561.
——, and P. Hoch. 2000. Proposal to reject the name *Gaura mollis* (Onagraceae). Taxon 49: 101-102.
Wagstaff, S.J., and R.G. Olmstead. 1997. Phylogeny of Labiatae and Verbenaceae inferred from rbcL sequences. Systematic Bot. 22: 165-179.
Wahl, H.A. 1954. A preliminary study of the genus *Chenopodium* in North America. Bartonia 27: 1-46.
Walker, J.B., K.J. Sytsma, J. Treutlein, and M. Wink. 2004. *Salvia* (Lamiaceae) is not monophyletic: implications for the systematics, radiation, and ecological specializations of Salvia and tribe Mentheae. Amer. J. Bot. 91: 1115-1125.
Wallace, L.A., and M.A. Case. 2000. Contrasting allozyme diversity between northern and southern populations of *Cypripedium parviflorum* (Orchidaceae): implications for Pleistocene refugia and taxonomic boundaries. Syst. Bot. 25: 281-296.
Walters, S.M., and D.A. Webb. 1972. Veronica. In T.G. Tutin, V.H. Heywood, N.A. Burges, D.M. Moore, D.H. Valentine, S.M. Walters, and D.A. Webb. Flora Europaea. Volume 3. Cambridge, England.
Wang, Y., P.W. Fritsch, S. Shi, F. Almeda, B.C. Cruz, and L.M. Kelly. 2004. Phylogeny and infrageneric classification of *Symplocos* (Symplocaceae) inferred from DNA sequence data. Amer. J. Bot. 91: 1901-1914.
Ward, A.B., and C.N. Horn. 1998. A status survey of *Dirca palustris* L. (Leatherwood, Thymelaeaceae) in South Carolina. Castanea 63: 165-173.
Ward, D.B. 1968. Contributions to the flora of Florida – 3, *Evolvulus* (Convolvulaceae). Castanea 33: 76-79.
——. 1974. Contributions to the flora of Florida – 6, *Vaccinium* (Ericaceae). Castanea 39: 191-205.
——. 1977a. Keys to the flora of Florida – 2, *Paronychia* (Caryophyllaceae. Phytologia 35: 414-418.
——. 1977b. Corrections in *Paronychia* (Caryophyllaceae). Phytologia 37: 449-450.
——. 1977c. Keys to the flora of Florida – 5, Dioscoreaceae. Phytologia 38: 151-154.
——. 1998. *Pueraria montana*: the correct scientific name of the kudzu. Castanea 63: 76-77.
——. 2001. New combinations in the Florida flora. Novon 11: 360-365.
——. 2004a. Keys to the flora of Florida – 9, *Oxalis* (Oxalidaceae). Phytologia 86: 32-41.
——. 2004b. *Acer floridanum*: the correct scientific name of the Florida maple. Castanea 69: 230-233.
——. 2004c. New combinations in the Florida flora II. Novon 14: 365-371.
——. 2004d. Keys to the flora of Florida – 11, *Elytraria* (Acanthaceae). Phytologia 86: 200-202.
——. 2005a. Rediscovery of *Sisyrinchium corymbosum* Bicknell (Iridaceae), lost for one hundred years. Castanea 70: 155-157.
——. 2005b. A case of disputed orthography: is it *Echinchloa colona*; or is it *Echinochloa colonum* (Gramineae). Sida 21: 2171-2183.
——. 2006a. A nomenclatural history of southeastern filiferous *Yucca*, with selection of a neotype for *Y. flaccida*. Castanea 71: 80-84.
——. 2006b. Keys to the flora of Florida – 13, *Vitis* (Vitaceae). Phytologia 88: 216-223.
——, and A.K. Gholson. 1987. The hidden abundance of *Lepuropetalon spathulatum* (Saxifragaceae) and its first reported occurrence in Florida. Castanea 52: 59-68.
——, and D.W. Hall. 2004. Keys to the flora of Florida – 10, Galactia (Leguminosae). Phytologia 86: 65-74.
——, and W.K. Taylor. 1999. Discovery of tree-form gopher apple (*Licania michauxii* Prance), with implication of an arboreous ancestor. Castanea 64: 263-265.
Ware, D.M.E. 1973. Floristic survey of the Thompson River watershed. Castanea 38: 349-378.
——. 1983. Genetic fruit polymorphism in North American *Valerianella* (Valerianaceae) and its taxonomic implications. Systematic Bot. 8: 33-44.
Ware, S. 1967. A new *Talinum* (Portulaceae) from the cedar glades of Middle Tennessee. Rhodora 69: 466-475.
——. 1992. Where are all the hickories in the Piedmont oak-hickory forest? Castanea 57: 4-12.
——, and G. Pinion. 1990. Substrate adaptation in rock outcrop plants: eastern United States *Talinum* (Portulacaceae). Bull. Torrey Bot. Club 117: 284-290.

