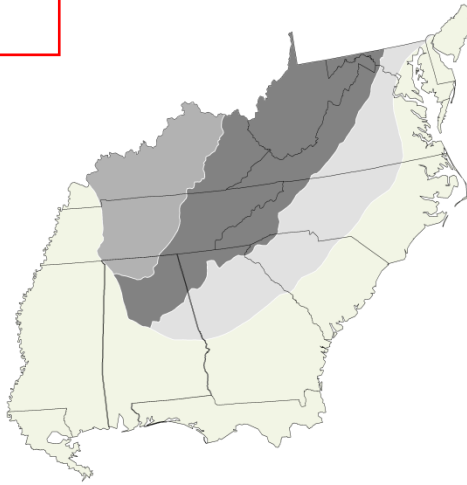


This version of the flora has maps reduced to a few pixels to reduce file size. For a full version, see <http://herbarium.unc.edu/flora.htm>

This version is also divided into parts to see if this will work better on mobile devices. This is part 3 of 4: the first half of Eudicotyledonae (Eudicots), pages 419-769

# Flora of the Southern and Mid-Atlantic States

Working Draft of 28 September 2012



by  
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## INTRODUCTION

### The Flora

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

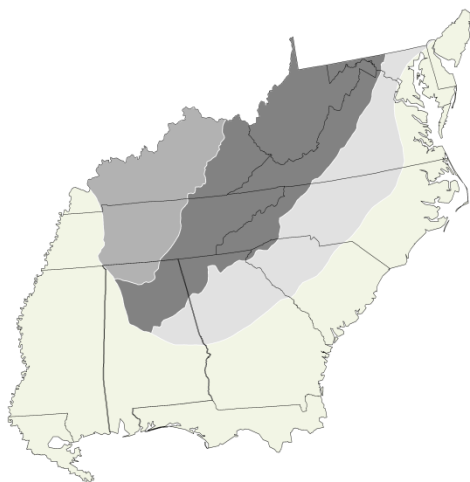
Yet, paradoxically, the societal uses and needs for the translation of taxonomic information to a useable form, such as floras, have never been greater. Globalization of human societies and economies has meant that plants are regularly introduced far away from their regions of nativity, and many become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

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

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

#### **Sources of information.**

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



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

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#### Criteria for inclusion of taxa.

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

The following categories of taxa are included and treated fully as “primary” species:

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

Additional categories of taxa are included and treated as “secondary” species:

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

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

**Taxonomic philosophy.** Taxonomic treatments generally follow recent monographic and revisionary work, but an effort has been made to provide a certain rough consistency of “splitting” vs. “lumping” across different taxonomic groups. As is generally true in recent treatments, generic and family concepts are often narrower than those used in the Radford, Ahles, and Bell (1968) Manual, based on new evidence, including (but not limited to) cladistic methods applied to morphologic and molecular data.

Ironically, these results have often resulted in a validation of earlier, narrower generic (and familial) concepts espoused by J.K. Small, P.A. Rydberg, and others (see Weakley 2005 for extensive discussion). Varieties are less frequently recognized than by Fernald (1950), though a considerable number of species and infraspecific taxa “lumped” by Radford, Ahles, and Bell (1968) are recognized (generally following more recent monographic or revisionary work). Some taxa not formally recognized are discussed and characters for their recognition provided in the text, to draw attention to putative taxa that may warrant recognition after further evaluation.

### Format and features.

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

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

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

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

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

These distribution statements are being replaced by a map.

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

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

The regions to which the eight arrows point are:



N arrow -- ne. North America (PA and n. NJ north to the Canadian maritime provinces, west through QC to se. ON and e. and s. OH);  
 NW arrow -- nw. North America (w. OH, MI, w. ON, and NU west to AK, BC, and OR, north of and including n. MO, NE, WY, ID, and OR);  
 W arrow -- w. United States (the western “Southeast” of trans-Mississippi LA, AR, s. MO, OK, and e. TX), west to sw. United States;  
 SW arrow -- Mexico, Central America, and South America;  
 S arrow -- peninsular FL;  
 SE arrow (dashed to indicate oversea) -- West Indies (including Bahamas) and Bermuda;  
 E arrow (dashed to indicate oversea) -- Asia and/or Africa;  
 NE arrow (dashed to indicate oversea) -- Europe.

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

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

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

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**Leaf duration.** The longevity of leaves is used in the keys for woody plants. **Evergreen** plants are those that retain full leaf cover through the winter, while **deciduous** plants lose their leaves at the end of the growing season (for some species, sometimes well before autumn). Some plants are also described as **tardily deciduous** or **semi-evergreen**, meaning that they drop leaves gradually into the winter, so that they are sparsely bedecked with leaves or even bare by the time of initiation of new growth in the spring. Unless you are in a position to observe the plant repeatedly through the seasons, leaf duration must be interpreted, and this can be difficult, especially on herbarium specimens. In general, evergreen leaves tend to be darker green (at least on the upper surface), often shinier, and usually thicker in texture and stiffer than deciduous leaves, but there are exceptions to all these tendencies. It can be helpful to see if the specimen or living plant has two obviously different ages of leaves present: older, tougher, more ragged and insect-eaten leaves of last year as well as younger leaves of the year. On many woody plants, it is easy to determine what is new (this year's) growth from older growth, and the younger vs. older leaves may be spatially separated on shoots of the season vs. on older wood. Note, though, that some "evergreen" shrubs or trees essentially replace all their leaves at leaf-out in the spring, all of last year's leaves being sloughed as the current year's leaves are emerging.

**Growth form or habit.** The basic growth form or habit of the plant is used extensively in the keys. **Woody** plants have substantial secondary or diameter growth of wood, which makes their stems (in general) thicker, stronger, stiffer, and tougher; they also have "perennating structures" (normally buds) borne above ground on their woody stems. **Woody plants** are further subdivided into **trees, shrubs, rosette shrubs, subshrubs, rosette subshrubs, and lianas**. **Trees** are generally more than 5 meters tall at maturity and usually have single stems which are not interconnected by subterranean rhizomes (forming clonal patches). However, some tree species are characteristically multi-trunked or tend to produce a multi-trunked growth form as a result of stump-sprouting following logging, and stressful ecological conditions (such as shallow soil over rock or maritime exposure) can produce trees shorter than 5 meters. **Shrubs** are generally less than 5 meters tall and are often multi-stemmed from the base or near it (though some shrubs are characteristically single stemmed); quite a few are also clonal and produce many above-ground stems from a series of interconnected underground rhizomes). Some species grow as both trees and shrubs or have an ambiguous form; these are generally keyed as both trees and shrubs. Note that trees have seedlings or saplings that are shorter than 5 meters tall and may be multi-stemmed in growth form, especially in burned habitats; these are not keyed as shrubs and can generally be recognized as tree seedlings or saplings by the presence in the habitat of adult trees of the same species and by their lack of sexual reproduction (flowers, fruits, cones, etc.) because of their juvenile condition. **Subshrubs** are somewhat to strongly woody, but short in stature (often < 2 dm tall); while they have woody growth, they are often mistaken for herbs. **Rosette shrubs and rosette subshrubs** have basal leaves (see **Leaf location**, below) from an above-ground but short woody stock. **Lianas** are woody vines: in essence shrubs with specialized structures for climbing, including a) adventitious roots, b) twining growth of main stems, or c) simple or branched tendrils that either twine themselves or have adhesive "holdfast" tips. Some plants are keyed both as lianas and as shrubs. **Herbaceous plants** lack substantial secondary growth of wood and are either annual or have perennating organs (such as buds) on subterranean rhizomes, crowns, caudices, or corms. Herbaceous plants are further subdivided into **herbs and herbaceous vines**. **Herbs** are erect, sprawling, or trailing, but lack specialized adaptations for climbing (twining, tendrils, etc.); whereas **herbaceous vines** have these specialized adaptations. The interpretation of "woodiness", between shrub and herb (and liana and herbaceous vine), can be difficult, especially with herbarium specimens. Some herbaceous plants can become suffrutescent: tough, fibrous, or thick in ways that mimic or approach woodiness. The presence of vegetative buds (not flower buds) in the axils of leaves on the aerial stems clearly indicates a woody plant. Some plants which are ambiguously woody and likely to be mistaken one way or the other are keyed both ways.

**Leaf disposition.** The disposition of the leaves, whether basal or cauline, is used as a distinction to separate some of the major subkeys (in the woody plants separating Keys A7, B1, and E from the others, and in the herbaceous plants separating Key N from Keys O, P, Q, R, and S), as well as in a few other places. **Basal leaves** arise from underground buds (on rhizomes, crowns, caudices, or corms) or from the very base (ground level) of an aerial stem. **Stem leaves** (cauline leaves) are those which arise from above-ground (aerial) stems of the plant. Many plants, however, have **basally disposed** leaves, where the largest leaves are basal (and usually persistent through the growing season as a "basal rosette"), but smaller stem leaves extend up the above-ground stem. This can be ambiguous, though, and the persistence of basal leaves can be affected by season and conditions. While many taxa are keyed both in Key N and in one or more of Keys O, P, Q, R, and S), if this choice seems at all ambiguous and keying one way does not work well, the other choice should be tried.

**Leaf type.** Leaves are described as either **simple** or **compound**. Simple leaves are not divided into separate leaflets; the leaf tissue is continuous with all other leaf tissue of the leaf. By contrast, compound leaves are separated into 2 or more separate leaflets, connected only by various stalks (petiolules, rachises, rachillas) that lack leaf tissue. Simple leaves may be **unlobed, pinnately lobed, or palmately lobed**, and the lobes may be variously shallow or cut nearly to the midvein or base of the leaf. Perhaps the easiest way to determine whether leaf lobing is pinnate or palmate is to look at the major veins in the leaf. Pinnately lobed leaves have lobes arrayed in a line along either side of the midvein, and the lobes are associated with the major secondary veins of the (pinnately veined) leaf. The lobes of palmately lobed leaves are associated with the 3 or more palmate veins that arise together from the base of the leaf blade (note that the lobes of palmately lobed leaves are sometimes themselves sublobed, and that these sublobes are often pinnately arrayed: the leaf is still considered palmately lobed). **Compound leaves** are further classified by the number of leaflets, whether the leaflets are arrayed in a pinnate or palmate manner, and whether there is a single order of division or 2 or more orders of division. **Palmately compound** leaves have all leaflets attached at a single point, at the end of the petiole. Palmately compound leaves in our flora have from 3 to ca. 21 leaflets and are never further compound beyond the single order of division (in other words, the leaflets are not themselves compound). **Pinnately compound** leaves have leaflets attached to one or more axes (rachises, rachillas) that extend beyond the end of the petiole, and many taxa have 2 or more orders of division. Bifoliate (**2-foliate**) leaves are very rare in our flora. Trifoliate leaves (**3-foliate**, and sometimes called "ternate") are very common in our flora and can be either **palmately 3-foliate** or (especially in the Fabaceae) **pinnately 3-foliate**. Pinnately compound leaves have a short rachis extending past the end of the petiole (and the point of attachment of the 2 lateral leaflets via their petiolules), with the terminal leaflet attached at the end of this rachis via its petiolule; the joint between the rachis and the terminal petiolule is usually obvious because of a change in diameter, color, vestiture, and/or texture. The distinction between palmately 3-foliate and pinnately 3-foliate leaves is not used in the [Key to Genera and Families](#) but is important in the some other keys, especially the key to genera of the Fabaceae. Pinnately compound leaves with 4 or more leaflets are very common in our flora, especially in some families. **Even-pinnately compound** leaves (the less common situation) have an even number of leaflets, often paired along the rachis or rachillas, and lack a terminal leaflet at the tip of the rachis or rachilla and extending along its axis; these taxa are concentrated in the Fabaceae and a few other smaller families. **Odd-pinnately compound** leaves have a terminal leaflet and therefore usually an odd number of leaflets. Odd-pinnately compound leaves with 2 or more orders of division are typically described in the keys as **complexly compound**. Other floras variously describe leaves of this sort as 2-pinnate, 3-pinnate, decomposed, biternate, or other terms, but these have largely been avoided in the keys in this work because the "compoundness" is often complex, mixed between pinnate and ternate, and therefore difficult to describe accurately with such terminology. For instance, many members of the Apiaceae have complexly compound leaves, which are initially 3-forked (ternate), each of these forks may then be 3-forked again (though with the lateral forks supporting fewer or smaller leaflets than the terminal one), and these 3-order divisions are then often pinnately compound. Note that **deeply lobed leaves** can sometimes be easily mistaken for **compound leaves**. Compound leaves have no leaf tissue connecting the individual leaflets, whereas lobed leaves have at

least a narrow flange of leaf tissue along the rachis or rachilla that connects the leaf tissue of one lobe with the leaf tissue of the next. In some taxa, this is difficult to interpret, and these have generally been keyed both ways.

**Lobes and teeth.** The presence, absence, number, and shape of **lobes** or **teeth** along the margin of the leaf are very useful vegetative characters. The term “tooth” or “teeth” is here used in a broad sense to include any of the small marginal projections covered under the terms dentate, denticulate, serrate, serrulate, crenate, crenulate, spinose, spinulose, doubly serrate (biserrate), or erose. In other words, teeth can be rounded, pointed, or spine-tipped, and of various shapes and sizes. The term “tooth” or “teeth” does not include undulations out of the main plane of the leaf, hairs, or epidermal projections in the plane of the leaf margin, described by terms such as ciliate, ciliolate, or scabrous-margined. Teeth are often regular in size and position but in some species are irregular in form, shape, and even presence (these species are keyed in several places). The term “lobe” or “lobes” is also used in a broad sense to mean a larger feature of the leaf margin. Relative to teeth, lobes are typically both actually larger and relatively larger in relation to the size of the leaf, and also more widely spaced, often with a sinus (the depression between 2 lobes) extending  $1/10^{\text{th}}$  to  $9/10^{\text{th}}$  of the way from the outer leaf outline to the midrib. Lobes are typically spaced 1 cm or more apart, though the term is also applied to more closely spaced features with relatively deep sinuses (at least  $3/10^{\text{th}}$  of the way to the midrib), especially in pteridophytes and in flowering plants with small leaves. Teeth are truly marginal, typically meeting 2 or 3 of the following 3 conditions: spaced  $< 1$  cm apart, the sinuses between them usually extending  $< 1/10^{\text{th}}$  of the way to the midrib, and the tooth itself (measured on its shorter side if it not equilateral)  $< 4$  mm long. Occasionally we have also used the number of “**points**” as a character in the keys. This is the total number of lobe points and tooth points along one side of the leaf (base to apex on one side of the midvein). Note that some leaves are unlobed except for the presence of 2 basal lobes (one on either side, often described as cordate, sagittate, auriculate, or hastate depending on the shape, size, and orientation of the lobes); this situation is not keyed in the “lobed” sections of the key (as noted in the pertinent couplets).

**Learning families.** Learning plant families, especially those that are particularly important in Virginia’s flora or that are especially distinctive, is an extremely useful aid in identifying plants. While “learning” a family often starts with understanding its distinctive characteristics, often including some rather technical characteristics, with experience it becomes a more “gestalt” sense that, for instance, “that plant just looks like Asteraceae”, even if the features that would allow it to be keyed are not present. Knowing plant families often allows one to bypass the Key to Genera and Families entirely or facilitates decisions at particular couplets in it. A few of the families that are particularly useful to learn are Apiaceae, Asteraceae, Brassicaceae, Cyperaceae, Euphorbiaceae, Fabaceae, Juncaceae, Lamiaceae, Poaceae, Ranunculaceae, Rosaceae, and Rubiaceae.

**Sluething characters.** Some characters used in the key may seem initially impossible to find on your plant or specimen, but may actually be findable or deducible. Old fruits can sometimes be found on woody species, or on the ground under the tree or shrub. Old flower stalks (from the previous year) are sometimes present in perennial herbs, allowing the size of the plant and the type of inflorescence to be assessed. The calyx is often persistent after the petals have fallen, and calyx merosity (number in the whorl) and symmetry is usually the same as the merosity and symmetry of the corolla (though not always). Various fruit characters can sometimes be deduced from the flowers, and various flower characters can be deduced from the fruits. When capsules are immature (sometimes even in the stage of an ovary while in flower), dehiscence can often be deduced by the presence of visible lines on the fruit (sutures, visible at  $10\times$ ). The number of carpels and locules can usually be determined from either the ovary or the immature or mature fruit, by making a careful  $\times$ -section. Stamens are sometimes present as shriveled remnants on fruits, allowing the number of stamens to be determined. Hair types (e.g., simple vs. stellate) may seem impossible if the leaf appears superficially glabrous, but hairs often remain to the end of the season on even apparently glabrous leaves in protected places, especially on the lower surface in the main vein axils. The bulbous or papillose bases of some hairs remain after the rest of the hair has worn off. Hairs with bulbous or papillate bases. Deducing the presence of stipules is often possible by looking for scars (usually linear) that extend beyond the leaf scar proper.

**Winter identification.** Note that no attempt has been made to make the key work consistently for plants in winter condition. Woody plants with evergreen foliage will generally be “keyable” in Keys B, D, E, F, G, H, I, and J, but deciduous species will not; there are various winter twig and bud keys available in print and online for the winter identification of trees and shrubs. Herbaceous plants with winter rosettes or otherwise green winter foliage will generally be found in Key N, but an impractical number of ambiguous or “dead end” leads will be encountered.

**Botanical terminology.** While the use of specialized terminology and jargon has been reduced, some of these terms are useful and unavoidable, and provide a precise meaning without a lengthy explanation. Terms can be found in the glossary, and there are print and online resources that provide definitions and often illustrations as well. Particularly recommended at the time of writing is Harris and Harris (2001), Plant Identification Terminology: an Illustrated Glossary.

**Characteristics of major groups of vascular plants.** At various points in the key, a kind of shorthand is used in key leads to indicate the main evolutionary group involved: Lycophytes, Pteridophytes, Gymnosperms, Basal Angiosperms, Eudicots, and Monocots. This shorthand is not placed in every couplet in which it could be, but is used where it is likely to be helpful to the user. While the readily visible characteristics of these groups have many exceptions, the following table} will aid in their recognition (note that this table is pragmatically based only on the characteristics of those taxa in our flora).