Warners, D.P., and D.C. Laughlin. 1999. Evidence for a species-level distinction of two co-occurring asters: *Aster puniceus* L. and *Aster firmus.*
Warnock, M.J. 1995. A taxonomic conspectus of North American *Delphinium*. Phytologia 78: 73-101.
Wasshausen, D.C. 1998. Acanthaceae of the southeastern United States. Castanea 63: 99-116.
Waterway, M.J. 1986. A reevaluation of *Lycopodium porophilum* and its relationship to *L. lucidulum* (Lycopodiaceae). Systematic Bot. 11: 263-276.
Watkins, J.E., Jr., and D.R. Farrar. 2002. A new name for an old fern from north Alabama. Amer. Fern J. 92: 171-178.
——, and D.R. Farrar. 2005. Origin and taxonomic affinities of *Thelypteris* (subgen. *Stegnogramma*) *burksiorum* (Thelypteridaceae). Brittonia 57: 183-201.
Watson, L.E., W.J. Elisens, and J.R. Estes. 1991. Electrophoretic and cytogenetic evidence for allopolyploid origin of *Marshallia mohrii* (Asteraceae). Am. J. Bot. 78: 408-416.
——, and J.R. Estes. 1990. Biosystematic and phenetic analysis of *Marshallia* (Asteraceae). Systematic Bot. 15: 403-414.
——, R.K. Jansen, and J.R. Estes. 1991. Tribal placement of *Marshallia* (Asteraceae) using chloroplast DNA restriction site mapping. Am. J. Bot. 78: 1028-1035.
——, A.B. Kornkven, C.R. Miller, J.R. Allison, N.B. McCarty, and M.M. Unwin. 2002. Morphometric and genetic variation in *Eriocaulon koernickianum* Van Heurck & Muller-Argoviensis (Eriocaulaceae): a disjunct plant species of the southeastern United States. Castanea 67: 416-426.
Weakley, A.E. 2002. Evolutionary relationships within the genus *Philadelphus* L. (Hydrangeaceae). Master's thesis, Biology Dept., Univ. of North Carolina, Chapel Hill, NC.
Weakley, A.S. 1990. Natural Heritage Program list of the rare plants of North Carolina. North Carolina Natural Heritage Program, Raleigh, NC.
——. 2005. Flora of the Carolinas, Virginia, and Georgia, working draft of June 2005. University of North Carolina Herbarium, N.C. Botanical Garden, Chapel Hill, NC. http://www.herbarium.unc.edu/. Accessed 10 December 2005.
——, and G.L. Nesom. 2004. A new species of *Ptilimnium* (Apiaceae) from the Atlantic coast. Sida 21: 743-752.
——, and P.M. Peterson. 1998. Taxonomy of the *Sporobolus floridanus* complex (Poaceae: Sporobolinae). Sida 18: 247-270.
Weatherwax, P. 1934. Flowering and seed production in *Amphicarpon floridanum*. Bull. Torrey Bot. Club 61: 211-215.
Weaver, R.E., Jr., and L. Rüdenberg. 1975. Cytytaxonomic notes on some Gentianaceae. J. Arnold Arb. 56: 211-222.
Webb. 1980. {*Hypericum*}
Webber, J.M. and P.W. Ball. 1980. Introgression in Canadian populations of *Lycopus americanus* Muhl. and *L. europaeus* L. (Labiatae). Rhodora 82: 281-304.
——, and P.W. Ball. 1984. The taxonomy of the *Carex rosea* group (section *Phaestoglochin*) in Canada. Can. J. Bot. 62: 2058-2073.
Weber, W.A. 1995. New names and combinations, principally in the Rocky Mountain flora – IX. Phytologia 79: 65-67.
Webster, G.L. 1967. The genera of Euphorbiaceae in the southeastern United States. J. Arnold Arb. 48: 303-430.
——. 1970. A revision of *Phyllanthus* (Euphorbiaceae) in the continental United States. Brittonia 22: 44-76.
——. 1992. Realignments in American *Croton* (Euphorbiaceae). Novon 2: 269-273.
——. 1993. A provisional synopsis of the sections of the genus *Croton* (Euphorbiaceae). Taxon 42: 793-823.
——. 1994. Synopsis of the genera and suprageneric taxa of Euphorbiaceae. Ann. Missouri Bot. Gard. 81: 33-144.
Webster, R.D. 1980. Distribution records for *Digitaria bicornis* in eastern United States. Sida 8: 352-353.
——. 1987. Taxonomy of *Digitaria* section *Digitaria* in North America (Poaceae: Paniceae). Sida 12: 209-222.
——. 1988. Genera of the North American Paniceae (Poaceae: Panicoideae). Systematic Bot. 13: 576-609.
——. 1980. Distribution records for *Digitaria bicornis* in eastern United States. Sida 8: 352-353.
——. 1992. Character significance and generic similarities in the Paniceae (Poaceae: Panicoideae). Sida 15: 185-213.
——. 1993. Nomenclature of *Setaria* (Poaceae: Paniceae). Sida 15: 447-489.
——. 1995. Nomenclatural changes in *Setaria* and *Paspalidium* (Poaceae: Paniceae). Sida 16: 439-446.
——, J.H. Kirkbride, and J.V. Reyna. 1989. New World genera of the Paniceae (Poaceae: Panicoideae). Sida 13: 393-417.
——, and R.B. Shaw. 1995. Taxonomy of the native North American species of *Saccharum* (Poaceae: Andropogoneae). Sida 16: 551-580.
Weckman, T.J., J.E. Weckman, R.L. Thompson, and D.L. White. 2002. Noteworthy Collections: Kentucky. New records and a summary of naturalized *Viburnum* taxa in Kentucky. Castanea 67: 104-106.
Weigant, P.L. 2002. Distribution of *Aletris* in North America. J. North Carolina Academy of Science 118: 44-49.
Weigend, M., O. Mohr, and T.J. Motley. 2002. Phylogeny and classification of the genus *Ribes* (Grossulariaceae) based on 5S-NTS sequences and morphological and anatomical data. Bot. Jahrb. Syst. 124: 163-182.
Weldy, T.W., H.T. Mlodozeniec, L.E. Wallace, and M.A. Case. 1996. The current status of *Cypripedium kentuckiense* (Orchidaceae) including a morphological analysis of a newly discovered population in eastern Virginia. Sida 17: 423-435.
Weller, S.G. 1970. A preliminary report on the varieties of *Maianthemum canadense* in northern Michgan. Michigan Botanist 9: 48-52.
Wells, E.F. 1984. A revision of the genus *Heuchera* (Saxifragaceae) in eastern North America. Systematic Bot. Monographs 3: 45-121.
Wen, J. 1993. Generic delimitation of *Aralia* (Araliaceae). Brittonia 45: 47-55.
——. 1998. Systematics and biogeography of the *Aralia* -- *Panax* complex (Araliaceae) [abstract]. Am. J. Bot. 85 [supplement]: 166.