## SECTION 6: EUDICOTYLEDONAE (EUDICOTS)

## 107. CERATOPHYLLACEAE S.F. Gray 1821 (Hornwort Family) [in CERATOPHYLLALES]

A peculiar and apparently very primitive family, of a single genus and about 6 species, aquatic herbs, of cosmopolitan distribution. References: Les in FNA (1997); Les (1985, 1986, 1988a, 1988b, 1988c, 1989)=Z; Les in Kubitzki, Rohwer, & Bittrich (1993). Key adapted from Les.

*Ceratophyllum* Linnaeus 1753 (Hornwort, Coontail)

A genus of about 6 species, aquatic herbs, of cosmopolitan distribution. References: Les in FNA (1997); Les (1985, 1986, 1988a, 1988b, 1988c, 1989)=Z; Les in Kubitzki, Rohwer, & Bittrich (1993). Key adapted from Les.

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

- 1 Largest leaves forking 1-2× (count branching-nodes from the base of the leaf to the tip of the most-forked division); leaves coarse-textured, stiff, the marginal denticles usually strongly raised on a broad base of green tissue; achene margin wingless, with 2 basal spines or tubercles (these rarely absent), otherwise entire (lacking marginal spines).....*C. demersum*
- 1 Largest leaves forking 3-4× (count branching nodes from the base of the leaf to the tip of the most-forked division); leaves fine-textured, flaccid, the marginal denticles not raised on a broad base of green tissue, sometimes obscure or obsolete; achene margin winged, with 2-20 lateral spines 0.1-6.5 mm long (occasionally spineless), with 2 basal spines (these rarely absent).
  - 2 Achene body (excluding the spines) 3-4.5 mm long; first leaves of the plumule simple; [Coastal Plain, NC southward].....*C. australe*
  - 2 Achene body (excluding the spines) 4.5-6 mm long; first leaves of the plumule forked; [widespread]..... *C. echinatum*

*Ceratophyllum australe* Grisebach. Ponds, pools, slow-moving streams. May-September. Se. NC south to s. FL and Panhandle FL, and in the West Indies; also in s. Mexico, Central America, n. South America, with apparent disjunctions in c. South America and the Galapagos Islands. Les treats this taxon as a subspecies of the Old World *C. muricatum*. Because of their allopatric distribution on separate continents and relative morphological distinctiveness (as shown by Les), I prefer to recognize them at the species level. [= *Ceratophyllum muricatum* Chamisso ssp. *australe* (Grisebach) Les – FNA, K, Z; < *C. muricatum* Chamisso – GW (also see *C. echinatum*)]

*Ceratophyllum demersum* Linnaeus, Coontail. Ponds, pools, slow-moving streams. May-September. NL (Newfoundland) west to AK, south to s. FL, TX, CA, and south through the West Indies and Central America to South America. [= RAB, C, F, FNA, G, GW, K, Pa, W, S, Z]

*Ceratophyllum echinatum* A. Gray in Torrey & A. Gray. Ponds, pools, slow-moving streams. May-September. NL (Newfoundland) west to ON and n. MN, south to c. peninsular FL and e. TX; also in BC, WA, and OR. [= RAB, C, F, FNA, G, K, Pa, S, Z; < *C. muricatum* Chamisso – GW (also see *C. australe*); = *C. submersum* Linnaeus var. *echinatum* (A. Gray) Wilmot-Dear]

## 109a. FUMARIACEAE A.P. de Candolle 1821 (Fumitory Family) [in RANUNCULALES]

This family includes 15-20 genera and 500-600 species, herbs, mostly north temperate. The Fumariaceae are often now subsumed into the Papaveraceae (Lidén 1981, 1986; Lidén et al. 1997; Judd, Sanders, & Donoghue 1994), but the option remains to recognize the two monophyletic clades as families: Papaveraceae s.s. and Fumariaceae (including *Pteridophyllum* and *Hypocoum*). References: Wang et al. (2009); Stern in FNA (1997); Hill (1992); Lidén (1986, 1981); Lidén et al. (1997); Lidén in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Corolla with the 2 outer petals spurred or saccate at their bases; [tribe *Corydaleae*].
  - 2 Ultimate leaf segments 1-4 mm wide; plants with basal leaves only.....*Dicentra*
  - 2 Ultimate leaf segments 5-70 mm wide; plants of reproductive age with cauline leaves.
    - 3 Ultimate leaf segments 5-10 mm wide; herbaceous vine with cauline leaves (acaulescent in its first year, and appearing to be an herb); [native].....*Adlumia*
    - 3 Ultimate leaf segments 20-70 mm wide; herb with basal and cauline leaves; [alien, cultivated and rarely persistent or naturalized].....  
.....[*Lamprocapnos*]
- 1 Corolla with only 1 outer petal spurred or saccate at its base.
  - 4 Ovary and fruit subglobose, with 1 seed; [tribe *Fumarieae*].....*Fumaria*
  - 4 Ovary and fruit elongate, with several to many seeds; [tribe *Corydaleae*].
    - 5 Flowers pink, the petals tipped with yellow; biennial; stem erect, 3-8 (-10) dm tall; capsules erect, 25-35 mm long.....*Capnoides*
    - 5 Flowers yellow; annual; stem erect, decumbent, or prostrate, 1-3 (-4) dm tall; capsules erect, ascending, divergent, or pendent, 10-20 (-25) mm long.....*Corydalis*

*Adlumia* Rafinesque ex A.P. de Candolle 1821 (Climbing Fumitory)

A genus of 2 species, herbs, of e. North America, Korea, and Manchuria. References: Boufford in FNA (1997); Lidén in Kubitzki, Rohwer, & Bittrich (1993).

*Adlumia fungosa* (Aiton) Greene ex Britton, Sterns, & Poggenburg, Alleghany-vine, Cliff-Harlequin, Climbing Fumitory. Cliffs, talus, rocky slopes, rich stream-bottom forests, cool rocky forests. June-September. QC west to WI and MN, south to n. DE, w. NC, TN, and IN. [= RAB, C, F, FNA, G, K, Pa, S, W]

*Capnoides* P. Miller 1754 (Rock Harlequin)

The genus is monotypic, an herb, of n. North America. Recent studies have emphasized its distinction from *Corydalis*, and its closer relationship to *Adlumia* and *Dicentra* than to *Corydalis* (Lidén 1981, 1986; Lidén et al. 1997). References: Stern in FNA (1997); Ownbey (1947)=Z; Lidén (1981, 1986); Lidén et al. (1997); Lidén in Kubitzki, Rohwer, & Bittrich (1993).

*Capnoides sempervirens* (Linnaeus) Borkhausen, Rock Harlequin, Tall Corydalis, Pink Corydalis, Pale Corydalis. Rock outcrops, especially granitic exfoliation domes, but also quartzite, greenstone, and sandstone, up to at least 1700 m in elevation. April-August; May-July. NL (Newfoundland) west to AK, south to NJ, PA, in and near the mountains to ne. GA, n. OH, n. IN, MN, MT, and BC. [= S; = *Corydalis sempervirens* (Linnaeus) Persoon – RAB, C, F, FNA, G, K, W, WV, Z]



*Corydalis* A.P. de Candolle 1805 (Corydalis)

A genus of about 400 species, herbs, of temperate regions of the Northern Hemisphere (especially China and the Himalayas). References: Stern in FNA (1997); Ownbey (1947)=Z; Lidén in Kubitzki, Rohwer, & Bittrich (1993). [also see *Capnoides*]

- 1 Fruits pendent or divergent; spurred petal 7-9 mm long; pedicels 6-15 mm long; seeds 2-2.5 mm wide, with a narrow, acute ring-margin ..... *C. flavula*
- 1 Fruits erect or ascending; spurred petal 10-15 mm long; pedicels 1-6 mm long (5-10 mm long in *C. aurea*); seeds 1.0-2.0 mm wide, without a narrow, acute ring-margin.
  - 2 Capsules mostly 15-20 mm long, ca. 1.0 mm in diameter, strongly constricted between the seeds at maturity; inflorescence long, usually far exceeding the poorly-developed upper leaves; ultimate leaf segments 0.5-1.5 (-3.0) mm wide; seeds < 1.5 mm wide; plant slightly to strongly glaucous; [of sandy soils of the outer Coastal Plain] ..... *C. halei*
  - 2 Capsules mostly 10-15 mm long, 1.5-2.0 mm in diameter, slightly or not at all constricted between the seeds at maturity; inflorescence relatively short, barely (if at all) overtopping the upper leaves; ultimate leaf segments 1.0-2.0 (-4.0) mm wide; seeds > 1.5 mm wide; plant green to slightly glaucous; [of circumneutral rock outcrops of the upper Piedmont and Mountains] ..... *C. micrantha*

*Corydalis aurea* Willdenow. Reported as occurring as far south and east as MD, WV (?), and PA (Kartesz 1999, Kartesz 2010). No definite documentation is known for this species in our area. [= G, K, Pa; = *Corydalis aurea* var. *aurea* – C, F; = *Corydalis aurea* ssp. *aurea* – FNA; = *Capnoides aureum* (Willdenow) Kuntze – S] {not keyed; not mapped; rejected as a component of our flora}

*Corydalis crystallina* Engelm. A species of the sc. United States, *C. crystallina* was collected in 1930 from an oat field at the Georgia Experiment Station in Laurens County. Presumably it was a one-time contaminant in seed and is a waif. Not considered a component of the flora of our area. [= FNA, F, G, K] {not keyed; not mapped; rejected as a component of our flora}

*Corydalis flavula* (Rafinesque) A.P. de Candolle, Short-spurred Corydalis. Rich moist forests, especially alluvial forests, glades and outcrops over mafic rocks (such as greenstone). March-April; May-June. S. CT, NY, and s. ON west to SD, south to NC, AL, LA, and OK. [= RAB, C, F, FNA, G, K, Pa, W, WV, Z; = *Capnoides flavulum* (Rafinesque) Kuntze – S]

*Corydalis halei* (Small) Fernald & Schubert, Southern Corydalis. Sandy roadsides and disturbed areas. March-April; May-June. E. NC south to FL, west to TX, and inland north to MO and OK. F and S recognized it as a species distinct from *C. micrantha*; Ownbey reduced it to a subspecies, citing inadequate morphological differences and some alleged intermediates in OK and MO. The two taxa appear readily separable on morphological, ecological, and geographical grounds; species status seems warranted. [= F; = *Corydalis micrantha* (Engelmann ex A. Gray) A. Gray ssp. *australis* (Chapman) G.B. Ownbey – RAB, FNA, K, Z; = *Corydalis micrantha* (Engelmann ex A. Gray) A. Gray var. *australis* (Chapman) Shinnars – C; < *Corydalis micrantha* – G; = *Capnoides halei* Small – S]

*Corydalis micrantha* (Engelmann ex A. Gray) A. Gray, Slender Corydalis. Circumneutral rock outcrops and adjacent glades and woodlands. April; June. *C. micrantha* (in the narrow sense) is primarily midwestern, ranging from IL, WI, MN, and SD south to AR, TX, and OK, with disjunct outliers in e. TN and w. NC. Ownbey (1947) had no records of Southern Appalachian populations of *C. micrantha*, and considered “ssp. *micrantha*” to range no farther east than IL and MO; RAB included montane populations in ssp. *australis*, stating “this is the only [subspecies] in our range.” Morphologically, however, these populations closely resemble *C. micrantha*; their association in the Brushy Mountains with other species disjunct from western or prairie ranges (*Anemone berlandieri*, *Arabis pycnocarpa*, *Pellaea wrightiana*) provides phytogeographic corroboration. [= F; = *Corydalis micrantha* ssp. *micrantha* – FNA, K, Z; = *Corydalis micrantha* var. *micrantha* – C; < *Corydalis micrantha* – G; = *Capnoides micranthum* (Engelmann ex A. Gray) Britton – S]

*Dicentra* Bernhardi 1833

A genus of about 12 species, perennial herbs, with a relictual north temperate distribution: e. North America, w. North America, and e. Asia. References: Stern in FNA (1997); Stern (1961)=Z; Lidén in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Flowers pink, in panicles; rootstock lacking bulblets; ultimate leaf segments generally 3-parted, each part 2-5 mm wide at base, gradually tapering to the tip.
- 2 Reflexed portions of the outer sepals 4-8 mm long; [native and cultivated] .....*D. eximia*
- 2 Reflexed portions of the outer sepals 2-5 mm long; [cultivated] ..... [*D. formosa* ssp. *formosa*]
- 1 Flowers white or yellowish (very rarely pinkish), in racemes; rootstock with bulblets; ultimate leaf segments not generally 3-parted, about 1 (-3) mm wide, with parallel sides for most of their length, then tapering suddenly to the tip.
- 3 Spurs of the corolla rounded, incurved, 2-5 mm long; bulblets yellow, spherical .....*D. canadensis*
- 3 Spurs of the corolla elongate, divergent, 7-9 mm long; bulblets white to pink, tear-shaped (narrowed upward).....*D. cucullaria*

*Dicentra canadensis* (Goldie) Walpers, Squirrel Corn. Rich, moist forests, especially rich cove forests in the mountains. April-May; June. S. ME west to s. MN, south to w. NC, n. GA, TN, and MO. [= RAB, C, F, FNA, G, K, Pa, W, WV; = *Bicuculla canadensis* (Goldie) Millspaugh – S]

*Dicentra cucullaria* (Linnaeus) Bernhardi, Dutchman's Britches. Rich, moist forests, especially rich cove forests in the mountains. March-May; May-June. NS west to n. MN, south to GA, AR, and KS; disjunct in WA, OR, and ID. [= RAB, C, F, FNA, G, K, Pa, W, WV; = *Bicuculla cucullaria* (Linnaeus) Millspaugh – S]

*Dicentra eximia* (Ker-Gawler) Torrey, Wild Bleeding Heart. Cliffs, talus slopes, rocky slopes, rock outcrops, shale slopes. April-July; July-August. An Appalachian endemic: NY and NJ south to NC and TN. [= RAB, C, F, FNA, G, K, Pa, W, WV; = *Bicuculla eximia* (Ker-Gawler) Millspaugh – S]

\* *Dicentra formosa* (Haworth) Walpers ssp. *formosa*, native from s. BC south to c. CA, is frequently cultivated and resembles our native *D. eximia*. A variety of cultivars, some apparently derived from hybrids between the two subspecies, make identification uncertain in some cases. [= FNA, Z] {not mapped; rejected as a component of our flora}



*Fumaria* Linnaeus 1753 (Fumitory)

A genus of about 50 species, annual herbs, primarily Eurasian. References: Boufford in FNA (1997); Stace (2010)=Z; Lidén in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Corolla (9-) 10-14 mm long, creamy white (to reddish); fruiting pedicels deflexed downward; fruit smooth when dry .....*F. capreolata*
- 1 Corolla 4-8 (-9) mm long, white to pink or purple; fruiting pedicels ascending; fruit rugose or verrucose when dry.
- 2 Corolla (6-) 7-8 (-9) mm long, dark pink to purple; raceme borne on a peduncle .....*F. officinalis*
- 2 Corolla 4-6 mm long, white (rarely very pale pink); raceme sessile or subsessile .....*F. parviflora*

\* *Fumaria capreolata* Linnaeus, White Ramping-fumitory. Cp (FL): ditches, fields, disturbed areas; rare, native of sw. Europe. [= FNA, WH, Z]

\* *Fumaria officinalis* Linnaeus, Fumitory, Earthsmoke. Cp (DE, GA, NC, SC, VA), Pd (NC, SC, VA), Mt (TN, VA, WV): sandy fields, disturbed places, escaped from gardens; uncommon (rare in GA, NC, SC, TN, VA, and WV), native of Europe. March-September. [= RAB, C, F, FNA, G, K, Pa, S, WH, WV; > *F. officinalis* ssp. *officinalis* – K, Z; > *F. officinalis* ssp. *wirtgenii* (W.D.J. Koch) Arcangeli – K, Z]

\* *Fumaria parviflora* Lamarck, Smallflower Fumitory, Fineleaf Fumitory. Cp (FL, GA): abandoned woodlots, other disturbed areas; rare, native of Eurasia. Reported for Lowndes County, GA (Carter, Baker, & Morris 2009). [= FNA, K, WH, Z]

*Lamprocapnos* Endlicher 1850 (Asian Bleeding Heart)

A monotypic genus, a perennial herb of e. Asia. References: Lidén et al. (1997); Stern (1961)=Z.

**Identification notes:** *Lamprocapnos* differs from other "bleeding hearts" (the native *Dicentra eximia* and the western American *Dicentra formosa* ssp. *formosa*) in its leafy stem, the inflorescence borne terminally or opposite a leaf, the leaves much less finely divided, and the flowers about as broad as long (vs. much longer than broad in *Dicentra eximia* and *Dicentra formosa*).

\* *Lamprocapnos spectabilis* (Linnaeus) Fukuhara, Bleeding Heart, native to e. Siberia, Korea, and n. China, is frequently cultivated and may persist or weakly naturalize. It is reported for KY (Kartesz 1999, Kartesz 2010) and various ne. United States. [= K; = *Dicentra spectabilis* (Linnaeus) Lemaire – Z] {not mapped; rejected as a component of our flora}

A family of 23 genera and about 230 species, mainly herbs (some shrubs and small trees), largely north temperate in distribution. References: Kiger in FNA (1997); Wang et al. (2009); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Flowering stem scapose, leaves basal only; petals 8-16, white; [subfamily *Chelidonioideae*].....**5. *Sanguinaria***
- 1 Flowering stem with leaves at least low on the stem; petals 0-6, purple, red, orange-red, orange, yellow, cream.
  - 2 Inflorescence a panicle; petals absent; [subfamily *Chelidonioideae*].....**4. *Macleaya***
  - 2 Inflorescence not a panicle; petals present, 4-6.
    - 3 Leaves and fruits prickly; [subfamily *Papaveroideae*].....**1. *Argemone***
    - 3 Leaves and fruits not prickly.
      - 4 Sepals connate; leaves ternately dissected into linear segments; sap watery; [subfamily *Eschscholzioideae*] ..... **8. *Eschscholzia***
      - 4 Sepals separate; leaves pinnately lobed; sap yellow, orange, or milky.
        - 5 Flowers several in a terminal umbel; [subfamily *Chelidonioideae*].
          - 6 Stigma lobes, placentae, and capsule valves 2; style very short; fruit linear, glabrous..... **6. *Chelidonium***
          - 6 Stigma lobes, placentae, and capsule valves (2-) 3-4; style ca. 1 cm long; fruit ellipsoid, pubescent with long white hairs ..... **7. *Stylophorum***
- 5 Flowers solitary, terminal.
  - 7 Fruit 15-30 cm long, 2-locular (the partitions complete), dehiscent by elongate valves; stigmatic lobes 2; [subfamily *Chelidonioideae*] ..... **3. *Glaucium***
  - 7 Fruit 1-8 cm long, 4-20-locular (the partitions incomplete), dehiscent by small valves beneath the stigmatic disc; stigmatic lobes 4-20; [subfamily *Papaveroideae*] ..... **2. *Papaver***

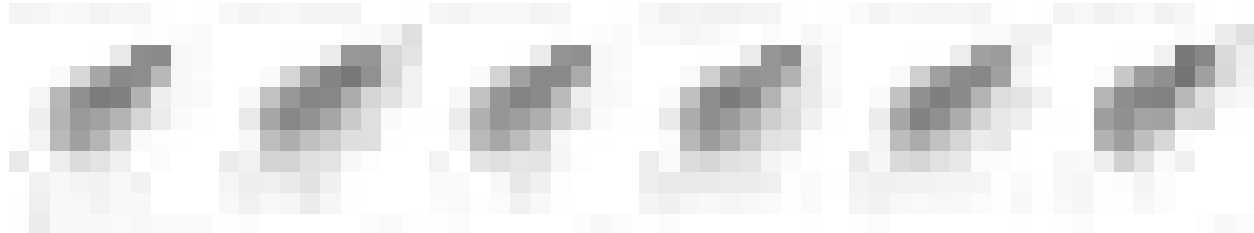
**1. *Argemone* Linnaeus 1753 (Prickly-poppy)**

A genus of about 32 species, annual and perennial herbs, of North America, West Indies, Central America, South America, and Hawaii. References: Ownbey in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Flowers white to pink; latex white or nearly clear .....***A. albiflora* ssp. *albiflora***
- 1 Flowers yellow to cream; latex yellow .....***A. mexicana***

***Argemone albiflora* Hornemann var. *albiflora***, Carolina-poppy, White Prickly-poppy. Sandy roadsides and disturbed areas. April-May (sporadically later). This species is apparently native to the southeastern United States, presumably including portions of our area, south to s. FL, but the native range is unclear. Var. *texana* (G.B. Ownbey) Shinnars occurs in TX, AR, and LA. The species' weediness suggests, however, that it may be merely adventive in our area. [= *A. albiflora* ssp. *albiflora* – FNA, K; < *A. albiflora* – RAB, C, WH; < *A. alba* Lestib. f. – G, S, misapplied]

\* ***Argemone mexicana* Linnaeus**, Mexican-poppy, Mexican Prickly-poppy. Sandy roadsides and disturbed areas; native of peninsular FL, West Indies, and maybe Mexico and Central America. April-May (sporadically later). [= RAB, C, FNA, G, K, Pa, WH]



**2. *Papaver* Linnaeus 1753 (Poppy)**

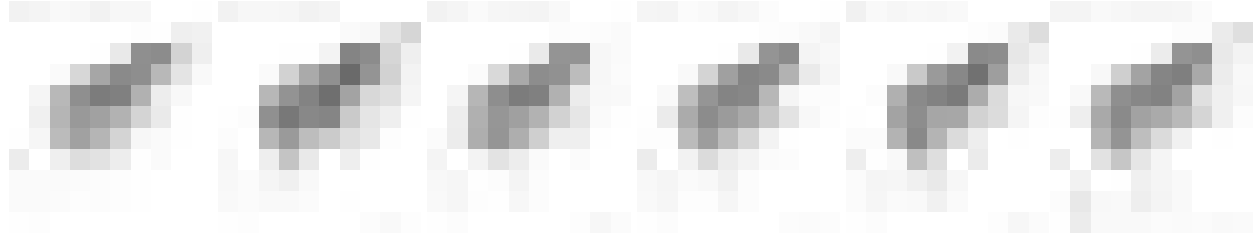
A genus of about 80 species, annual and perennial herbs, of temperate Northern Hemisphere. References: Kiger & Murray in FNA (1997); Kiger (1975)=Z; Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** Other species are cultivated and may be found in our area persistent, escaped, as waifs, or as naturalized populations.

- 1 Upper cauline leaves clasping the stem; [section *Papaver*] ..... ***P. somniferum***
- 1 Upper cauline leaves not clasping the stem.
  - 2 Ovaries and capsules sparsely to densely setose-pubescent; [section *Argemonidium*].
    - 3 Capsules oblong to clavate, sparsely setose with weak hairs ..... ***P. argemone***
    - 3 Capsules obovoid-ellipsoid to subglobose, densely setose with strong hairs ..... ***P. hybridum***
  - 2 Ovaries and capsules glabrous.
    - 4 Flowers > 10 cm across; perennial; [section *Macrantha*]..... ***P. orientale***
    - 4 Flowers < 10 cm across; annual; [section *Rhoeadium*].
      - 5 Capsule 2-3× as long as broad; stigmatic lobes 5-9 ..... ***P. dubium***
      - 5 Capsule 1-1.5× as long as broad; stigmatic lobes 8-15 ..... ***P. rhoeas***



- \* *Papaver argemone* Linnaeus, Prickly Poppy. Disturbed areas; native of Europe and sw. Asia. April-May. Reported from PA (Rhoads & Black 2007, Kiger & Murray in FNA 1997), VA (probably only from cultivation), and MD (Kiger & Murray in FNA 1997). [= FNA, Pa]
- \* *Papaver dubium* Linnaeus, Long-headed Poppy. Roadsides, fields, disturbed areas; native of Europe. April-July. [= RAB, C, F, FNA, G, K, Pa, S, W, WV, Z]
- \* *Papaver hybridum* Linnaeus, Rough Poppy. Disturbed areas; native of Eurasia. May-June. [= RAB, FNA, K, Z]
- \* *Papaver orientale* Linnaeus, Oriental Poppy. Disturbed areas; native of sw. Asia. May-June. [= FNA, G, K, Pa, Z]
- \* *Papaver rhoeas* Linnaeus, Corn Poppy, Field Poppy, Red Poppy, Shirley Poppy, Common Poppy. Disturbed areas; native of Eurasia and n. Africa. May-September. [= RAB, C, F, FNA, G, K, Pa, WH, WV, Z]
- \* *Papaver somniferum* Linnaeus, Opium Poppy, Common Poppy. Disturbed areas; native of Mediterranean Europe and Asia Minor. May-July. [= RAB, C, F, FNA, G, K, Pa, S, WH, Z]



### 3. *Glaucium* P. Miller 1754 (Horned-poppy)

A genus of about 23 species, annual and perennial herbs, of temperate Europe and w. Asia. References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993). Key based on FNA.

- 1 Basal leaves few, glabrate to moderately pubescent; blades of distal leaves not distinctly clasping stem; petals orange to reddish orange, usually with blackish basal spot; capsules straight to slightly curved, pubescent or glabrate.....*G. corniculatum*
- 1 Basal leaves numerous, densely pubescent; distal blades of distal leaves distinctly clasping stem; petals yellow or orange-yellow, sometimes with reddish to violet basal spot; capsules mostly distinctly curved, glabrous, tuberculate, or scabrous.....*G. flavum*

- \* *Glaucium corniculatum* (Linnaeus) J.H. Rudolph, Red Horned-poppy, Blackspotted Horned-poppy. Pasture; native of Europe and sw. Asia. April-May. [= FNA, K]
- \* *Glaucium flavum* Crantz, Yellow Horned-poppy, Sea-poppy. Disturbed areas; native of Mediterranean Europe. June. [= C, F, FNA, G, K]

### 4. *Macleaya* R. Brown 1826 (Plume-poppy)

A genus of 2 species, perennial herbs, of e. Asia. References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

- \* *Macleaya cordata* (Willdenow) R. Brown, Plume-poppy, Tree-celandine. Moist streambanks, persistent or escaped from cultivation; native of e. Asia. June-July. Reported as naturalized in TN by Kral (1981). [= C, F, FNA, G, K, Pa]

### 5. *Sanguinaria* Linnaeus 1753 (Bloodroot)

A monotypic genus, a perennial herb, of e. North America. References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

*Sanguinaria canadensis* Linnaeus, Bloodroot, Red Puccoon. Moist nutrient-rich forests. March-April; April-May. NS west to MN and MB, south to Panhandle FL and OK. Fernald recognizes two varieties – var. *rotundifolia*, more southern and the primary form in our area, is considered to have leaves less lobed than the more northern var. *canadensis*; leaf shape variability within populations makes it impractical to recognize infraspecific taxa. [= RAB, C, FNA, G, K, Pa, S, W, WH; > *S. canadensis* var. *canadensis* – F; > *S. canadensis* var. *rotundifolia* (Greene) Fedde – F]

### 6. *Chelidonium* Linnaeus 1753 (Greater-celandine)

A monotypic genus, a perennial herb, of temperate Eurasia. References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

- \* *Chelidonium majus* Linnaeus, Greater-celandine, Rock-poppy, Swallow-wort. Moist slopes, shaded roadsides, rocky forests; native of Eurasia. March-July. First reported for GA (Rabun County) by Stiles & Howel (1998). [= RAB, C, F, FNA, G, Pa, S, W; > *C. majus* var. *majus* – K]

### 7. *Stylophorum* Nuttall 1818 (Celandine-poppy)

A genus of 2-5 species, perennial herbs, of e. North America and e. Asia. References: Kiger in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

*Stylophorum diphyllum* (Michaux) Nuttall, Celandine-poppy, Woods-poppy. Moist forests over calcareous rocks (such as limestone). March-April. S. QU, w. PA, s. MI, and WI, south to sw. VA, e. TN, nw. GA, sc. TN, and AR; introduced elsewhere from horticultural use. [= C, F, FNA, G, K, Pa, S, W, WV]



#### 8. *Eschscholzia* Chamisso 1820 (California-poppy)

A genus of about 12 species, annual and perennial herbs, of sw. North America and n. Mexico. References: Clark in FNA (1997); Kadereit in Kubitzki, Rohwer, & Bittrich (1993).

\* *Eschscholzia californica* Chamisso *spp. californica*, California-poppy. Roadsides, disturbed areas; native of w. North America. May-August. [= FNA, K; < *Eschscholtzia californica* – F, RAB, orthographic variant; < *Eschscholzia californica* – Pa]

### 111. LARDIZABALACEAE Decaisne 1839 (Lardizabala Family) [in RANUNCULALES]

A family of about 8 genera and 35 species, shrubs and vines, primarily Asian, but also in s. South America. References: Thieret & Kartesz in FNA (1997); Wang et al. (2009); Cheng-Yih & Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

#### *Akebia* Decaisne 1837 (Akebia)

A genus of 5 species, vines, of temperate e. Asia. References: Cheng-Yih & Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

\* *Akebia quinata* (Houttuyn) Decaisne, Five-leaf, Five-leaf Akebia, Chocolate-vine. Escaped from cultivation to roadbanks, suburban woodlands, and floodplains; native of Japan, China, and Korea, potentially invasive and difficult to eradicate. April-June; June-July. [= RAB, C, F, FNA, K, Pa]

### 112. MENISPERMACEAE A.L. de Jussieu 1789 (Moonseed Family) [in RANUNCULALES]

A family of about 72 genera and 450 species, vines, shrubs, trees, and herbs, of tropical, subtropical, and warm temperate areas. References: Rhodes in FNA (1997); Wang et al. (2009); Hoot et al. (2009); Kessler in Kubitzki, Rohwer, & Bittrich (1993).

- |   |  |                    |
|---|--|--------------------|
| 1 | Leaves asymmetrically peltate (the stem attached 1-5 mm in from the leaf margin); stamens 12-24; petals 6-9; fruit bluish-black; [tribe <i>Menispermeae</i> ] .....          | <i>Menispermum</i> |
| 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 <i>Tinosporeae</i> ] ...                        | <i>Calyccarpum</i> |
| 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 <i>Tiliacoreae</i> ] ..... | <i>Cocculus</i>    |

#### *Calyccarpum* Nuttall ex Torrey & A. Gray 1838 (Cupseed)

A monotypic genus, a woody vine, of e. North America. References: Kessler in Kubitzki, Rohwer, & Bittrich (1993).

*Calyccarpum lyonii* (Pursh) A. Gray, Cupseed, Lyonia-vine. Floodplain forests, wet hammocks. May-June. Se. SC, e. TN, sc. KY, s. IN, s. IL, MO, and e. KS, south to se. GA, Panhandle FL, s. AL, s. MS, s. LA, and e. TX. [= C, F, FNA, G, K, S, WH]

#### *Cocculus* A.P. de Candolle 1817 (Coralbeads, Snailseed)

A genus of 8 species, woody vines, shrubs, and trees, of tropical, subtropical, and warm temperate regions of North America, Central America, Africa, Madagascar, India, Malaysia, and the Philippines. References: Kessler in Kubitzki, Rohwer, & Bittrich (1993).

*Cocculus carolinus* (Linnaeus) A.P. deCandolle, Coralbeads, Carolina Moonseed, Snailseed, Red Moonseed. Moist to dry forests and thickets, especially where calcareous, also weedy in landscaping. June-August. VA south to FL, west to TX, north in the interior to s. IN and MO. Its occurrences in VA may be primarily adventive. [= RAB, C, F, FNA, G, K, W, WH; = *Epibaterium carolinum* (Linnaeus) Britton – S]

*Menispermum* Linnaeus 1753 (Moonseed)

A genus of 2-4 species, woody vines, of temperate e. North America and temperate e. Asia. References: Kessler in Kubitzki, Rohwer, & Bittrich (1993).

*Menispermum canadense* Linnaeus, Moonseed, Yellow Parilla. Moist nutrient-rich forests, especially on floodplains or lower slopes. June-August. QC west to MB, south to GA and OK. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, WV]



113. BERBERIDACEAE A.L. de Jussieu 1789 (Barberry Family) [in RANUNCULALES]

As broadly defined here, a family of about 15 genera and 650 species, herbs and shrubs, of the temperate Northern Hemisphere and Andean South America. There has been much debate and study of whether the Berberidaceae should 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) and Kim et al. (2004) conclude that division of the Berberidaceae into segregate families is not warranted. References: Whetstone, Atkinson, & Spaulding in FNA (1997); Wang et al. (2009); Stearn (2002); Kim & Jansen (1996, 1998); Ahrendt (1961); Loconte & Estes (1989b); Kim et al. (2004); Meacham (1980); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Leaves ternately compound; [subfamily *Nandinoideae*].
  - 2 Plant a shrub, with multiple leaves; flowers white ..... **1. *Nandina***
  - 2 Plant an herb, with 2 leaves; flowers green, greenish yellow, or maroon ..... **2. *Caulophyllum***
- 1 Leaves simple (though sometimes variously lobed or divided into segments).
  - 3 Plant a shrub; leaves not peltate, simple or 1-pinnately compound; flowers yellow; [subfamily *Berberidoideae*] ..... **3. *Berberis***
  - 3 Plant an herb; leaves peltate, 2-parted or radially lobed; flowers white; [subfamily *Podophylloideae*].
    - 4 Plant caulescent; flower solitary and scapose; leaf segments 2; fruit a capsule ..... **4. *Jeffersonia***
    - 4 Plant caulescent; flower solitary, or cymose to umbellate, borne on a stem with leaves; leaf segments several; fruit a berry.
      - 5 Flowers cymose or umbellate; stamens 6; berry globose, 8-12 mm long, 2-4 seeded; larger leaves with only 2 clefts that extend > halfway to the peltate center of the leaf (thus the leaf divided into 2 halves, the other sinuses shallow) ..... **5. *Diphylleia***
      - 5 Flower solitary; stamens 12-18; berry ovoid, 25-70 mm long, many-seeded; larger leaves with 5 or more clefts that extend > halfway to the peltate center of the leaf (thus the leaf fairly evenly divided into multiple lobes) ..... **6. *Podophyllum***

**1. *Nandina*** Thunberg 1781 (Nandina, Sacred-bamboo)

A monotypic genus, a shrub, native of Japan, China, and India. Here treated as a monotypic genus in the Berberidaceae, *Nandina* seems to have only a general kinship to the Berberidaceae (see Ehdaie & Russell 1984, Loconte & Estes 1989b, Meacham 1980) and should perhaps be placed in its own monotypic family. References: Whetstone, Atkinson, & Spaulding in FNA (1997); Ehdaie & Russell (1984); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

\* *Nandina domestica* Thunberg, Nandina, Sacred-bamboo. Forests and woodlands in suburban areas, commonly planted, increasingly escaping and naturalizing; native of China. May-June; October-November. *Nandina* has numerous cultivated forms, and is widely planted in the Piedmont and Coastal Plain of our area, especially southward. Leaflet shape varies in cultivated forms from broadly ovate to linear. [= RAB, FNA, K]

**2. *Caulophyllum*** Michaux 1803 (Blue Cohosh)

A genus of 3 species, herbs, with a relictual north temperate distribution (e. North America, e. Asia). The only other species of the genus is *C. robustum* Maximowicz, of e. Asia. References: Loconte in FNA (1997); Stearn (2002)=Y; Loconte & Blackwell (1981, 1984, 1985)=Z; Uttal (1985); Brett (1981); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Carpels (in flower) 3.5-5 mm long, averaging 4 mm; style 0.8-1.5 mm long; sepals 6-9 mm long, usually purple; terminal leaflets (5-) 7-9 (-10) cm long, (4-) 5-7.5 (-8) cm wide; main inflorescence with 4-18 flowers; first leaf 2-ternate or 3-ternate ..... ***C. giganteum***

- 1 Carpels (in flower) 1.3-2.8 mm long, averaging 2 mm; style 0.3-1.0 mm long; sepals 3-6.5 mm long, yellow, yellow-purple, or green; terminal leaflets (3-) 5-7 (-8) cm long, (2-) 3.5-6.5 (-10) cm wide; main inflorescence with 5-70 flowers; first leaf 3-ternate or 4-ternate .....  
.....*C. thalictroides*

*Caulophyllum giganteum* (Farwell) Loconte & Blackwell, Northern Blue Cohosh. Rich forests. April-May; July-August. *C. giganteum* is more northern in distribution than *C. thalictroides*, ranging south to VA, nw. NC, ne. and nc. TN (Chester, Wofford, & Kral 1997), and c. KY. This species blooms about 2 weeks earlier than *C. thalictroides* where they grow together. The combination of sympatry, morphologic distinctness, and phenologic separation of the two taxa argues for recognition at the species level. [= FNA, K, W, Y, Z; < *C. thalictroides* – RAB, F, G, Pa, S; = *C. thalictroides* var. *giganteum* Farwell – C]

*Caulophyllum thalictroides* (Linnaeus) Michaux, Common Blue Cohosh, Green Vivian. Rich forests. April-May; July-August. NS, QC, ON, and MB, south to GA, AL, AR, and OK. [= FNA, K, W, Y, Z; < *C. thalictroides* – RAB, F, G, Pa, S (also see *C. giganteum*); = *C. thalictroides* var. *thalictroides* – C]

### 3. *Berberis* Linnaeus 1753 (Barberry)

A genus of 400-600 species, shrubs, of North America, South America, Asia, Europe, and n. Africa. Many authors favor the inclusion of *Mahonia* in *Berberis*. It appears that *Mahonia* is a paraphyletic grade basal to *Berberis* (in the narrow sense) (Kim, Kim, & Landrum 2004). References: Whittemore in FNA (1997); Loconte in Kubitzki, Rohwer, & Bittrich (1993); Kim, Kim, & Landrum (2004).