——, and R.K. Jansen. 1995. Morphological and molecular comparisons of *Campsis grandiflora* and *C. radicans* (Bignoniaceae), and eastern Asian and eastern North American vicariad pair. Pl. Syst. Evol. 196: 173-183.
——, and S. Shi. 1999. A phylogenetic and biogeographic study of *Hamamelis* (Hamamelidaceae), an eastern Asian and eastern North American disjunct genus. Biochemical Systematics and Ecology 27: 55-66.
——, S. Shi, R.K. Jansen, and E.A. Zimmer. 1998. Phylogeny and biogeography of *Aralia* sect. *Aralia* (Araliaceae). Am. J. Bot. 85: 866-875.
——, and T.F. Stuessy. 1993. The phylogeny and biogeography of *Nyssa* (Cornaceae). Systematic Bot. 18: 68-79.
——, and E.A. Zimmer. 1996. Phylogeny and biogeography of *Panax* L. (the ginseng genus, Araliaceae): inferences from ITS sequences of nuclear ribosomal DNA. Molecular Phylogenetics and Evolution 6: 167-177.
——, P.P. Lowry II, J.L. Walck, and K.-O. Yoo. 2002. Phylogenetic and biogeographic diversification in *Osmorhiza* (Apiaceae). Ann. Missouri Bot. Gard. 89: 414–428.
Werth, C.R. 1991. Isozyme studies on the *Dryopteris* "*spinulosa*" complex, I: The origin of the log fern *Dryopteris celsa*. Systematic Bot. 16: 446-461.
——, Linghe Zeng, and W.V. Baird. 1997. An enigmatic tetraploid *Eleusine* (Gramineae) discovered in South Carolina. ASB Bulletin 44: 97.
Wherry, E.T. 1929. Acidity relations of the Sarracenias. J. Washington Acad. Sci. 19: 379-390.
——. 1933. The Appalachian relative of *Sarracenia flava*. Bartonia 15: 7-8.
——. 1940. A novelty in the genus *Tiarella* (Saxifragaceae). Notulae Naturae (Academy of Natural Sciences of Philadelphia) 42: 1-4.
——. 1946. A key to the eastern North American lilies. Bartonia 24: 5-8.
——. 1949. Further observations on eastern Tiarellas. Bartonia 25: 70.
——. 1955. The genus *Phlox*. Morris Arboretum Monographs III. Philadelphia, PA.
——. 1972. Notes on the *Sarracenia* subspecies. Castanea 37: 146-147.
Whetstone, R.D. 1983. The Sterculiaceae in the flora of the southeastern United States. Sida 10: 15-23.
Whitcher, I.N., and Jun Wen. 2001. Phylogeny and biogeography of *Corylus* (Betulaceae): inferences from ITS sequences. Systematic Bot. 26: 283-298.
Whitehead, D.R. 1963. "Northern" elements in the Pleistocene flora of the Southeast. Ecology 44: 403-406.
Whittemore, A.T. 2003. Noteworthy collections: District of Columbia. Castanea 68: 261.
——. 2004. Sawtooth oak (*Quercus acutissima*, Fagaceae) in North America. Sida 21: 447-454.
——, and K.C. Nixon. 2005. Proposal to reject the name *Quercus prinus* (Fagaceae). Taxon 54: 213-214.
Widrlechner, M.P. 1998. The genus *Rubus* L. in Iowa. Castanea 63: 415-465.
Wieboldt, T.F. 1987. The shale barren endemic, *Arabis serotina* (Brassicaceae). Sida 12: 381-389.
——. 1992. *Cardamine micranthera* Rollins, small-anthered bittercress in Patrick County: new to the Virginia flora. Banisteria 1: 16-17.
——. 1995. A new station for smooth cliffbrake, *Pellaea glabella*, (Pteridaceae) on masonry walls. Banisteria 6: 23-24.
——, and S. Bentley. 1982. *Cheilanthes feei* new to Virginia. Amer. Fern J. 72: 76-78.
——, and J.S. Semple. 2003. *Solidago faucibus* (Asteraceae: Astereae), a new mesic forest goldenrod from the Appalachian mountains. Sida 20: 1595-1603.
——, G.P. Fleming, J.C. Ludwig, and F.C. Huber. 1998. Noteworthy collections: Virginia. Castanea 63: 82-91.
Wiegand, K.M. 1928. *Aster lateriflorus* and some of its relatives. Rhodora 30: 161-179.
Wiegleb, G., and Z. Kaplan. 1998. An account of the species of *Potamogeton* L. (Potamogetonaceae). Folia Geobotanica 33: 241-316.
Wiegrefe, S.J., K.J. Sytsma, and R.P. Guries. 1994. Phylogeny of elms (*Ulmus*, Ulmaceae): molecular evidence for a sectional classification. Systematic Bot. 19: 590-612.
Wiggins, I.L. 1932. Plants recently established in the San Francisco bay region. Torreya 32: 3-4.
Wikström, N., and P. Kenrick. 2000. Relationships of *Lycopodium* and *Lycopodiella* based on combined plastid rbcL gene and trnL intron sequence data. Systematic Bot. 25: 495-510.
——, and P. Kenrick. 2001. Evolution of Lycopodiaceae (Lycopsida): estimating divergence times from rbcL gene sequences by use of nonparametric smoothing. Molecular Phylogenetics and Evolution 19: 177-186.
Wilbur, R.L. 1963. The leguminous plants of North Carolina. North Carolina Agricultural Experiment Station Tech. Bull. No. 151, Raleigh, N.C. 294 pp.
——. 1964. A revision of the dwarf species of *Amorpha* (Leguminosae). J. Elisha Mitchell Sci. Soc. 80: 51-65.
——. 1968. The status of *Hedyotis procumbens* var. *hirsuta* (Rubiaceae). Rhodora 70: 306-311.
——. 1970a. Taxonomic and nomenclatural observations on the eastern North American genus *Asimina* (Annonaceae). J. Elisha Mitchell Sci. Soc. 86: 88-96.
——. 1970b. Infraspecific classification in the Carolina flora. Rhodora 72: 51-65.
——. 1975. A revision of the North American genus *Amorpha* (Leguminosae-Psoraleae). Rhodora 77: 337-409.
——. 1988a. What do we know about *Diamorpha smallii* (Crassulaceae), "one of the better-known taxa in the Southeastern flora?" Sida 13: 1-16.
——. 1988b. The authority for *Lepuropetalon spathulatum* (Saxifragaceae). Castanea 53: 306-308.
——. 1988c. The correct scientific name of the pale, yellow, or white gentian of the eastern United States. Sida 13: 161-165.
——. 1994. The Myricaceae of the United States and Canada: genera, subgenera, and series. Sida 16: 93-107.