**Identification notes:** Other species of *Berberis* are used horticulturally in our area. Though none appear to be established at this time, the possibility of encountering species other than those treated above should be kept in mind.

- 1 Leaves 1-pinnately compound, > 10 cm long, not fascicled on short spur shoots; stems not spiny; leaves evergreen.  
2 Bud scales deciduous, 3-8 mm long; leaflet blades 1-3-veined from base.....*B. repens*  
2 Bud scales evergreen, 11-44 mm long; leaflet blades 4-6-veined from base.  
3 Leaflet blades with 2-7 teeth per side, each tooth 3-8 mm long; leaflets very thick and stiff.....*B. bealei*  
3 Leaflet blades with 6-13 teeth per side, each tooth 1-2 (-3) mm long; leaflets thickish, but flexible when fresh .....*B. nervosa*  
1 Leaves simple, < 6 cm long, fascicled on short spur shoots; stems spiny; leaves deciduous or evergreen.  
4 Leaves entire; flowers solitary or 2-4 in umbels; spines mostly simple; [section *Tschonoskyanae*].....*B. thunbergii*  
4 Leaves bristly-serrate; flowers 5-many in racemes (sometimes the racemes umbelliform); spines mostly trifurcate (some simple or bifurcate).  
5 Leaves evergreen, coriaceous; leaf teeth tipped with firm prickles; fruits blue-black, pruinose; [section *Wallichianae*].....*B. julianiae*  
5 Leaves deciduous, herbaceous; leaf teeth tipped with weak bristles; fruits red, not pruinose.  
6 Leaves with 1-9 (20) bristles on each margin, the bristles 3-6 mm apart; berries ovoid (6-9 mm long, 6-7 mm broad), 5-10 (rarely more) in an often umbellate raceme; petals notched at apex; [section *Canadenses*].....*B. canadensis*  
6 Leaves with 18-36 bristles on each margin, ca. 2 mm apart; berries ellipsoid (8-10 mm long, 4-5 mm broad), 10-20 in a raceme; petals obtuse at apex; [section *Vulgares*].....*B. vulgaris*

\* *Berberis bealei* Fortune, Leatherleaf Mahonia, Chinese Mahonia, Holly-grape. In deciduous forests in suburban areas, spread from plantings; native of China. December-March; May-July. Naturalizing widely in the southeastern United States, including (at least) AL, DE, GA, FL, NC, and SC. [= FNA, WH; = *Mahonia bealei* (Fortune) Carrière – RAB, K]



*Berberis canadensis* P. Miller, American Barberry, Allegheny Barberry. Rocky woods, forest openings, glades, usually over mafic rocks (such as diabase) or calcareous rocks (such as limestone), sometimes along fence-rows in sw. VA (presumably spread by birds). April-May; September-October. A broad Southern Appalachian-Ozarkian endemic, not occurring in Canada (the epithet a misnomer): scattered and local in VA, WV, KY, TN, NC, SC, AL, GA, MO, IL, IN, and sc. PA (where apparently now extirpated). Along with *B. vulgaris*, *B. canadensis* has been subjected to organized eradication programs because of its serving as an alternate host for wheat rust (*Puccinia graminis*). [= RAB, C, F, FNA, G, K, Pa, S, W]

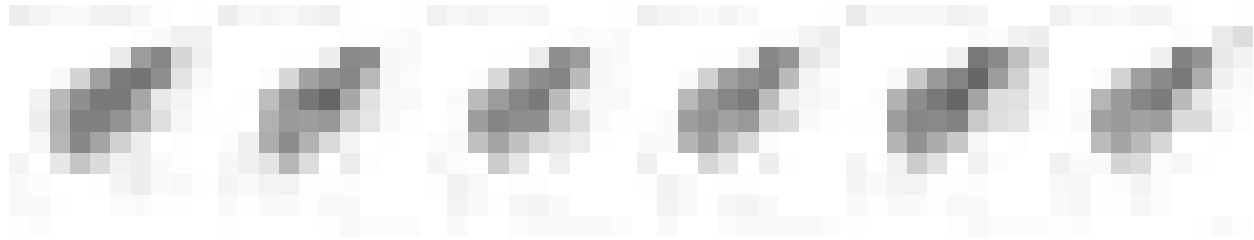
\* *Berberis julianiae* Schneider, Evergreen Barberry. Seeding down and escaping locally near horticultural plantings; native of China. First reported for NC by Pittillo & Brown (1988). [= K; = *B. julianae*, orthographic variant]

\* *Berberis nervosa* Pursh. Disturbed areas; native of w. North America. Introduced in SC (Hill & Horn 1997). [= FNA; = *Mahonia nervosa* (Pursh) Nuttall – K]

\* *Berberis repens* Lindley, Creeping Oregon Grape. Suburban woodlands; native of nw. North America. [= FNA; = *Mahonia repens* (Lindley) G. Don – K] {add to synonymy}

\* *Berberis thunbergii* A.P. de Candolle, Japanese Barberry. Rich forests, old fields; native of Japan. March-April; May-September. This species is immune to wheat rust; it is now the most commonly encountered barberry in much of our area. [= RAB, C, F, FNA, G, K, Pa, S, W]

\* *Berberis vulgaris* Linnaeus, European Barberry, Common Barberry. Disturbed areas; native of Europe. April; September. This species, once widely cultivated and established in North America, serves as an alternate host to wheat rust and has been subjected to eradication programs for over half a century. It may no longer occur in our area. [= C, F, FNA, G, K, Pa]



#### 4. *Jeffersonia* W. Barton 1793 (Twinleaf)

A genus of 2 species, the only other species of the genus is native to e. Asia (eastern Russia, Korea, Manchuria). The closest North American relatives of *Jeffersonia* are *Achlys* and *Vancouveria* of the Pacific Northwest. References: George in FNA (1997); Stearn (2002)=Y; Loconte & Estes (1989b); Loconte in Kubitzki, Rohwer, & Bittrich (1993).

*Jeffersonia diphylla* (Linnaeus) Persoon, Twinleaf. Moist and extremely nutrient-rich forests, generally over calcareous or mafic rocks (including limestone, dolostone, amphibolite, greenstone, etc.) or very rich alluvium. March-April; May. The species is widespread 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, Pa, S, W, WV, Y]

#### 5. *Diphylleia* Michaux 1803 (Umbrella-leaf)

A genus of 3 species, herbs, with a relictual north temperate distribution. The other two species in the genus are east Asian – *D. grayi* F. Schmidt of Japan and Sakhalin, and *D. sinensis* H.L. Li of the Hubei, Shaanxi, Gansu, Sichuan, and Yunnan provinces of China. References: George in FNA (1997); Ying, Terabayashi, & Boufford (1984)=Z; Stearn (2002)=Y; Loconte in Kubitzki, Rohwer, & Bittrich (1993).

*Diphylleia cymosa* Michaux, Umbrella-leaf, Pixie-parasol. Seepages and brook-banks, sometimes away from brooks or seeps in northern hardwood or cove hardwood forests (but then usually in subterranean seepage), primarily at moderate to high elevations. May-June; July-August. A narrow Southern Appalachian endemic: high mountains of w. NC and e. TN, extending a short distance into ne. GA, nw. SC, and sw. VA. [= RAB, C, F, FNA, G, K, S, W, Y, Z]

#### 6. *Podophyllum* Linnaeus 1753 (May-apple)

A genus of 2 species (or ca. 14 if *Dysosma* is included), herbs, one in e. North America, the other in e. Asia. The obvious morphological kinship of *Podophyllum*, *Diphylleia*, and *Hydrastis* is corroborated by alkaloid chemistry. References: George in FNA (1997); Shaw (2000, 2002)=Z; Loconte in Kubitzki, Rohwer, & Bittrich (1993).

*Podophyllum peltatum* Linnaeus, May-apple, American Mandrake. Rich forests, bottomlands, slopes, pastures. March-April; May-June. NS west to MN, south to Panhandle FL and TX. The ripe fruits are edible; the rest of the plant contains a variety of alkaloids, and is poisonous-medicinal. Compounds from *Podophyllum* are used in wart removal, and show anti-viral and anti-cancer promise. [= RAB, C, F, FNA, G, K, Pa, S, W, WV; > *P. peltatum* var. *peltatum* – Z; > *P. peltatum* var. *annulare* J.M.H. Shaw – Z]

### 114a. HYDRASTIDACEAE Martinov 1820 (Golden-seal Family) [in RANUNCULALES]

A family of 2 genera and 2 species, perennial herbs, of temperate e. North America and Japan. In chemistry, morphology, and anatomy, *Hydrastis* shows some relationship to *Podophyllum* and *Diphylleia* of the Podophyllaceae (often included in the Berberidaceae). Though usually placed in the Ranunculaceae, Tobe & Keating (1985) present evidence from morphology, anatomy, embryology, palynology, chemistry, and cytology that suggests that *Hydrastis* is best recognized as a monotypic family. They contend that "*Hydrastis* represents a relictual primitive group which very early diverged from a common ancestral stock of the Ranunculaceae, Berberidaceae and probably of Circaeasteraceae, and that *Hydrastis* has evolved in its own evolutionary line parallel with other lines leading to the modern representatives of these families." In recent papers on classification of the flowering plants, Thorne (1992) and Reveal (1993a) have also accepted Hydrastidaceae as a distinct family. Tobe in Kubitzki & Bayer places *Hydrastis* with *Glaucidium* Siebold & Zuccarini in a bigeneric Hydrastidaceae. References: Tamura in Kubitzki, Rohwer, & Bittrich (1993); Wang et al. (2009); Tobe in Kubitzki & Bayer (2002).

#### 1. *Hydrastis* Linnaeus 1759 (Golden-seal)

A monotypic genus, an herb, endemic to e. North America. References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

*Hydrastis canadensis* Linnaeus, Golden-seal. Mesic, very nutrient-rich forests, with circumneutral soils, over calcareous or mafic rocks such as limestone, amphibolite, and dolostone, sometimes forming large colonies after canopy disturbance such as logging. April; May-June. VT and MN south to w. and c. NC, n. GA, TN, and AR. Exploited for the herbal trade (and still often used as a home remedy in more remote parts of the mountains), though too rare in the eastern part of our area to support economically significant wild collection. The rhizome and roots are bitter in taste and contain several alkaloids. Reported for SC (P. McMillan, pers.comm. 2002). [= RAB, C, F, FNA, G, K, Pa, S, W, WV]



#### 114b. RANUNCULACEAE A.L. de Jussieu 1789 (Buttercup Family) [in RANUNCULALES]

A family of about 62 genera and 2450 species, herbs, shrubs, and vines, primarily of temperate and boreal regions. Classification of subfamilies and tribes follows Wang et al. (2009). References: Whittemore & Parfitt in FNA (1997); Wang et al. (2009); Keener (1977); Tamura in Kubitzki, Rohwer, & Bittrich (1993). [also see *HYDRASTIDACEAE*]

- 1 Shrub or vine; leaves compound (or sometimes some to most of them simple in *Clematis*).
- 2 Leaves opposite, distributed along the usually branched, clambering stem; sepals 4, white to blue or purplish, 10-50 mm long; wood not yellow; [subfamily *Ranunculoideae*, tribe *Anemoneae*] ..... **16. Clematis**
- 2 Leaves alternate, clustered together at the top of the usually unbranched, erect stem; sepals 5, maroon, 2-5 mm long; wood yellow; [subfamily *Coptidoideae*]..... **1. Xanthorhiza**
- 1 Herb; leaves compound or simple.
  - 3 Leaves simple, sometimes deeply cleft or lobed into rounded or elongate segments; [subfamily *Ranunculoideae*].
    - 4 Plants in flower ..... **Key A**
    - 4 Plants in fruit ..... **Key B**
  - 3 Leaves compound, the leaflets either linear or more-or-less petiolulate.
    - 4 Plants in flower ..... **Key C**
    - 4 Plants in fruit ..... **Key D**

#### Key A

- 1 Flowers bilaterally symmetrical, the upper sepal hooded or spurred; [tribe *Delphinieae*].
  - 2 Upper sepal hooded or helmet-shaped; petals hidden by the sepals; perianth blue or creamy white; stems weak, clambering, reclining, vining, or ascending in a curve ..... **7. Aconitum**
  - 2 Upper sepal spurred; petals at least partly exerted from the sepals; perianth blue, pink, white, or greenish; stems strong, erect, normally straight
    - 3 Annual; pistil 1; petals 2, connate; leaf lobes < 1.5 mm wide ..... **8. Consolida**
    - 3 Perennial; pistil 3 (-5); petals 4, separate; leaf lobes > 2 mm wide ..... **9. Delphinium**
- 1 Flowers radially symmetrical, no perianth parts spurred or hooded (except the 5 sepals spurred in *Myosurus*).
  - 3 Petals present, white or yellow, larger and more conspicuous than the sepals; sepals present, green; [in other words, **with** a second, green, less conspicuous perianth whorl below the largest and colored perianth whorl; note that some *Anemone* have a calyx-like involucre of 3 bracts subtending each flower]; [tribe *Ranunculeae*].
    - 4 Basal leaves linear to linear-spatulate, mostly 4-8 cm long, 1-3 mm wide; receptacle elongate, 1-6 cm long (superficially resembling a *Plantago* inflorescence) ..... **19. Myosurus**
    - 4 Basal leaves various, but not as above; receptacle globose to sub-cylindric, mostly < 1 cm long
      - 5 Sepals 3 (-4); petals 7-12; achenes pubescent, beakless; leaves simple, cordate, unlobed; [introduced garden plants]..... **18. Ficaria**
      - 5 Sepals (3-) 5 (-6); petals typically 5-9 (10 in some "doubled" forms); achenes smooth or variously ornamented with spines, papillae, or tubercles, sometimes also pubescent; leaves various, usually not at once simple, cordate, and unlobed; [native or introduced]..... **20. Ranunculus**
  - 3 Petals absent (or modified into relatively inconspicuous nectaries or staminodia); sepals present and petaloid (white, yellow, yellow-green, cream, or blue).
    - 6 Sepals 3-5 mm long, caducous; stamens white and showy; [tribe *Ranunculeae*] ..... **17. Trautvetteria**
    - 6 Sepals 6-40 mm long, not caducous; stamens not notably white and showy.
      - 7 Leaves opposite, distributed along the stem; style plumose; [tribe *Anemoneae*] ..... **16. Clematis**
      - 7 Leaves all basal, or with a few alternate or whorled involucre leaves on the stem; style not plumose.
        - 8 Sepals white, bluish, or blue; basal leaves 3-5 (-7)-lobed; [tribe *Anemoneae*] ..... **15. Anemone**
        - 8 Sepals yellow, green, or whitish (sometimes marked with purple); basal leaves unlobed, or palmately cleft into 5-11 (-many) segments.
          - 9 Leaves cordate-reniform, unlobed; sepals bright yellow; petals absent; [native, of bogs and marshes]; [tribe *Caltheae*]..... **14. Caltha**

- 9 Leaves palmately or pedately lobed or divided; sepals green, greenish, dull yellow, or whitish; petals modified into tubular nectaries; [introduced, rarely persistent or escaped from cultivation].
- 10 Sepals 5-8, much longer than wide, yellow; cauline leaves absent, except for the involucre which immediately subtends the flower; [tribe *Cimicifugeae*] ..... 12. *Eranthis*
- 10 Sepals 5, nearly as wide as long, green or maroon; cauline leaves present; [tribe *Helleboreae*]..... 11. *Helleborus*

**Key B**

- 1 Fruit a follicle, each carpel with 2 or more ovules.
  - 2 Leaves cordate-reniform, toothed, not lobed or divided; [tribe *Caltheae*] ..... 14. *Caltha*
  - 2 Leaves variously palmately or pedately lobed or divided.
    - 3 Carpels 1-3; plants 3-30 dm tall; [native, except *Consolida*]; [tribe *Delphinieae*].
      - 4 Stems weak, clambering, reclining, or vining..... 7. *Aconitum*
      - 4 Stems strong, erect.
        - 5 Annual; leaf lobes < 1.5 mm wide; [exotic] ..... 8. *Consolida*
        - 5 Perennial; leaf lobes > 2 mm wide; [native]..... 9. *Delphinium*
    - 3 Carpels 3-6; plants 1-5 dm tall; [introduced, rarely persistent or escaping].
      - 6 Cauline leaves absent, except for the involucre which immediately subtends the fruit; [tribe *Cimicifugeae*] ..... 12. *Eranthis*
      - 6 Cauline leaves present; [tribe *Helleboreae*]..... 11. *Helleborus*
- 1 Fruit an achene (or dehiscent utricle in *Trautvetteria*), each carpel with 1 ovule.
  - 7 Leaves opposite, distributed along the stem; style plumose; [tribe *Anemoneae*] ..... 16. *Clematis*
  - 7 Leaves all basal, or with a few alternate or whorled involucre leaves on the stem; style not plumose.
    - 8 Basal leaves linear to linear-spatulate, mostly 4-8 cm long, 1-3 mm wide; receptacle elongate, 1-6 cm long (superficially resembling a *Plantago* inflorescence); [tribe *Ranunculeae*]..... 19. *Myosurus*
    - 8 Basal leaves various, but not as above, generally long-petiolate, with an expanded, cordate, 3-lobed, or palmately-lobed blade; receptacle globose to sub-cylindric, mostly < 1 cm long.
      - 9 Fruit a dehiscent utricle; cauline leaves alternate; [tribe *Ranunculeae*] ..... 17. *Trautvetteria*
      - 9 Fruit an achene; cauline leaves opposite or whorled (or alternate in *Ranunculus*).
        - 10 Cauline leaves opposite or whorled, or reduced to 3 sepal-like involucre bracts immediately subtending the flower; sepals absent (but in "*Hepatica*" mimicked by the bracts); [tribe *Anemoneae*]..... 15. *Anemone*
        - 10 Cauline leaves alternate; sepals present; [tribe *Ranunculeae*]
          - 11 Achenes pubescent, beakless; leaves simple, cordate, unlobed; [introduced garden plants] ..... 18. *Ficaria*
          - 11 Achenes smooth or variously ornamented with spines, papillae, or tubercles, sometimes also pubescent; leaves various, usually not at once simple, cordate, and unlobed; [native or introduced]..... 20. *Ranunculus*

**Key C**

- 1 Leaflets linear, < 1.5 mm wide.
  - 2 Flowers bilaterally symmetrical; [subfamily *Ranunculoideae*, tribe *Delphineae*] ..... 8. *Consolida*
  - 2 Flowers radially symmetrical.
    - 3 Aquatic; [native]; [subfamily *Ranunculoideae*, tribe *Ranunculeae*]..... 20. *Ranunculus*
    - 3 Terrestrial; [alien].
      - 4 Flower lacking involucre; pistils simple; [subfamily *Ranunculoideae*, tribe *Adonideae*] ..... 6. *Adonis*
      - 4 Flower closely subtended by a finely dissected involucre; pistils compound; [subfamily *Ranunculoideae*, tribe *Nigelleae*] ..... 10. *Nigella*
- 1 Leaflets broader, rounded, lobed, or toothed.
  - 5 Leaves all cauline, opposite; stems somewhat woody at base; [subfamily *Ranunculoideae*, tribe *Anemoneae*] ..... 16. *Clematis*
  - 5 Leaves basal and cauline, the cauline alternate (or with opposite or whorled involucre bracts).
    - 6 Petals present, conspicuous
      - 7 Flowers dangling; petals red, orange with yellow, or blue, spurred; [subfamily *Thalictrioideae*] ..... 3. *Aquilegia*
      - 7 Flowers not dangling; petals yellow, not spurred; [subfamily *Ranunculoideae*, tribe *Ranunculeae*] ..... 20. *Ranunculus*
    - 6 Petals absent or inconspicuous (soon deciduous or altered into a nectary-bearing clavate structure); sepals sometimes petaloid and conspicuous.
      - 8 Sepals petaloid, conspicuous, white (or tinged with pink or green).
        - 9 Involucre absent, all leaves on the stem alternate; petaloid sepals 5-10, white; [subfamily *Thalictrioideae*] ..... 4. *Enemion*
        - 9 Involucre of opposite or whorled, leaflike bracts present; petaloid sepals (4-) 5-20 (-30), white, cream, rose, or green.
          - 10 Basal leaves with 3-5 leaflets, these toothed or incised; petaloid sepals white, cream, rose, or green; [subfamily *Ranunculoideae*, tribe *Anemoneae*] ..... 15. *Anemone*
          - 10 Basal leaves with > 5 leaflets; these with 0-3 rounded lobes at the tip; petaloid sepals white to pale pink; [subfamily *Thalictrioideae*] ..... 5. *Thalictrum thalictroides*
      - 8 Sepals absent, or inconspicuous in comparison to the stamens or pistils.
        - 11 Leaflets 3; flower solitary; [subfamily *Coptidoideae*]..... 2. *Coptis*
        - 11 Leaflets many; flowers many, in a panicle or raceme.
          - 12 Inflorescence a raceme; [subfamily *Ranunculoideae*, tribe *Cimicifugeae*]..... 13. *Actaea*
          - 12 Inflorescence a panicle; [subfamily *Thalictrioideae*] ..... 5. *Thalictrum*

**Key D**

- 1 Fruit a follicle or capsular (or fleshy and berrylike in some *Actaea*).
  - 2 Mature leaves > 4 dm wide; [subfamily *Ranunculoideae*, tribe *Cimicifugeae*] ..... 13. *Actaea*
  - 2 Mature leaves < 3 dm wide.

- 3 Leaflets linear; [aliens].
  - 4 Flowers in a raceme, not subtended by an involucre; fruit follicular, each with a 1-2 mm long beak; [subfamily *Ranunculoideae*, tribe *Delphineae*] .....8. *Consolida*
  - 4 Flower solitary, subtended by a finely divided involucre; fruit a spherical capsule-like structure composed of 5 or 10 partially connate follicles, each follicle terminated by a linear beak 13-20 mm long; [subfamily *Ranunculoideae*, tribe *Nigelleae*] ...10. *Nigella*
- 3 Leaflets broad, rounded; [mostly natives].
  - 5 Follicles borne on stipes, forming an umbel-like cluster; rhizomes yellow or orange; [subfamily *Coptidoideae*] .....2. *Coptis*
  - 5 Follicles sessile; rhizomes brown or tan; [subfamily *Thalictroideae*].
    - 6 Follicles 15-31 mm long, with beaks 7-18 mm long .....3. *Aquilegia*
    - 6 Follicles 3.5-6.5 mm long, with beaks 1.5-3 mm long .....4. *Enemion*
- 1 Fruit an achene.
  - 7 Leaves divided into numerous linear segments, all of which are < 1 mm wide.
    - 8 Plant terrestrial; [subfamily *Ranunculoideae*, tribe *Adonideae*] .....6. *Adonis*
    - 8 Plant aquatic (if leaves divided into numerous linear segments); [subfamily *Ranunculoideae*, tribe *Ranunculeae*] .....20. *Ranunculus*
  - 7 Leaf segments rounded or cleft, > 1 mm wide.
    - 9 Leaves cauline, opposite; [subfamily *Ranunculoideae*, tribe *Anemoneae*] .....16. *Clematis*
    - 9 Leaves basal and/or cauline, cauline leaves (if present) alternate (leaflike involucral bracts sometimes present and opposite or whorled).
      - 10 Leaflike involucral bracts present, opposite or whorled.
        - 11 Achenes not ribbed or veined on lateral surfaces; leaf texture moderate to distinctly thick and leathery; [subfamily *Ranunculoideae*, tribe *Anemoneae*] .....15. *Anemone*
        - 11 Achenes conspicuously ribbed or veined on lateral surfaces; leaf texture thin, delicate; [subfamily *Thalictroideae*] .....5. *Thalictrum thalictroides*
      - 10 Leaflike involucral bracts not present.
        - 12 Leaflets 3-many, if many the leaflets typically with teeth, or sharp lobes; [subfamily *Ranunculoideae*, tribe *Ranunculeae*] .....20. *Ranunculus*
        - 12 Leaflets many, unlobed or typically with 3-9 rounded lobes; [subfamily *Thalictroideae*] .....5. *Thalictrum*

**1. *Xanthorrhiza* Marshall 1785 (Yellowroot)**

A monotypic genus, a shrub, of temperate e. North America. References: Parfitt in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** An unmistakable plant, the woody stems usually about knee-high and unbranched, bearing a cluster of pinnate leaves near the tip, and the rhizomes with a bright yellow, staining, bitter-tasting alkaloid.

*Xanthorrhiza simplicissima* Marshall, Yellowroot, Brook-feather. Streambanks and riverbanks. March-May; May-June. Se. VA, w. VA, WV, and s. OH south to FL Panhandle and s. MS; disjunct west of the Mississippi in w. LA and e. TX; also scattered northward as naturalized populations from cultivation in PA, MD, NY, MA, CT, and ME. [= RAB, C, F, FNA, G, GW, K, Pa, W, WV; = *Xanthorrhiza simplicissima* – S, orthographic variant]

**2. *Coptis* Salisbury 1807 (Goldthread)**

A genus of about 15 species, perennial herbs, of boreal to temperate e. Asia and North America. References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

*Coptis trifolia* (Linnaeus) Salisbury var. *groenlandica* (Oeder) Fassett, Goldthread, Goldenroot. Bogs. April-June. The species ranges from Greenland west to AK, south to NJ, nw. NC, n. IN, IA, and BC; and in e. Asia. Var. *groenlandica* is the variety in e. North America, northeast to Greenland, and in southern parts of nw. North America; var. *trifolia* is Alaskan and e. Asian. Whether the varieties are worth recognition is somewhat questionable. *Coptis* had been reported for NC by many floras (for instance, C, F, G, and S), but the documentation was unknown; its presence in NC has now been confirmed by P. McMillan. The species is distinctive, with neatly trifoliolate leaves, small white flowers on scapes, and yellow roots. [= C; = *C. groenlandica* (Oeder) Fernald – F, WV; = *C. trifolia* ssp. *groenlandica* (Oeder) Hultén – G; < *C. trifolia* – FNA, K, Pa, S]

**3. *Aquilegia* Linnaeus 1753 (Columbine)**

A genus of about 80 species, perennial herbs, of the Northern Hemisphere. References: Whittemore in FNA (1997); Munz (1946)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** When in leaf, somewhat easily mistaken for *Thalictrum* or *Enemion*; look for old fruits.

- 1 Flowers red and yellow; {add other characters}; spurs straight; [native, common] .....*A. canadensis*
- 1 Flowers blue, purple, mauve, pink, white, or red and yellow; spurs hooked; [alien, rare] .....*A. vulgaris*

*Aquilegia canadensis* Linnaeus, Canada Columbine, Eastern Columbine. Forests, woodlands, rock outcrops, especially (though by no means entirely) on calcareous or mafic substrates. March-May. NS, QC, ON, MB, and SK south to Panhandle FL, s. AL, w. TN, c. AR, and se. OK; disjunct in Edwards Plateau, TX. One of our most familiar wildflowers. Disjunct populations in the deep South, on limestone in sw. GA and FL Panhandle, have been described as *A. australis* or *A. canadensis* var. *australis*; they need additional study. [= RAB, C, FNA, G, K, Pa, S, W; > *A. canadensis* var. *canadensis* – F, Z; > *A. canadensis* var.



*coccinea* (Small) Munz – F, Z; > *A. canadensis* – S; > *A. australis* Small – S; > *A. coccinea* Small – S; > *A. canadensis* var. *australis* (Small) Munz – Z]

\* *Aquilegia vulgaris* Linnaeus, European Columbine. Disturbed areas; native of Europe. April-June. 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, Pa; > *A. vulgaris* varieties – Z]

**4. *Enemion* Rafinesque 1820 (Isopyrum)**

A genus of about 6 species, perennial herbs, of temperate North America and e. Asia. The issue of the separation of the genus *Enemion* from *Isopyrum* remains somewhat controversial; I here follow Keener (1977), Tamura (1993), and Ford (1997).  
References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993); Keener (1977).

**Identification notes:** *Enemion* is somewhat superficially similar to the much more common *Thalictrum thalictroides*, with which it sometimes grows, but can be distinguished by the following characters: fruit a follicle (vs. fruit an achene), petaloid sepals 5 (vs. 5-10, usually some at least of the flowers on a plant with 6 or more).

*Enemion biternatum* Rafinesque, Isopyrum, False Rue-anemone. Rich forests, either on natural levees with very nutrient rich sediments or on slopes with underlying mafic rocks. March-April; May. Mainly west of the Appalachians, W. NY, s. ON and MN south to TN and AR; disjunct in the Piedmont and Coastal Plain of VA, NC, and SC, and the FL Panhandle. [= FNA, K; = *Isopyrum biternatum* (Rafinesque) Torrey & Gray – RAB, C, F, G, S]



**5. *Thalictrum* Linnaeus 1753 (Meadow-rue)**

A genus of about 330 species, perennial herbs, of Eurasia, North America, South America, and Africa. Ro & McPherson (1997) corroborate via molecular phylogeny that *Anemonella* should be included in *Thalictrum*; in fact, *T. thalictroides* appears to form a basal subclade in *Thalictrum* with *T. clavatum* (and presumably *T. mirabile*). References: Park & Festerling in FNA (1997); Park (1992)=Z; Ro & McPherson (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** *Thalictrum thalictroides* is superficially similar to *Enemion biternatum*, but can be distinguished by the following characters: fruit an achene (vs. fruit a follicle), petaloid sepals 5-10 (vs. 5).

- 1 Sepals petaloid, conspicuous, white (or tinged with pink or green); leaflike involucral bracts present, opposite or whorled; inflorescence an umbel; [section *Anemonella*] .....*T. thalictroides*
- 1 Sepals absent, or inconspicuous in comparison to the stamens or pistils; leaflike involucral bracts not present; inflorescence a panicle, corymb or raceme.
- 2 Fruit (achene) scimitar-shaped, borne on a stipe 1.5-4 mm long; flowers perfect; [section *Physocarpum*].
- 3 Achene concave or straight on the upper surface, 4-5.5 mm long, borne on a stipe 1.5-3 mm long; inflorescence branches stiff and diverge at acute angles; [fairly widespread in our area, on a wide variety of moist substrates, especially in the Mountains] .....*T. clavatum*
- 3 Achene straight on the upper surface, 2.5-4 mm long, borne on a stipe 2.5-4 mm long; inflorescence branches flexuous and divergent; [of sandstone rockhouses of Cumberland Plateau of AL, TN, and KY]..... *T. mirabile*
- 2 Fruit (achene) not scimitar-shaped, not borne on a stipe; flowers unisexual (or sometimes a few or more bisexual).
- 4 Leaflets of the stem leaves linear to narrowly lanceolate, oblanceolate or elliptic, (3-) 5-10 (-25)× as long as wide; [section *Leucocoma*] .....*T. cooleyi*
- 4 Leaflets of the stem leaves ovate, obovate, or suborbicular, 0.7-3 (-5)× as long as wide.
- 5 Most of the leaflets with (3-) 4-6 (-9) lobes or teeth; [section *Heterogamia*].
- 6 Cauline leaf subtending the lowest flowering branch sessile; plant flowering May-July; achenes borne on a 0.7-2.5 mm long stipe. ....*T. coriaceum*
- 6 Cauline leaf subtending the lowest flowering branch with a petiole 3-7 cm long; plant flowering March-April; achenes nearly sessile, the stipe nonexistent or <0.3 mm long.
- 7 Largest leaflets < 15 mm wide; stems 10-40 cm tall, reclining..... *T. debile*
- 7 Largest leaflets > 15 mm long; stems 30-80 cm tall, erect..... *T. dioicum*
- 5 Most of the leaflets with 1-3 (-5) lobes or teeth; [section *Leucocoma*].
- 8 Leaflet undersurfaces, peduncles, and achenes with stipitate glands or papillae.
- 9 Anthers 1-3.6 (-4) mm long; stigmas 1.5-4.7 (-6) mm long ..... *T. dasycarpum*
- 9 Anthers 0.5-2.8 mm long; stigmas 0.6-3.5 mm long.
- 10 Anthers 0.5-1.2 mm long; stigmas 0.6-2.2 mm long .....*T. hepaticum*
- 10 Anthers 1.5-2.8 mm long; stigmas (1.5-) 2.0-3.5 mm long..... *T. revolutum*
- 8 Leaflet undersurfaces, peduncles, and achenes glabrous or pubescent, lacking both stipitate glands and papillae.
- 11 Leaflet undersurfaces, peduncles, and achenes finely pubescent ..... *T. pubescens*
- 11 Leaflet undersurfaces, peduncles, and achenes glabrous.