——. 2002. The identity and history of *Myrica caroliniensis* (Myricaceae). Rhodora 104: 31-41.
——. 2003. What is the correct name for the bristly greenbrier? Rhodora 105: 250-259.
——. 2004. The subgeneric nomenclature for the herbaceous-stemmed *Smilax* species (Smilacaceae) of North America. Brittonia 56: 166-168.
——, and S. Bloodworth. 2004. Notes on the box huckleberry, *Gaylussacia brachycera* (Ericaceae), and its unexpected presence in North Carolina. Rhodora 106: 371-377.
——, and M.K. Whitson. 2005. The identity of Riddell's seven validly published but over-looked pteridophytic binomials. Amer. Fern J. 95: 160-169.
——, and H.S. Daoud. 1961. The genus *Lechea* (Cistaceae) in the southeastern United States. Rhodora 63: 103-118.
——, and H.S. Daoud. 1964. The genus *Helianthemum* (Cistaceae) in the southeastern United States. J. Elisha Mitchell Sci. Soc. 70: 38-43.
——, and C.H. Racine. 1971. The genus *Leiophyllum* (Ericaceae): morphological variation, distribution, and classification. J. Elisha Mitchell Sci. Soc. 87: 222-226
Wilce, J.H. 1972. Lycopod spores, I. General spore patterns and the generic segregates of *Lycopodium*. Amer. Fern J. 62: 65-79.
Williams, C. 1999. André Michaux and the discovery of *Magnolia macrophylla* in North Carolina. Castanea 64: 1-13.
Williams, J.G., and A.E. Williams. 1983. Field guide to orchids of North America from Alaska, Greenland, and the Arctic south to the Mexican border. Universe Books, New York.
Williges, K.A., and C.S. Loftin. 1995. Noteworthy plant species from the Okefenokee Swamp, Georgia. Sida 16: 775-780.
Wilson, C.A. 2004. Phylogeny of *Iris* based on chloroplast matK gene and trnK intron sequence data. Molecular Phylogenetics and Evolution 33: 402-412.
Wilson, J.S. 1965. Variation of three taxonomic complexes of the genus *Cornus* in eastern United States. Trans. Kans. Acad. Sci. 67: 747-817.
Wilson, K.A. 1960a. The genera of Hydrophyllaceae and Polemoniaceae in the southeastern United States. J. Arnold Arb. 41: 197-212.
——. 1960b. The genera of Convolvulaceae in the southeastern United States. J. Arnold Arb. 41: 298-317.
Wilson, P. 1932. *Talinum*. In P.A. Rydberg, Portulacaceae. North American Flora, volume 21, part 4. New York Botanical garden, New York, NY.
Windham, M.D. 1987. *Argyrochosma*, a new genus of Cheilanthoid ferns. Amer. Fern J. 77: 37-41.
Windler, D.R. 1974. A systematic treatment of the native unifoliolate *Crotalarias* of North America (Leguminosae). Rhodora 76: 151-204.
Winkworth, R.C., and M.J. Donoghue. 2005. *Viburnum* phylogeny based on combined molecular data: implications for taxonomy and biogeography. Amer. J. Botany 92: 653-666.
Winter, K., M.R. Schmitt, and G.E. Edwards. 1982. *Microstegium vimineum*, a shade adapted C4 grass. Plant Science Letters 24: 311-318.
Wipff, J.K. 1996a. Nomenclatural combinations in *Schizachyrium* (Poaceae: Androponeae). Phytologia 80: 35-39.
——. 1996b. Nomenclatural combinations in *Digitaria* (Poaceae: Paniceae). Phytologia 80: 348-349.
——. 1996c. Nomenclatural combinations in the *Andropogon gerardii* complex (Poaceae: Andropogoneae). Phytologia 80: 343-347.
——, and S.L. Hatch. 1994. A systematic sutudy of *Digitaria* sect. *Pennatae* (Poaceae: Paniceae) in the New World. Systematic Bot. 19: 613-627.
——, and S.D. Jones. 1995. Nomenclatural combination in Poaceae. Phytologia 78: 244-245.
——, R.I. Lonard, S.D. Jones, and S.L. Hatch. 1993. The genus *Urochloa* (Poaceae: Paniceae) in Texas, including one previously unreported species for the state. Sida 15: 405-414.
——, and B.S. Rector. 1993. *Rottboellia cochinchinensis* (Poaceae: Andropogoneae) new to Texas. Sida 15: 419-424.
Wise, D.A., and M.Y. Menzel. 1971. Genetic affinities of the North American species of *Hibiscus* sect. *Trionum*. Brittonia 23: 425-437.
Wiser, S.K. 1991. Two North Carolina locations for *Calamagrostis cainii* Hitch., previously considered endemic to Mt. LeConte, Tennessee. Castanea 56:147-149.
Wofford, B.E. 1976. The taxonomic status of *Ageratina luciae-brauniae* (Fern.) King & H. Robins. Phytologia 33: 369-371.
——. 1983. A new *Lindera* (Lauraceae) from North America. J. Arnold Arb. 64: 325-331.
——. 1989. Guide to the vascular plants of the Blue Ridge. Univ. of Georgia Press, Athens, GA.
——. 2006. A new species of *Stenanthium* (Melianthaceae) from Tennessee, U.S.A. Sida 22: 447-459.
——, and E.W. Chester. 2002. Guide to the trees, shrubs, and woody vines of Tennessee. Univ. of Tennessee Press, Knoxville.
——, and R.L. Jones. 1988. *Fimbristylis perpusilla* Harper (Cyperaceae) from the Cumberland Plateau of Tennessee. Castanea 53: 299-302.
——, and R. Kral. 1993. Checklist of the vascular plants of Tennessee. Sida, Bot. Misc. 10: 1-66.
——, J. de Paula-Souza, A.S. Weakley, and T.E. Govus. 2004. The rediscovery of the South American *Hybanthus parviflorus* (Violaceae) in North America. Sida 21: 1209-1214.
Wojciechowski, M.F., M. Lavin, and M.J. Sanderson. 2004. A phylogeny of legumes (Leguminosae) based on analysis of the plastid matK gene resolves many well-supported subclades within the family. Amer. J. Bot. 91: 1846-1862.
Wood, C.E., Jr. 1949. The American barbistyled species of *Tephrosia* (Leguminosae). Contr. Gray Herbarium 170: 193-384.