- 12 Leaflets entire to 3-lobed, averaging about 10 mm wide, the broadest usually < 20 mm wide; filaments (2-) 3-4.5 (-6.5) mm long (averaging 3.6 mm).....*T. macrostylum*
- 12 Leaflets 3-lobed (rarely entire), averaging 15-23 mm wide, the broadest usually 15-60 mm wide; filaments (2-) 4-5 (-8) mm long (averaging 4-5 mm).
- 13 Anthers 1-3.6 (-4) mm long; stigmas 1.5-4.7 (-6) mm long.....*T. dasycarpum*
- 13 Anthers 0.5-2.8 mm long; stigmas 0.6-3.5 mm long.
- 14 Anthers 0.5-1.2 mm long; stigmas 0.6-2.2 mm long.....*T. hepaticum*
- 14 Anthers 1.5-2.8 mm long; stigmas (1.5-) 2.0-3.5 mm long.....*T. revolutum*

*Thalictrum clavatum* A.P. de Candolle, Lady-rue, Mountain Meadowrue. Seepages, moist forests, spray cliffs at waterfalls, brookbanks. May-July. A Southern Appalachian endemic: VA, WV, e. KY south through w. NC and e. TN to nw. SC and n. GA. [= RAB, C, F, FNA, G, GW, K, S, W, WV]

*Thalictrum cooleyi* H.E. Ahles, Cooley's Meadowrue, Savanna Meadowrue. Ecotones between calcareous savannas and adjacent swamp forests, shallowly underlain by coquina limestone ("marl"), generally within a few meters of both *Taxodium ascendens* and *Liriodendron tulipifera*. Late June-early July; August-October. The species is endemic to two small areas, centered around Maple Hill (Pender and Onslow counties, NC) and Old Dock (Columbus and Brunswick counties, NC), with a small disjunct population in Panhandle FL (Walton County), and a small number of ambiguous populations in sw. GA (Dougherty and Worth counties); the GA populations are assigned here for now but may well represent a new taxon. It is associated with a number of other narrow endemic species. The leaflets of basal leaves (winter rosettes) are much broader, resembling the leaflets of other *Thalictrum* species in length/width ratio. Leaves produced from May on have the very narrow leaves typical of the species. Park (1992) found that *T. cooleyi* has the highest chromosome number known in the genus, 2n = 210, a ploidy level of 30x compared to the base chromosome level of 7 in *Thalictrum*. [= RAB, FNA, GW, K, WH, Z]

*Thalictrum coriaceum* (Britton) Small, Appalachian Meadowrue, Maid of the Mist. Rich forests. May-July. A Southern and Central Appalachian endemic: MD, VA, and WV south through w. KY and e. TN to w. NC and ne. GA. The roots are bright yellow. A preliminary study concluded that *T. steeleanum* B. Boivin is not distinct from *T. coriaceum* (Park 1988); further study is needed. *T. 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, Pa; > *T. coriaceum* - C, F, G, W, WV; > *T. steeleanum* B. Boivin - C, F, G, W, WV; > *T. coriaceum* - S; > *T. caulophylloides* Small - S]

*Thalictrum dasycarpum* Fischer & Avé-Lallemant, Purple Meadowrue. Forest, woodlands, and prairies. Late May-July. QC and YT south to PA, KY, TN, AL, MS, LA, TX, NM, AZ, and WA. It has been reported for scattered localities in VA (Harvill et al. 1992). Park (1992) and FNA do not document the occurrence of *T. dasycarpum* in VA; substantiation is needed. [= FNA, K, Pa] {synonymy incomplete}

*Thalictrum debile* Buckley, Trailing Meadowrue. Moist to wet forests over limestone. Nw. GA west to e. MS. [= FNA, GW, K, S]

*Thalictrum dioicum* Linnaeus, Early Meadowrue. Seepages, moist forests. ME, QC, and MN south to SC, c. GA, AL, and MO. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV]



*Thalictrum hepaticum* Greene, Appalachian Tall Meadowrue. Seepage areas. May-July. PA south to n. GA and se. TN, strictly or primarily in the Appalachians. Plants tentatively placed here have been problematic. Keener (1981) reduced *T. hepaticum* Greene to a variety of *T. pubescens*, and discussed their distinction. Park (1992) contends that these plants are, indeed, glandular puberulent, and should therefore be reduced to synonymy under *T. revolutum*, stating "these are not given varietal status [under *T. 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) *T. 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 *T. revolutum* or *T. pubescens*. This entity appears to be closer to *T. pubescens* in leaflet shape, sepal length, anther length, and stigma length, and to *T. revolutum* in leaflet and petiolule vestiture. More study is needed; the taxon is here provisionally accepted in order to draw attention to the problem. [= *T. pubescens* var. *hepaticum* (Greene) Keener - W; < *T. polygamum* Muhlenberg ex Sprengel - RAB, F, G, S, nomen nudum; < *T. pubescens* - C, GW, K, WV; < *T. revolutum* - FNA, Pa]

*Thalictrum macrostylum* Small & Heller, Small-leaved Meadowrue. Moist places, perhaps associated with circumneutral soils, moist to dry ultramafic outcrop barrens (over olivine), tidal freshwater marshes, rarely pineland seepages with calcareous substrate. May-August. Se. VA south and west through NC, SC, sc. GA, FL, and AL to MS. [= C, F, FNA, G, GW, K, S, WH, Z; > *T. macrostylum* - RAB; > *T. subrotundum* B. Boivin - RAB]

*Thalictrum mirabile* Small, Rockhouse Meadowrue. Wet sandstone cliffs, primarily in the Cumberland Plateau (and especially associated with sandstone rockhouses). KY south through TN to n. AL and nw. GA (and additionally cited in FNA as occurring in w. NC). A delicate relative of *T. clavatum*, the inflorescence appears sparser because of the shorter and narrower achenes borne on longer stipes. [= FNA, GW, K, S]

***Thalictrum pubescens*** Pursh, Common Tall Meadowrue, Late Meadowrue, King-of-the-meadow. Bogs, marshes, wet forests. May-July. NL (Labrador), NL (Newfoundland), and ON south to GA, SC and MS. [= *T. pubescens* var. *pubescens* – W; < *T. polygamum* Muhlenberg ex Sprengel – RAB, F, G, S, nomen nudum; < *T. pubescens* – C, GW, K, WV, Z; < *T. pubescens* – FNA]

***Thalictrum revolutum*** DC, Skunk Meadowrue. Mesic to dry forests, woodlands, and barrens, over hornblende, greenstone, dolostone, and serpentinized olivine. May-July. QC and ON south to n. FL, LA, and TX, and scattered southwest to CO, NV, and AZ. The species is normally stipitate-glandular or papillose, but can be glabrous, as accounted for in the key. [= RAB, C, F, G, GW, K, S, W, WH, WV; < *T. revolutum* – FNA, Pa]

***Thalictrum thalictroides*** (Linnaeus) Eames & Boivin, Rue-anemone, Windflower. Moist forests. March-May. ME, MN, and KS, south to Panhandle FL, MS, AR, and OK. [= RAB, FNA, K, Pa, W, WH, WV; = *Anemone thalictroides* (Linnaeus) Spach – C, F, G; = *Syndesmon thalictroides* (Linnaeus) Hoffmannsegg ex Britton – S]



6. *Adonis* Linnaeus 1753 (Adonis)

A genus of about 26 species, annual and perennial herbs, of Eurasia. References: Tamura in Kubitzki, Rohwer, & Bittrich (1993).

\* ***Adonis annua*** Linnaeus, Autumn Adonis, Bird's-eye. Disturbed areas; native of Eurasia. April-June. Naturalized in n. AL and sc. TN (Parfitt in FNA 1997). [= C, FNA, G, K]

7. *Aconitum* Linnaeus 1753 (Monkshood, Aconite)

A genus of about 300 species, herbs, of Eurasia, n. Africa, and North America. References: Brink & Woods in FNA (1997); Hardin (1964b)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Flowers white, creamy white, or yellowish; basal leaves numerous, large, usually 10-20 cm across, on long, stout petioles; roots fascicled; [section *Lycocotnum*].....***A. reclinatum***
- 1 Flowers pale to medium blue (rarely white); basal leaves fewer, smaller, rarely over 10 cm across, on shorter and wirier petioles; root thickened, tuberous.....***A. uncinatum***

***Aconitum reclinatum*** A. Gray, White Monkshood, Trailing Wolfsbane, White Aconite. Rich cove forests, particularly along brookbanks, in seepages, and in periglacial boulderfields with seepage, primarily over mafic rocks (such as amphibolite, metagabbro, or greenstone), rarely over sandstone or granitic rocks. June-September. A Southern and Central Appalachian endemic: sw. PA, w. VA and e. WV south to w. NC and ne. TN. It is more restricted in distribution and habitat than *A. uncinatum*, but the two species sometimes occur together, even intertwined! [= C, F, FNA, G, K, Pa, RAB, S, W, Z; *A. vaccarum* Rydberg]

***Aconitum uncinatum*** Linnaeus, Eastern Blue Monkshood, Appalachian Blue Monkshood. Seepages, cove forests, other moist forests. August-October. 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 the character differences seem ambiguous, poorly correlated with one another, and geographically incoherent. [= RAB, FNA, Pa, S, W; > *A. uncinatum* var. *muticum* A.P. de Candolle – C; > *A. uncinatum* var. *uncinatum* – C, F; > *A. uncinatum* var. *acutidens* Fernald – F; > *A. uncinatum* Linnaeus ssp. *muticum* (A.P. de Candolle) Hardin = K, Z; > *A. uncinatum* ssp. *uncinatum* – K, Z]

8. *Consolida* (A.P. de Candolle) S.F. Gray 1821 (Annual Larkspur)

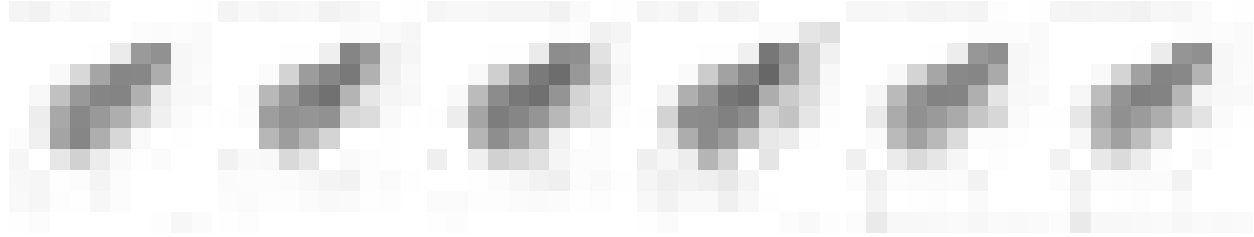
A genus of about 43 species, annual herbs, of Eurasia. References: Warnock in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Lower bracts of the inflorescence unlobed or the single lowermost bract with 3 lobes; pistil glabrous; follicle 8-17 mm long.
  - 2 Terminal lobe of petal < 2 mm wide; follicles pubescent.....***C. pubescens***
  - 2 Terminal lobe of petal > 2 mm wide; follicles glabrous or pubescent.....***C. regalis***
- 1 Lower bracts of the inflorescence (at least 2 of them) with 3 or more lobes; pistil densely pubescent; follicle 12-25 mm long.
  - 3 Spur < 12 mm long; upper bracteoles overlapping the flower, attached 1-4 mm below the flower..... ***C. orientalis***
  - 3 Spur > 12 mm long; upper bracteoles not overlapping the flower, attached 4-20 mm from the flower.
    - 4 Inflorescence with 3 or fewer branches; stems glabrous to sparsely puberulent; follicles 12-25 mm long..... ***C. ajacis***
    - 4 Inflorescence with 3 or more branches; stems pubescent; follicles 10-15 mm long..... ***C. pubescens***

\* ***Consolida ajacis*** (Linnaeus) Schur, Rocket Larkspur. Roadsides, fields, waste places, disturbed ground; native of Europe. Late June-early September. [= FNA, K2, Pa; = *Delphinium ajacis* Linnaeus – RAB, F, G, S, WV; = *Delphinium ambiguum* Linnaeus – C; = *Consolida ambigua* (Linnaeus) P.W. Ball & Heywood in Heywood & P.W. Ball – W]

\* *Consolida orientalis* (Gay) Schrödinger, Oriental Larkspur. Disturbed areas, perhaps only a waif after cultivation; native of s. Europe, n. Africa, and w. Asia. [= FNA, K2; ? *C. hispanica* (Willk. ex Costa) Greuter & Burdet]

\* *Consolida pubescens* (de Candolle) Soó, Hairy Larkspur. Disturbed areas, perhaps only a waif after cultivation; native of sw. Europe and nw. Africa. Naturalized in s. TN (Warnock in FNA 1997). [= FNA, K2] {not yet keyed}



\* *Consolida regalis* S.F. Gray, Royal Larkspur, Forking Larkspur. Disturbed areas; native of Europe. Also known from DC and to be expected in VA. [= FNA, K2, Pa; = *Delphinium consolida* Linnaeus – C, G, S]

**9. *Delphinium* Linnaeus 1753 (Larkspur)**

A genus of about 320 species, herbs, of Eurasia, Africa, and North America. References: Warnock in FNA (1997); Kral (1976)=Z; Warnock 1995; Tamura in Kubitzki, Rohwer, & Bittrich (1993). [also see *Consolida*]

- 1 Follicles divergent; raceme 0.5-2 (-3) dm long; flowering plants 2-9 (-13) dm tall; flowering March-May; [section *Diedropetala*; subsection *Grumosa*].
  - 2 Stems (4.5-) 6-9 (-13) dm tall; flowers (sepals) deep blue; lower stem pubescent; [in sunny or semi-sunny situations, apparently endemic to n. AL] ..... *D. alabamicum*
  - 2 Stems 2-6 dm tall; flowers (sepals) deep bluish purple, pink, or white; lower stem glabrous or nearly so; [usually in deep shade, widespread in our area] ..... *D. tricorne*
- 1 Follicles erect; raceme > 3 dm long; flowering plants 5-20 dm tall; flowering May-September.
  - 3 Seeds wing-margined, the surfaces smooth; stem below the inflorescence glabrous; flowering plants 8-20 dm tall; flowering July-September; [section *Diedropetala*; subsection *Exaltata*] ..... *D. exaltatum*
  - 4 Seeds with prominent transverse ridges; stem below the inflorescence pubescent; flowering plants 2-10 (-15) dm tall; flowering May-July; [section *Diedropetala*; subsection *Virescens*].
    - 5 Basal leaves usually present at anthesis; flowers (sepals) white; stems 2-4 (-7) dm tall; ultimate segments of midcauline leaves 5-12 in number, 2-4 mm wide ..... *D. carolinianum* ssp. *calciphilum*
    - 4 Basal leaves absent at anthesis; flowers (sepals) blue to purple (rarely white); stems (3-) 6-10 (-15) dm tall; ultimate segments of midcauline leaves 12-25 in number, 0.5-1.5 mm wide ..... *D. carolinianum* ssp. *carolinianum*

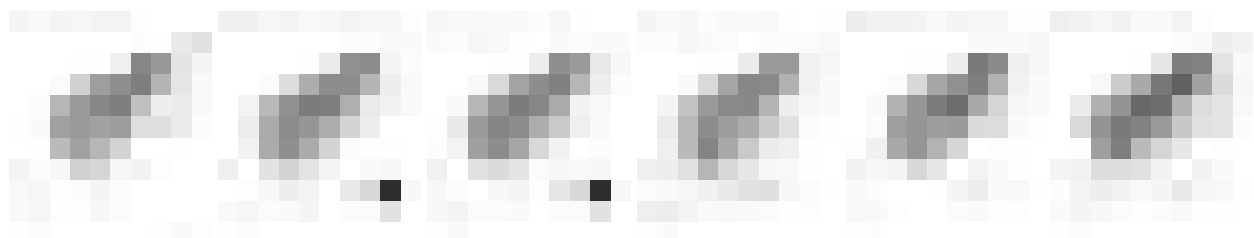
*Delphinium alabamicum* Kral, Alabama Larkspur. Limestone prairies and glades. Endemic to c. and n. AL and nw. GA. May. [= FNA, K]

*Delphinium carolinianum* Walter ssp. *calciphilum* M.J. Warnock, Glade Larkspur. Limestone glades. KY south through e. and c. TN to ne. AL and nw. GA. [= FNA, K; < *D. virescens* Nuttall – C, G; < *D. carolinianum* var. *carolinianum* – F; < *D. carolinianum* – S; < *D. virescens* var. *virescens* – Z; < *D. carolinianum* Walter ssp. *virescens* (Nuttall) R.E. Brooks]

*Delphinium carolinianum* Walter ssp. *carolinianum*, Prairie Larkspur, Carolina Larkspur, Blue Larkspur. Rocky woodlands, granite outcrops, Altamaha Grit outcrops, blackland prairies, moist sandy woodlands associated with longleaf pine. May-July. IL west to MO, south to LA and TX, with disjunct occurrences eastward in SC, GA, Panhandle FL (Gadsden County), TN, and MS. The flowers are a pale to medium blue. This species has been reported for NC (by C) and "north to Va." (by F and S). I know of no documentation for its past or present occurrence in NC or VA, but its presence in those states is plausible. [= FNA, K; = *D. carolinianum* Walter – C, G, WH, Z; < *D. carolinianum* var. *carolinianum* – F; < *D. carolinianum* – S]

*Delphinium exaltatum* Aiton, Tall Larkspur. Dry to moist soils over calcareous (such as dolostone, especially Elbrook Formation) or mafic rocks (such as amphibolite, metagabbro, greenstone, and diabase), usually in the open (as grassy balds) or on forest edges in partial sun. July (low elevations) - September (high elevations). Sw. PA and OH southwest to MO and e. TN, and south to the Mountains of VA and the Mountains and Piedmont of NC. The flowers are a pale to medium blue. [= C, F, FNA, G, K, Pa, RAB, S, W, WV, Z]

*Delphinium tricorne* Michaux, Dwarf Larkspur. Rich, moist forests, especially over mafic or calcareous rocks, less commonly (as along the Roanoke River in ne. NC) on very fertile alluvial deposits. March-May. Sw. PA and MN south to NC, nw. GA, AL, and OK. The flowers are variable in color, usually a deep bluish violet, but ranging through pink to pure white. [= C, F, FNA, G, K, RAB, S, W, WV, Z]



**10. *Nigella* Linnaeus 1753 (Fennel-flower)**

A genus of about 20 species, annual herbs, of Europe, n. Africa, and Asia. References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

\* *Nigella damascena* Linnaeus, Love-in-a-mist, Fennel-flower. Cultivated in gardens, rarely persistent or escaping; native of s. Europe. June-July. [= C, F, FNA, G, K, Pa]

**11. *Helleborus* Linnaeus 1753 (Hellebore, Christmas-rose)**

A genus of about 21 species, perennial herbs, of Europe and Asia. References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** Other species of *Helleborus* are increasingly being cultivated; all have the potential to naturalize.

- 1 Primary leaves of mature (fertile) plants all cauline; leaf segments <1.5 cm wide; flowers <3 cm across, >9 per inflorescence ..... *H. foetidus*
- 1 Primary leaves of mature (fertile) plants basal (the stem with reduced, bracteal leaves subtending the inflorescence); leaf segments >3 cm wide; flowers >4 cm across, (1-) 3 (-5) per inflorescence ..... *H. viridis*

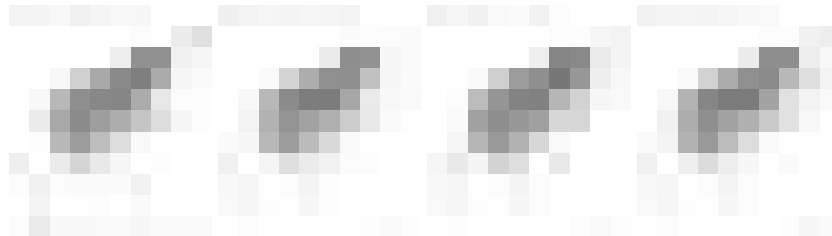
\* *Helleborus foetidus* Linnaeus, Stinking Hellebore. Cultivated in gardens, seeding down and spreading locally near plantings; native of Europe. December-March. [= K2]

\* *Helleborus viridis* Linnaeus, Green Hellebore, Christmas-rose, Lenten-rose. Cultivated in gardens, seeding down, rarely escaped or persistent; rare, native of Europe. December-May. [= C, F, FNA, G, K1, K2, S, WV]

**12. *Eranthis* Salisbury 1808 (Winter-aconite)**

A genus of about 8 species, perennial herbs, of Europe and Asia. References: Parfitt in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

\* *Eranthis hyemalis* (Linnaeus) Salisbury, Winter-aconite. Cultivated in gardens, sometimes persisting or escaped; native of Eurasia. January-March. [= F, FNA, G, K, Pa]



**13. *Actaea* Linnaeus 1753 (Baneberry)**

A genus of about 28 species, perennial herbs, of temperate regions of the Northern Hemisphere. Compton, Culham, & Jury (1998) support the inclusion of *Cimicifuga* in *Actaea*, based on morphologic and molecular analyses. References: Ford in FNA (1997); Ramsey in FNA (1997); Compton, Culham, & Jury (1998)=Z; Park & Lee 1996; Ramsey (1987, 1988); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** In rich coves and other mesic Appalachian forests, *Actaea* often grows with a number of other herbs with similarly compound leaves, including *Astilbe* (Saxifragaceae), *Arunceus* (Rosaceae), *Caulophyllum* (Berberidaceae), *Angelica*, *Thaspium*, *Osmorrhiza*, and *Ligusticum* (Apiaceae), *Aralia* (Araliaceae), *Thalictrum* (Ranunculaceae), and others. The curious evolutionary convergence of leaf morphology (to a 2-3-ternately compound form) of a large number of unrelated genera of Appalachian cove forests is interesting.

- 1 Plant with leaves only present.
  - 2 Terminal leaflet deeply cordate, mostly > 12 cm wide, with 7-9 major veins arising palmately from the base; principal leaves with 3-9 (-17) leaflets; [section *Oligocarpae*] ..... *A. rubifolia*
  - 2 Terminal leaflet broadly cuneate, rounded, truncate, or subcordate, mostly < 12 cm wide, with 3 major veins arising from the base; principal leaves with (15-) 20-70 leaflets.
    - 3 Petiole of basal leaves with a deep, broad groove (ca. 1 mm wide and 1 mm deep), persistent on fully expanded leaves; roots with vascular tissue in lunate bundles arranged in a circle; flowering July-September; [section *Podocarpae*] ..... *A. podocarpa*
    - 3 Petiole of basal leaves terete, not grooved (or with a shallow, narrow groove early, obscure or absent on fully expanded leaves); roots with vascular tissue in a central (3-) 4 (-5)-armed cross or star; flowering April-August; [section *Actaea*] ..... *A. pachypoda*, *A. racemosa*, or *A. rubra*
- 1 Plant in flower or fruit.
  - 4 Carpels 3-8, on a short stipe elongating to 5-8 mm long; flowering July-September; roots with vascular tissue in lunate bundles arranged in a circle; [section *Podocarpae*] ..... *A. podocarpa*
  - 4 Carpels 1 (-3), sessile; flowering April-October; roots with vascular tissue in a central (3-) 4 (-5)-armed cross or star.

- 5 Fruit fleshy, indehiscent; flowering April-May; [section *Actaea*].
- 6 Fruiting pedicels thick, 1-2 mm in diameter; fruit white (rarely red); [widespread in our area].....*A. pachypoda*
- 6 Fruiting pedicels slender, 0.4-0.7 mm in diameter; fruit red (rarely white); [northern, just reaching our area in ec. NJ].....*A. rubra*
- 5 Fruit dry, follicular, dehiscent; flowering May-October.
- 7 Staminodes present; principal leaves with (15-) 20-70 leaflets; follicles 6-9 mm long; terminal leaflet broadly cuneate, rounded, truncate, or subcordate, with 3 major veins arising from the base; flowering May-August; [section *Actaea*] .....*A. racemosa*
- 7 Staminodes absent; principal leaves with 3-9 (-17) leaflets; follicles 12-17 mm long; terminal leaflet deeply cordate, with 7-9 major veins arising palmately from the base; flowering August-October; [section *Oligocarpae*]..... *A. rubifolia*

*Actaea pachypoda* Elliott, White Baneberry, Dolls'-eyes, White Cohosh. Rich cove forests and slopes. April-May; August-October. QC and MN south to c. GA, FL Panhandle, s. AL, s. MS, e. LA, and OK. [= RAB, F, FNA, K, Pa, W, Z; = *A. alba* (Linnaeus) P. Miller – C, G, S, probably misapplied; > *A. pachypoda* f. *pachypoda* – Z; > *A. pachypoda* f. *rubrocarpa* (Killip ex House) Fernald – Z]

*Actaea podocarpa* A.P. de Candolle, Mountain Black-cohosh, Late Black-cohosh. Rich cove forests and slopes, at moderate to high elevations. July-September. Endemic to the Southern and Central Appalachians: s. PA to w. NC, ne. GA, and e. TN. Most closely related to *Actaea laciniata* (S. Watson) J. Compton of OR and WA. [= K, Pa, Z; = *Cimicifuga americana* Michaux – RAB, C, F, FNA, G, S, W]

*Actaea racemosa* Linnaeus, Common Black-cohosh, Early Black-cohosh. Rich cove forests, other mesic and moderately to very fertile forests. May-August. Primarily Appalachian: w. MA south to SC and c. GA, but extending e. into the Coastal Plain and west to OH, IN, and MO. Var. *dissecta* appears to be a sporadically occurring form, apparently always occurring in small numbers associated with typic material; McCoy (2004) reports its collection in NC. [= Pa; = *Cimicifuga racemosa* (Linnaeus) Nuttall – RAB, C, F, FNA, S, W; >> *C. racemosa* var. *cordifolia* (Pursh) Gray – F, misapplied in part; > *C. racemosa* var. *racemosa* – F; < *C. racemosa* – G (also see *C. rubifolia*); > *Actaea racemosa* Linnaeus var. *racemosa* – K, Z; > *Actaea racemosa* Linnaeus var. *dissecta* (A. Gray) J. Compton – K, Z]

*Actaea rubifolia* (Kearney) Kartesz, Appalachian Black-cohosh. Rich cove forests over calcareous rocks (limestone or dolostone). August-October. Sw. VA south to e. TN; disjunct in s. IL, w. KY, and nw. TN. This species is alleged by C (1991) to occur in NC, but this is probably an error, based on confusion with *Cimicifuga cordifolia* Pursh, now considered a form of *Actaea racemosa*. For this reason, the name *Actaea cordifolia* used by Compton, Culham, & Jury (1998) does not apply to this taxon. *Actaea rubifolia* is related to *Actaea elata* (Nuttall) Prantl of nw. North America. [= K; = *Cimicifuga rubifolia* Kearney – C, FNA, S, W; >> *C. racemosa* var. *cordifolia* (Pursh) A. Gray – F, misapplied in part; < *C. racemosa* – G; = *Actaea cordifolia* A.P. de Candolle – Z, misapplied]

*Actaea rubra* (Aiton) Willdenow, Red Baneberry. Moist forests. May-June. Circumboreal, in e. North America to ec. NJ (Monmouth Co.), sc. PA (Rhoads & Klein 1993; Rhoads & Block 2007), OH, IN, IL, IA, and ne. KS. [= C, F, FNA, G, Pa, Z; > *A. rubra* ssp. *rubra* – K]

**14. *Caltha* Linnaeus 1753 (Marsh Marigold, Cowslip)**

A genus of about 12 species, perennial herbs, of the Northern and Southern Hemispheres (sometimes further divided). References: Ford in FNA (1997); Tamura in Kubitzki, Rohwer, & Bittrich (1993).

*Caltha palustris* Linnaeus var. *palustris*, Marsh Marigold, Cowslip. Bogs, wet meadows, seepage swamps, brookbanks. April-June. *Caltha palustris* is circumboreal, widespread in n. Eurasia and n. North America, south in e. North America to e. VA, w. NC, ne. TN, WV, IN, IL, IA, and NE. *Caltha palustris* is polymorphic; one or more additional varieties (some of them sometimes recognized as separate species) are more northern. Eastern North American material is apparently uniformly 2n=32 (Keener 1977). [= G, GW, K; < *C. palustris* – C, F, FNA, Pa, RAB, S, W; *C. palustris* var. *flabellifolia* (Pursh) Torrey & A. Gray]



**15. *Anemone* Linnaeus 1753 (Anemone)**

A genus of about 140-200 species (depending on circumscription), perennial herbs (rarely shrubs), of Eurasia, North America, Central America, South America, and Africa. Hoot, Reznicek, & Palmer (1994) discuss the phylogeny of *Anemone*, and also suggest that *Hepatica* be included within it. References: Dutton, Keener, & Ford in FNA (1997); Keener, Dix, & Dutton (1996); Tamura in Kubitzki, Rohwer, & Bittrich (1993); Steyermark & Steyermark (1960)=Z; Ziman et al. (2004)=Y.

- 1 Basal leaves lobed but not fully divided into 3 or more leaflets; [subgenus *Anemonidium*].
- 2 Leaves lobed, and also toothed and variously cleft; leaves not variegated; [section *Anemonidium*].....*A. canadensis*
- 2 Leaves lobed, the margins of the lobes entire; leaves often prominently variegated; [section *Hepatica*].
- 3 Leaves 3 (-7) lobed, the lobes acute, the primary sinuses deep, over halfway to the petiole (the middle lobe 70-90% of the total length of the leaf blade); involucre 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); involucre 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; involucre bracts petiolate; [subgenus *Anemone*; section *Anemone*; group *Multifida*].
  - 5 Base of involucre 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 involucre 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; involucre 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; involucre 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; involucre leaflets oblanceolate, 1-2.5 cm long, {width}; achene bodies < 1.5-2.5 (-3.0) mm long..... **A. caroliniana**
- 6 Sepals 5 (-8), white; involucre leaves petiolate, the leaflets ovate, obovate, elliptic, lanceolate, or oblanceolate 2-8 cm long, 8-30 mm wide; [subgenus *Anemonanthea*, section *Anemonanthea*, series *Quinquefoliae*].
  - 8 Ovaries and achenes with hairs 0.1-0.2 mm long; terminal leaflet broadest at or below the middle (lanceolate or ovate), serrate to below the middle; sepals 15 mm or more long ..... **A. lancifolia**
  - 8 Ovaries and achenes with hairs 0.5-1.0 mm long; terminal leaflet broadest at or above the middle (elliptic, oblanceolate, or obovate), serrate only above the middle; sepals < 15 mm long.
    - 9 Achene bodies 2.5-3.0 mm long; lateral leaflets of radical leaves toothed only (rarely lobed); terminal leaflet usually broadest at the middle; styles 0.5-1 mm long; sepals about 8 mm long..... **A. minima**
    - 9 Achene bodies 3.0-4.5 mm long; lateral leaflets of radical leaves lobed or cleft (sometimes only toothed); terminal leaflet usually broadest above the middle; styles 1-2 mm long; sepals 6-15 mm long..... **A. quinquefolia**

**Anemone acutiloba** (A.P. de Candolle) G. Lawson, Sharp-lobed Hepatica, Sharp-lobed Liverleaf. Moist forests, especially over calcareous or mafic rocks. March-April. ME, s. QC, s. ON, and MN south to SC, AL, MS, and AR. See comments under *A. americana* about the taxonomy of the two taxa of "Hepatica." [= FNA, Pa; = *Hepatica acutiloba* A.P. de Candolle – RAB, C, F, G, W, WV; = *Hepatica nobilis* P. Miller var. *acuta* (Pursh) Steyermark – K, Z; = *Hepatica acuta* (Pursh) Britton – S]

**Anemone americana** (A.P. de Candolle) H. Hara, Round-lobed Hepatica, Round-lobed Liverleaf. Moist forests. February-May. NS, s. QC, s. ON, and MB south to Panhandle FL, AL, MS, and AR. The two taxa of "Hepatica" seem entirely distinct in our area; they are described as hybridizing freely or merging indistinguishably in other parts of their ranges. They are also both closely related to the European *H. nobilis* P. Miller. Steyermark & Steyermark (1960) chose to treat the three entities as varieties of *H. nobilis*; I prefer to retain them at the specific level. [= FNA, Pa, WH; = *Hepatica americana* (A.P. de Candolle) Ker-Gawler – RAB, C, F, G, W, WV; = *Hepatica nobilis* P. Miller var. *obtusata* (Pursh) Steyermark – K, Z; < *Hepatica hepatica* (Linnaeus) Karsten – S]

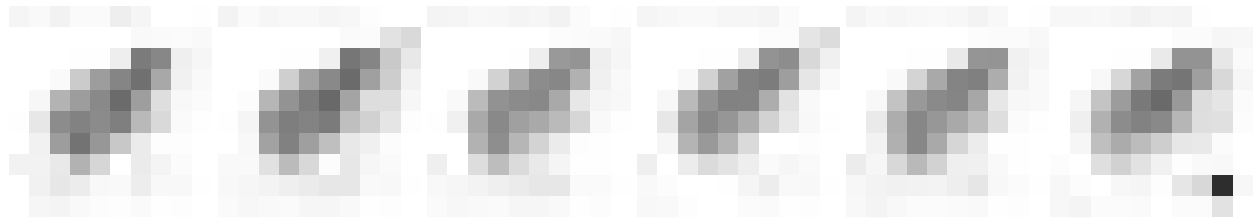
**Anemone berlandieri** Pritzell, Eastern Prairie Anemone, Ten-petal Anemone. Thin, circumneutral soils around rock outcrops, calcareous glades, calcareous hammocks (in FL). March-April. *A. berlandieri* and *A. caroliniana* have been much confused in floras; see Joseph & Heimbürger (1966) for clarification. *A. berlandieri* is primarily a species of midwestern prairies, occurring from n. AR and s. KS south through OK to c. LA and s. TX; disjunct eastward in AL, c. GA, n. FL, c. NC, c. SC, and sc. VA. It reaches its northeastern limit (and only VA occurrence) at calcareous mudstone cliffs on the Banister River in Pittsylvania County, VA; it is scattered in the Piedmont of NC on a variety of rock types, including mafic meta-argillite and plagioclase-rich granite. [= FNA, K, WH; < *A. caroliniana* Walter – RAB, C, F, G, S, W; ? *A. heterophylla* Nuttall ex Torrey & Gray; < *A. decapetala* Arduino, misapplied (a South American species)]

\* *Anemone blanda* Schott & Kotschy, Greek Anemone. Reported by Harvill et al. (1992) from Madison County, VA and for Fauquier County, VA by Shetler & Orli {}. It is not known whether this species is established in our area. {make sure this is not a misidentified specimen of *A. berlandieri* – see FNA p. 140} [= FNA, K] {not yet keyed; not mapped; rejected}

**Anemone canadensis** Linnaeus, Canada Anemone. Moist forests. May-August. QC west to AB, south to MD, w. VA, s. WV, e. TN (Chester, Wofford, & Kral 1997), KY, MO, and NM. [= C, F, FNA, G, K, Pa, W]

**Anemone caroliniana** Walter, Prairie Anemone, Carolina Anemone. Clayey soils of post oak and blackjack oak woodlands (Iredell soils), wet meadows. Ranging primarily in the Midwest, north in the Southeast to disjunct locations in c. and sc. GA, c. SC, c. TN (Chester, Wofford, & Kral 1997), and sc. NC. [= FNA, K; < *A. caroliniana* Walter – RAB, C, F, G, S, W (also see *A. berlandieri*)]

**Anemone lancifolia** Pursh, Lanceleaf Anemone. Rich, moist soils on slopes or in bottomlands. March-May. Appalachian: VA south to GA (?), in and near the Appalachians. It is a somewhat larger plant than the closely related *A. quinquefolia*. [= RAB, C, F, FNA, G, K, S, W; = *A. quinquefolia* var. *lancifolia* (Pursh) Fosberg]



**Anemone minima** A.P. de Candolle, Tiny Anemone. Acidic forests, especially under *Alnus serrulata* along small streams. March-May. A Southern Appalachian endemic: VA and WV south to NC and TN. See Dutton & Keener (1994). [= *C. F. G. W.*; = *Anemone quinquefolia* Linnaeus var. *minima* (A.P. de Candolle) Frodin ex Dutton & Keener – FNA, K; = *A. minima* A.P. de Candolle – C, F, G, W]

**Anemone quinquefolia** Linnaeus, Wood Anemone. Rich, moist forests, grassy balds, often abundant at high elevations. March-May. NL, QC, ON, MB, SK, and AB south to SC, GA, AL, MS, AR, and SD. [= *A. quinquefolia* var. *quinquefolia* – FNA; = *A. quinquefolia* – RAB, Pa, 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. *alba* (Oakes) A. Wood. This variety 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] {not mapped}

**Anemone virginiana** Linnaeus var. *virginiana*, Tall Anemone, Thimbleweed. Rich forests and woodlands, especially prevalent on circumneutral soils. May-July. NL (Newfoundland), ME, s. ON, and SK, south to GA, AL, MS, LA, OK, and WY. Two other varieties are more northern; see discussion of var. *alba* above. [= *C. FNA, K*; < *A. virginiana* – Pa, RAB, W; = *A. virginiana* – F, G, S; > *A. virginiana* – S; > *A. riparia* Fernald – S, misapplied]

**16. Clematis** Linnaeus 1753 (Clematis, Virgin's-bower)

A genus of about 295 species, shrubs, vines, and suffruticose herbs, of Eurasia, North America, South America, Africa, Madagascar, and Oceania. W.A. Weber (1995) proposes generic status (as *Coriflora* W.A. Weber) for the leatherflowers, here treated as *Clematis*, subgenus *Viorna*. References: Pringle in FNA (1997); Moreno & Essig in FNA (1997); Essig (1990); Keener (1975); Keener (1967); Pringle (1971)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** Additional species of *Clematis*, of Asian or European origin, are cultivated as ornamentals and might be encountered.