——. 1958. The genera of the woody Ranales in the southeastern United States. J. Arnold Arb. 39: 296-346.
——. 1960. The genera of Sarraceniaceae and Droseraceae in the southeastern United States. J. Arnold Arb. 41: 152-163.
——. 1961. The genera of Ericaceae in the southeastern United States. J. Arnold Arb. 42: 10-80.
——. 1966. On the identity of *Drosera brevifolia*. J. Arnold Arb. 47: 89-99.
——. 1971. The Saururaceae in the southeastern United States. J. Arnold Arb. 52: 479-485.
——. 1975. The Balsaminaceae in the southeastern United States. J. Arnold Arb. 56: 413-426.
——. 1983a. The genera of Menyanthaceae in the southeastern United States. J. Arnold Arb. 64: 431-445.
——. 1983b. The genera of Burmanniaceae in the southeastern United States. J. Arnold Arb. 64: 293-307.
——, and W.P. Adams. 1976. The genera of Guttiferae (Clusiaceae) in the southeastern United States. J. Arnold Arb. 57: 74-90.
——, and R.K. Godfrey. 1957. *Pinguicula* (Lentibulariaceae) in the southeastern United States. Rhodora 59: 217-230.
——, and R.E. Weaver, Jr. 1982. The genera of Gentianaceae in the southeastern United States. J. Arnold Arb. 63: 441-487.
Woodland, D.W. 1982. Biosystematics of the perennial North American taxa of *Urtica*. II. Taxonomy. Systematic Bot. 7: 282-290.
——, I.J. Bassett, C. Crompton, and S. Forget. 1982. Biosystematics of the perennial North American taxa of *Urtica*. I. Chromosome number, hybridization, and palynology. Systematic Bot. 7: 269-281.
Woods, K., K.W. Hilu, J.H. Wiersema, and T. Borsch. 2005a. Pattern of variation and systematics of *Nymphaea odorata*: I. Evidence from morphology and inter-simple sequence repeats (ISSRs). Systematic Botany 30: 471-480.
——, K.W. Hilu, T. Borsch, and J.H. Wiersema. 2005b. Pattern of variation and systematics of *Nymphaea odorata*: II. Sequence information from ITS and trnL-trnF. Systematic Botany 30: 481-493.
Woods, M. 2005. A revision of the North American species of *Apios* (Fabaceae). Castanea 70: 85-100.
——, A.R. Diamond, Jr., and D.N. Searcy. 2003. Noteworthy collections: Alabama. Castanea 68: 91-92.
Woodson, R.E., Jr. 1928. Studies in the Apocynaceae. III. A monograph of the genus *Amsonia*. Ann. Missouri Bot. Garden 15: 379-434.
——. 1930. Studies in the Apocynaceae. I. A critical study of the Apocynoideae (with special reference to the genus *Apocynum*). Ann. Missouri Bot. Garden 17: 1-212.
——. 1954. The North American species of *Asclepias* L. Ann. Missouri Bot. Garden 41: 1-211.
Wooten, J.W., and A.F. Clewell. 1971. *Fleischmannia* and *Conoclinium* (Compositae, Eupatorieae) in eastern North America. Rhodora 73: 566-574.
Wujek, D.E., and F.J. Menapace. 1986. Taxonomy of *Carex* section *Folliculatae* using achene morphology. Rhodora 88: 399-403.
Wunderlin, R.P. 1981. *Polygonella polygama* (Polygonaceae) in Florida. Florida Sci. 44: 78-80.
——. 1982. Guide to the vascular plants of central Florida. University Presses of Florida, Tampa, FL. 472 pp.
——, and B.F. Hansen. 2003. Guide to the vascular plants of Florida, second edition. University Press of Florida, Gainesville, FL.
——, and B.F. Hansen. 2005. Atlas of Florida vascular plants <http://www.plantatlas.usf.edu/>. [S.M. Landry and K.N. Campbell (application development), Florida Center for Community Design and Research.] Institute for Systematic Botany, University of South Florida, Tampa. Accessed 28 November 2005.
——, B.F. Hansen, and D.W. Hall. 1985. The vascular flora of central Florida: taxonomic and nomenclatural changes, additional taxa. Sida 11: 232-244.
——, B.F. Hansen, K.R. Delaney, M. Nee, and J.J. Mullahey. 1993. *Solanum viarum* and *S. tampicense* (Solanaceae): two weedy species new to Florida and the United States. Sida 15: 605-611.
——, and J.E. Poppleton. 1977. The Florida species of *Ilex* (Aquifoliaceae). Florida Sci. 40: 7-21.
Wurdack, J.J., and R. Kral. 1982. The genera of Melastomataceae in the southeastern United States. J. Arnold Arb. 63: 429-439.
Wurdack, K.J., P. Hoffmann, and M.J. Chase. 2005. Molecular phylogenetic analysis of uniovulate Euphorbiaceae (Euphorbiaceae senso stricto) using plastid rbcL and trnL-F DNA sequences. Amer. J. Bot. 92: 1397-1420.
——, P. Hoffmann, R. Samuel, A. de Bruijn, M. van der Bank, and M.W. Chase. 2004. Molecular phylogenetic analysis of of Phyllanthaceae (Phyllanthoideae pro parte, Euphorbiaceae sensu lato) using plastid rbcL DNA sequences. Amer. J. Bot. 91: 1882-1900.
Wyatt, R. 1983. Reproductive biology of the granite outcrop endemic *Sedum pusillum* (Crassulaceae). Systematic Bot. 8: 24-28.
——. 1985. *Aesculus parviflora* in South Carolina: phytogeographical implications. Bull. Torrey Bot. Club 112: 194-195.
——. 1996. More on the southward spread of common milkweed, *Asclepias syriaca* L. Bull. Torrey Bot. Club 123: 68-69.
——, S.B. Broyles, J.L. Hamrick, A. Stoneburner. 1993. Systematic relationships within *Gelsemium* (Loganiaceae): evidence from isozymes and cladistics. Systematic Bot. 18: 345-355.
——, A. Stoneburner, S.B. Broyles, and J.R. Allison. 1993. Range extension southward in the common milkweed, *Asclepias syriaca* L. Bull. Torrey Bot. Club 120: 177-179.
Wynne, F.E. 1944. *Drosera* in eastern North America. Bull. Torrey Bot. Club 71: 166-174.
Xiang, Chunsheng, and J.C. Semple. 1996. Molecular systematic study of *Aster* sensu lato and related genera (Asteraceae: Astereae) based on chloroplast DNA restriction site analyses and mainly North American taxa. Pp. 393-423 in D.J.N. Hind and H.J. Beentje (eds.) Compositae: Systematics. Proceedings of the International Compositae Conference, Kew, 1994, vol. 1.

Xiang, Q.-Y. (Jenny), D.E. Soltis, and P.S. Soltis. 1998. Phylogenetic relationships of Cornaceae and close relatives inferred from matK and rbcL sequences. Amer. J. Bot. 85: 285-297.

Xiang, Q.-Y. (Jenny), M.L. Moody, D.E. Soltis, C.z. Fan, and P.S. Soltis. 2002. Relationships within Cornales and circumscription of Cornaceae – matK and rbcL sequence data and effects of outgroups and long branches. Molecular Phylogenetics and Evolution 24: 35-57.

Xiang, Q.-Y. (Jenny), D.T. Thomas, W. Zhang, S.R. Manchester, and Z. Murrell. 2006. Species level phylogeny of the genus *Cornus* (Cornaceae) based on molecular and morphological evidence – implications for taxonomy and Tertiary intercontinental migration. Taxon 55: 9-30.

Yamashita, J., and M.N. Tamura. 2000. Molecular phylogeny of the Convallariaceae (Asparagales). In: K.L. Wilson & D. A. Morrison, eds., Monocots: systematics and evolution. CSIRO, Melbourne.

Yang, S.-X., J.-B. Yang, L.-G. Lei, D.-Z. Li, H. Yoshino, and T. Ikeda. 2004. Reassessing the relationships between *Gordonia* and *Polyspora* (Theaceae) based on the combined analyses of molecular data from the nuclear, plastid, and mitochondrial genomes. Plant Syst. Evol. 248: 45-55.

Yatabe, Y., H. Nishida, and N. Murakami. 1999. Phylogeny of Osmundaceae inferred from rbcL nucleotide sequences and comparison to the fossil evidences. J. Plant Res. 112: 397-404.

Yates, H.O. 1966a. Morphology and cytology of *Uniola* (Gramineae). Southwestern Naturalist 11: 145-189.

——. 1966b. Revision of grasses traditionally referred to *Uniola*, I. *Uniola* and *Leptochloöpsis*. Southwestern Naturalist 11: 372-394.

——. 1966c. Revision of grasses traditionally referred to *Uniola*, II. *Chasmanthium*. Southwestern Naturalist 11: 415-455.

Yelton, J.D. 1974. *Houstonia montana*, a species, not an ecological variety. Castanea 39: 149-155.

Yeo, P.F. 1984. Fruit-discharge type in *Geranium* (Geraniaceae): its use in classification and its evolutionary implications. J. Linn. Soc. Bot. 89: 1-36.

Yeou-Ruenn, Ling. 1995. The New World *Artemisia* L. In Hind, D.J.N., C. Jeffrey, and G.V. Pope (eds.). Advances in Compositae systematics, pp. 239-254. Royal Botanic Gardens, Kew.

Ying, Tsuen-Shen, Susumu Terabayashi, and D.E. Boufford. 1984. A monograph of *Diphylleia* (Berberidaceae). J. Arnold Arb. 65: 57-94.

Yuan, Y.-M., and P. Küpfer. 1995. Molecular phylogenetics of the subtribe Gentianinae (Gentianaceae) inferred from the sequences of internal transcribed spacers (ITS) of nuclear ribosomal DNA. Plant Systematics and Evolution 196: 207-226.

——, P. Küpfer, & J.J. Doyle. 1996. Infrageneric phylogeny of the genus *Gentiana* (Gentianaceae) inferred from nucleotide sequences of the internal transcribed spacers (ITS) of nuclear ribosomal DNA. Amer. J. Bot. 83: 641-652.

Yuncker, T.G. 1921. Revision of the North American and West Indian species of *Cuscuta*. Illinois Biol. Monogr. 6: 91-231.

——. 1965. *Cuscuta*. N. Am. Fl. II (4). 51 pp.

Zahner, R., and S.M. Jones. 1983. Resolving the type locality for *Shortia galacifolia* T. & G. Castanea 48: 163-173.

Zardini, E.M., H. Gu, & P.H. Raven. 1991. On the separation of two species within the *Ludwigia uruguayensis* complex (Onagraceae). Systematic Bot. 16: 242-244.

Zavada, M.S. 1983. Comparative morphology of monocot pollen and evolutionary trends of apertures and wall structures. Bot. Rev. 49: 331-379.

——, and M. Kim. 1996. Phylogenetic analysis of Ulmaceae. Plant Systematics and Evolution 200: 13-20.

——, Xue-Lin Xu, and J.M. Edwards. 1983. On the taxonomic status of *Lophiola aurea* Ker-Gawler. Rhodora 85: 73-81.

Zettler, L.W., N.S. Ahuja, and T.M. McInnis, Jr. 1996. Insect pollination of the endangered Monkey-face Orchid (*Platanthera integrilabia*) in McMinn County, Tennessee – one last glimpse of a once common spectacle. Castanea 61: 14-24.

Zhang, J. 1996. A molecular biosystematic study on North American *Solidago* and related genera (Asteraceae: Astereae) based on chloroplast DNA RFLP analysis. Ph.D. dissertation, Univ. of Waterloo, Ontario, Canada.

Zhang, W.-H., Z.-D. Chen, J.-H. Li, H.-B. Chen, and Y.-C. Tang. 2003. Phylogeny of the Dipsacales s.l. based on chloroplast trnL-F and ndhF sequences. Molecular Phylogenetics and Evolution 26: 176-189.

Zika, P.F. 2003. The native subspecies of *Juncus effusus* (Juncaceae) in western North America. Brittonia 55: 150-156.

——, and A.L. Jacobson. 2003. An overlooked hybrid Japanese knotweed (*Polygonum cuspidatum* × *sachalinense*; Polygonaceae) in North America. Rhodora 105: 143-152.

Ziman, S., C.S. Keener, Y. Kadota, E. Bulakh, O. Tsarenko, and B.E. Dutton. 2004. A taxonomic revision of *Anemone* L. subgenus *Anemonanthea* (DC.) Juz. sensu lato (Ranunculaceae). J. Japn. Bot. 79: 43-71, 196-206, 281-310.

Zohary, D., and M. Hopf. 1994. Domestication of plants in the Old World. The origin and spread of cultivated plants in west Asia, Europe, and the Nile Valley. Second edition. Clarendon Press, Oxford. 279 pp.

Zomlefer, W.B. 1996. The Trilliaceae in the southeastern United States. Harvard Papers in Botany 1: 91-120.

——. 1997a. The genera of Melanthiaceae in the southeastern United States. Harvard Papers in Botany 2: 133-177.

——. 1997b. The genera of Nartheciaceae in the southeastern United States. Harvard Papers in Botany 2: 195-211.

——. 1997c. The genera of Tofieldiaceae in the southeastern United States. Harvard Papers in Botany 2: 179-194.

——. 1998. The genera of Hemerocallidaceae in the southeastern United States. Harvard Papers in Botany 3: 113-145.

——. 1999. Advances in angiosperm systematics: examples from the Liliales and Asparagales. J. Torrey Bot. Soc. 126: 58-62.

——. 2003. Documented chromosome numbers 2003: 1. Chromosome number of *Toxicoscordion nuttallii* (Liliales: Melanthiaceae) and clarification of the genus. Sida 20: 1085-1092.

——, and W.S. Judd. 2002. Resurrection of segregates of the polyphyletic genus *Zigadenus* s.l. (Liliales: Melanthiaceae) and resulting new combinations. Novon 12: 299-308.

——, and G.L. Smith. 2002. Documented chromosome numbers 2002: 1. Chromosome number of *Stenanthium* (Liliales: Melanthiaceae) and its significance in the taxonomy of tribe Melanthieae. Sida 20: 221–226.

——, N.H. Williams, W.M. Whitten, and W.S. Judd. 2001. Generic circumscription and relationships in the tribe Melanthieae (Liliales, Melanthiaceae), with emphasis on *Zigadenus*: evidence from ITS and trnL-F sequence data. Amer. J. Bot. 88: 1657-1669.

——, W.M. Whitten, N.H. Williams, and W.S. Judd. 2003. An overview of *Veratrum* s.l. (Liliales: Melanthiaceae) and an infrageneric phylogeny based on ITS sequence data. Systematic Botany 28: 250-269.

——, W.M. Whitten, N.H. Williams, and W.S. Judd. 2006. Infrageneric phylogeny of *Schoenocaulon* (Liliales: Melanthiaceae) with clarification of cryptic species based on ITS sequence data and geographical distribution. Amer. J. Botany 93: 1178-1192.

Zona, S. 1997. The genera of Palmae (Arecaceae) in the southeastern United States. Harvard Papers in Botany 27: 1-107.

Zuloaga, F.O., O. Morrone, A.S. Vega, and L.M. Giussani. 1998. Revisión y análisis cladístico de *Steinchisma* (Poaceae: Panicoideae: Paniceae). Ann. Missouri Bot. Gard. 631-656.

INDEX of FAMILIES and GENERA