- 1 Flowers numerous, in compound cymose-paniculate inflorescences; sepals white; filaments glabrous; [subgenus *Clematis*].
  - 2 Flowers perfect, with 5-10 carpels; anthers 1.5-3 mm long; leaf margins entire (rarely cleft); leaflets (3-) 5 (-7); [alien, in disturbed areas]..... *C. terniflora*
  - 2 Flowers mostly polygamo-dioecious, the pistillate with 18-60 carpels; anthers 0.5-1 mm long; leaf margins coarsely toothed; leaflets 3 (*C. virginiana*) or 5-7 (*C. catesbyana*); [native, though sometimes weedy].
    - 3 Leaves 3-foliolate; pistillate flowers with 40-60 carpels..... *C. virginiana*
    - 3 Leaves (3-) 5-7-foliolate; pistillate flowers with 18-35 carpels..... *C. catesbyana*
- 1 Flowers solitary or in groups of 3's; sepals usually at least partly bluish, purplish or red; filaments pubescent.
  - 4 Leaves (most or all of them) simple, sessile or subsessile; plant an erect herb to 7 dm tall; [subgenus *Viorna*].
    - 5 Leaves glaucous and glabrous beneath, the uppermost commonly pinnate and tendril-bearing..... *C. addisonii*
    - 5 Leaves green and usually pubescent beneath (glabrous in *C. baldwinii*), the uppermost usually simple and entire, neither pinnate nor tendril-bearing (though occasionally lobed).
      - 6 Leaves of flowering material soft-pubescent beneath, the largest 3-9 cm wide, with stomates on the lower surface only; leaves of fruiting material usually light green with the secondary and tertiary veins forming prominent reticulations on the upper surface.
        - 7 Stems and leaves usually densely sericeous-woolly; sepal backs densely sericeous; mature styles white to pale yellow, sharply recurved and flexuous; [of shale barrens and calcareous woodlands of w. VA]..... *C. coactilis*
        - 7 Stems and leaves villous; sepal backs moderately sericeous-pilose; mature styles yellowish-white to deep tawny, loosely spreading-recurved; [of various woodlands, fairly widespread in our area]..... *C. ochroleuca*
      - 6 Leaves of flowering material glabrous to sparsely pilose beneath, the largest 2-5 cm wide (or 3.5-11 cm wide in *C. fremontii*), with stomates on both surfaces; leaves of fruiting material often dark green, either with the secondary and tertiary veins forming prominent reticulations on the upper surface (*C. fremontii*) or the upper with the secondary and tertiary veins not forming prominent reticulations on the upper surface (*C. albicoma*, *C. viticaulis*, and *C. baldwinii*).
        - 8 Sepal tips acuminate; achene bodies cobwebby-tomentose toward the tip (*C. fremontii*) or long pilose (*C. baldwinii*)
          - 9 Leaf blades 0.2-2.5 (-3.5) cm wide, not notably reticulate on the upper surface; beak of the achene plumose with long hairs; [of wet pinelands of n. FL southward]..... *C. baldwinii*
          - 9 Leaf blades 3.5-11 cm wide, prominently reticulate on the upper surface; beak of the achene silky tomentose near the base, nearly glabrous 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].
          - 10 Sepal backs villous; pubescence on the summit of the achene and the base of the style spreading or reflexed; mature styles white to pale yellow, sharply recurved and flexuous..... *C. albicoma*
          - 10 Sepal backs finely puberulent; pubescence on the summit of the achene and the base of the style closely appressed-ascending; mature styles tawny to deep reddish-brown, loosely spreading-recurved..... *C. viticaulis*
  - 4 Leaves (most of them) compound, petiolate; plant a trailing or climbing vine, to many meters long (or erect or ascending in *C. addisonii* and *C. socialis*).
    - 11 Sepals thin in texture, 3-5 cm long, soft-villous, neither apically recurved nor with broad, strongly crisped margins; leaves 3-foliolate; [subgenus *Atragene*]..... *C. occidentalis* var. *occidentalis*
    - 11 Sepals thick in texture, 1-5 cm long, short-sericeous, apically recurved; leaves 1-11-foliolate; [subgenus *Viorna*].
      - 12 Lower surface of leaves glaucous and glabrous (rarely with a few scattered hairs).
        - 13 Plant an erect or ascending herb; lower leaves simple, upper leaves simple to 2-6-foliolate; [of dry limestone glades, endemic to VA]..... *C. addisonii*
        - 13 Plant a climbing vine; all leaves generally compound, often 6-10-foliolate; [of various habitats, ranging from NC south].
          - 14 Leaf blade thin in texture; secondary and tertiary veins not prominently reticulate..... *C. glaucophylla*
          - 14 Leaf blade leathery in texture; secondary and tertiary veins prominently reticulate; [in the Ridge and Valley of eastern TN and westward]..... *C. versicolor*
      - 12 Lower surface of leaves not glaucous, pubescent (rarely nearly glabrous).

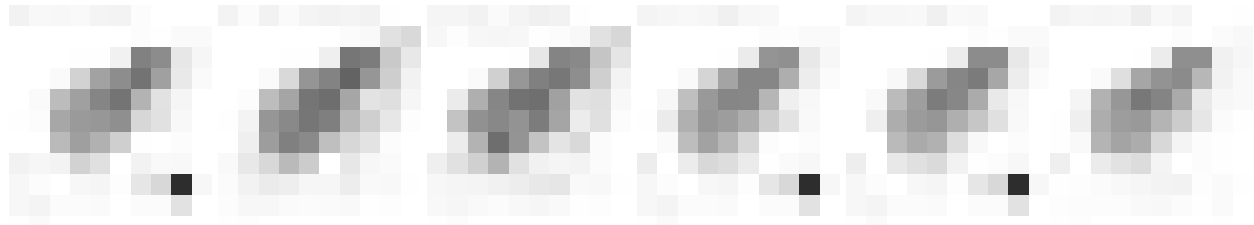


- 15 Plants erect, to 2-3 (-5) dm tall, forming clonal patches by underground rhizomes; leaflets linear-lanceolate, averaging ca. 10× as long as wide ..... *C. socialis*
- 15 Plants viny, sprawling or climbing, the stems usually over 1 m long, not rhizomatous-clonal; leaflets generally broader.
- 16 Leaves coriaceous, the secondary and tertiary veins forming prominent reticulations on the upper surface.
  - 17 Leaf blade coarsely reticulate-veined, the ultimate closed areoles often > 2 mm long in the longer dimension, the tertiary and quaternary veins not prominently raised; achene beak sparsely pubescent to silky, with ascending or appressed hairs ..... *C. pücheri* var. *pücheri*
  - 17 Leaf blade finely reticulate-veined, the ultimate closed areoles mostly < 2 mm long in the longest dimension, the tertiary and quaternary veins often prominently raised; achene beak plumose, with spreading hairs..... *C. reticulata*
- 16 Leaves membranous, the secondary and tertiary veins forming faint, indistinct reticulations on the upper surface.
  - 18 Sepals 2.5-5 cm long, the tips widely spreading, the upper margins thin, crisped, to 6 mm wide; peduncles usually without bracts..... *C. crispa*
  - 18 Sepals 1.5-3 cm long, the tips either abruptly and shortly recurved (*C. viorna*) or spreading to short-reflexed (*C. morefieldii*), the upper margins not thin or crisped, to 2.5 mm wide; peduncles usually with bracts.
    - 19 Stems with cobwebby pubescence; bracts near the base of the peduncle; sepals densely silky-pubescent on the outer surface, pinkish-green; [limestone habitats of n. AL and se. TN] ..... *C. morefieldii*
    - 19 Stems glabrous to sparsely pilose; bracts well above the base of the peduncle; sepals sparsely pubescent on the outer surface, pale lavender to purple; [widespread in our area] ..... *C. viorna*

***Clematis addisonii*** Britton, Addison's Leatherflower. Dry to mesic calcareous barrens, woodlands, and forests, over dolostone (Elbrook Formation). April-June. Endemic to w. VA (Botetourt, Montgomery, Roanoke, and Rockbridge counties). [= C, F, FNA, G, K, W; = *Viorna addisonii* (Britton) Small - S; = *Coriflora addisonii* (Britton) W.A. Weber]

***Clematis albicoma*** Wherry, White-haired Leatherflower. Shale barrens. May-June. Endemic to w. VA (Alleghany, Augusta, Bath, Botetourt, Highland, and Rockbridge counties), and e. WV. [= C, FNA, G, K, W; = *Clematis albicoma* var. *albicoma* - F; = *Coriflora albicoma* (Wherry) W.A. Weber]

***Clematis baldwinii*** Torrey & A. Gray, Pine-hyacinth, Flatwood Clematis. Wet pine flatwoods. April-August. Ne. FL south to s. FL. [= FNA, GW, WH; > *Clematis baldwinii* var. *baldwinii* - K2; > *Clematis baldwinii* var. *latiuscula* R.W. Long - K2; = *Viorna baldwinii* (Torrey & A. Gray) Small - S; = *Coriflora baldwinii* (Torrey & A. Gray) W.A. Weber] {not yet keyed}



***Clematis catesbyana*** Pursh, Coastal Virgin's-bower, Satin-curles. Dunes and interdune swales with abundant shell hash, calcareous woodlands and thickets, calcareous hammocks. July-September. Se. VA south to c. peninsular FL and west to LA, and inland especially in calcareous parts of c. KY, c. TN and n. AR and s. MO, as well as in the Ridge and Valley of VA and disjunct at Linville Caverns, McDowell County, NC, where on dolomite in a geologic window in the Blue Ridge. [= C, FNA, GW, K, WH; < *Clematis ligusticifolia* Nuttall - RAB, misapplied; > *Clematis catesbyana* - S; > *Clematis micrantha* Small - S]

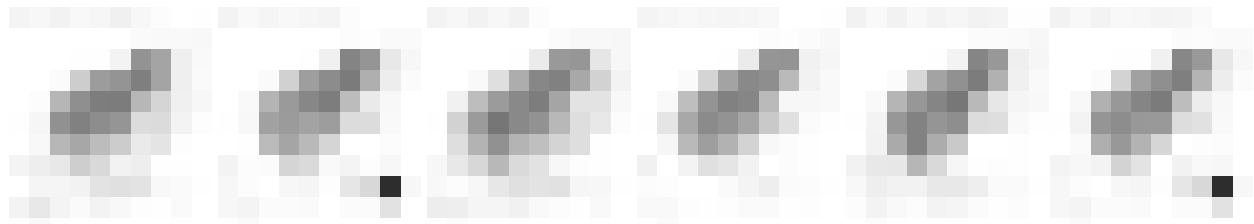
***Clematis coactilis*** (Fernald) Keener, Virginia White-haired Leatherflower. Shale barrens, shaly woodlands, dry calcareous barrens and woodlands. May-June. Endemic to w. VA (Botetourt, Craig, Giles, Montgomery, Pulaski, Roanoke, and Wythe counties). [= C, FNA, K, W; = *Clematis albicoma* Wherry var. *coactilis* Fernald - F; = *Coriflora species 1*]

***Clematis crispa*** Linnaeus, Marsh Clematis, Southern Leatherflower, Blue Jasmine. Marshes, swamps, floodplain forests, disturbed wet or moist areas. April-August. Widespread in Southeastern United States, FL to TX, north to se. VA and s. IL. [= RAB, C, F, FNA, G, GW, K, W, WH; = *Viorna crispa* (Linnaeus) Small - S; = *Coriflora crispa* (Linnaeus) W.A. Weber]

***Clematis fremontii*** S. Watson. Calcareous flatwoods and limestone glades. E. MO, s. MO, nc. KS and sc. NE; disjunct in the Ridge and Valley of nw. GA (Floyd County) and se. TN (Hamilton County). See Anonymous (2003) and Horn & Shaw (2007) for additional information. [= FNA, K; = *Coriflora fremontii* (S. Watson) W.A. Weber]

***Clematis glaucophylla*** Small, White-leaved Leatherflower. Wet hammocks, habitat in our area poorly known, also probably in dry woodlands or openings over calcareous rocks, according to RAB in "rich woods". May-September. Widespread in Southeastern United States, from se. TN and OK, south to FL Panhandle and LA, but apparently rare and poorly known. Previous attributions of this species for NC, SC, KY, and (perhaps) VA appear to be based on misidentifications. [= RAB, C, F, FNA, G, GW, K, WH; = *Viorna glaucophylla* (Small) Small - S; = *Coriflora glaucophylla* (Small) W.A. Weber]

***Clematis morefieldii*** Kral, Morefield's Leatherflower. Limestone habitats. Endemic to nc. AL and se. TN. See Estes & Fleming (2006) for additional information. [= FNA, K; = *Coriflora morefieldii* (Kral) W.A. Weber]



***Clematis occidentalis*** (Hornemann) A.P. de Candolle var. ***occidentalis***, Purple Clematis, Mountain Clematis. Rocky slopes over mafic rocks (greenstone, amphibolite), known positively in NC only from amphibolite peaks in Ashe County. May-June. Var. *occidentalis* is widespread in ne. North America, from NB west to w. ON, south to NJ, DE, OH, nw. IL, and ne. IA, and in the mountains to w. VA and w. NC. Two other varieties occur in the Rocky Mountains. Fernald's var. *cacuminis*, published under *C. verticillaris*, described plants from the mountains of VA and NC; it is apparently merely a form based on material in early flower (Pringle 1971). [= FNA, K, Pa; < *Clematis verticillaris* A.P. de Candolle – RAB, G; < *Clematis occidentalis* – C, W; > *Clematis verticillaris* var. *verticillaris* – F; > *Clematis verticillaris* A.P. de Candolle var. *cacuminis* Fernald – F; < *Atragene americana* Sims – S]

***Clematis ochroleuca*** Aiton, Curlyheads. Dry woodlands and woodland borders, generally over mafic or calcareous rocks, such as diabase, gabbro, or calcareous siltstone. April-June. Primarily Piedmont: C. MD south to ec. GA; disjunct on Long Island, NY. [= RAB, C, F, FNA, G, K, W; = *Viorna ochroleuca* (Aiton) Small – S; = *Coriflora ochroleuca* (Aiton) W.A. Weber]

***Clematis pitcheri*** Torrey & A. Gray var. ***pitcheri***, Bellflower Leatherflower. Limestone glades and barrens. April-October. IN, IL, IA, and e. NE south to w. KY, c. TN, ne. MS, AR, TX, and NM. [= FNA, K; < *Viorna pitcheri* (Torrey & A. Gray) Britton – S]

***Clematis reticulata*** Walter. Dry, sandy woodlands, such as longleaf pine sandhills and dry hammocks. May-August. Se. SC south to c. peninsular FL, west to TX, and north in the interior to TN and AR. [= RAB, FNA, K, WH; = *Viorna reticulata* (Walter) Small – S; = *Coriflora reticulata* (Walter) W.A. Weber]

***Clematis socialis*** Kral, Alabama Leatherflower. Wet calcareous flatwoods. Nw. GA (Floyd Co.) and ne. AL (St. Clair and Cherokee counties). Timmerman-Erskine & Boyd (1999) report on reproductive ecology of this endangered species; Goertzen & Boyd (2007) on its genetic diversity. [= FNA, K]

\* ***Clematis terniflora*** A.P. de Candolle, Sweet Autumn Clematis, Yam-leaved Clematis. Disturbed areas; native of e. Asia (Japan, China, Korea). July-September. [= C, FNA, GW, K, Pa, W, WH; ? *Clematis dioscoreifolia* Léveillé & Vaniot – RAB; > *Clematis dioscoreifolia* Léveillé & Vaniot var. *robusta* Carrière & Rehder – F; ? *Clematis paniculata* Thunberg – S; ? *Clematis maximowicziana* Franchet & Savatier]



***Clematis versicolor*** Small ex Rydberg, Pale Leatherflower. Calcareous barrens. June-August. Sc. KY, c. TN, nc. AL; Ozarks and Ouachitas of s. MO, n. and c. AR, and e. OK south into e. TX. [= FNA, K; = *Viorna versicolor* (Small ex Rydberg) Small – S; = *Coriflora versicolor* (Small ex Rydberg) W.A. Weber]

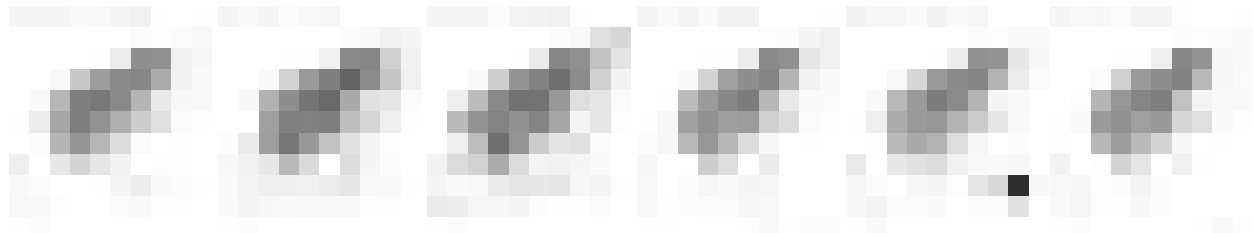
***Clematis viorna*** Linnaeus, Northern Leatherflower, Vase-vine. Mesic forests, woodlands, thickets, especially over mafic rocks. May-September. PA, IL, and MO south to GA, AL, MS, and AR. [= C, F, FNA, G, K, Pa, RAB, W; > *Viorna viorna* (Linnaeus) Small – S; > *Viorna beadlei* Small – S; > *Viorna flaccida* (Small) Small – S; > *Viorna gattingeri* (Small) Small – S; > *Coriflora viorna* (Linnaeus) W.A. Weber; > *Coriflora beadlei* (Small) W.A. Weber]

***Clematis virginiana*** Linnaeus, Virgin's-bower. Moist forests, thickets, and openings. July-September. Noca Scotia, ON and MB, south to c. peninsular FL and TX. Vegetatively, this species can be distinguished from *C. viorna* and *C. crispa* (the other common and widespread species in our area) by its leaves with three relatively symmetrical leaflets (vs. leaves with 3-many irregular leaflets). [= RAB, C, F, FNA, GW, K, Pa, S, W; ? *C. virginiana* var. *virginiana* – G]

\* ***Clematis vitalba*** Linnaeus, Traveler's Joy. Disturbed areas, persistent after cultivation; native of e. Asia. Reported for Baltimore County, MD (Kartesz 2010). [= FNA, K2] {not yet keyed}

***Clematis viticaulis*** Steele, Millboro Leatherflower. Shale barrens and shaly woodlands. May-June. Endemic to w. VA (Bath and Rockbridge counties). [= C, F, FNA, G, K, W; = *Coriflora viticaulis* (Steele) W.A. Weber]

\* ***Clematis viticella*** Linnaeus, Italian Clematis. Disturbed areas, persistent after cultivation; native of Europe. Reported for TN (Pringle in FNA 1997). [= FNA, K; *Viticella viticella* (Linnaeus) Small] {not yet keyed}



**17. *Trautvetteria*** Fischer & C.A. Meyer 1835 (Tassel-rue)  
[contributed by Aaron J. Floden and Alan S. Weakley]

A genus of 4-6 closely related species, perennial herbs, disjunctly distributed in temperate to boreal e. North America, w. North America, and Japan. References: Parfitt in FNA (1997); Floden (2011)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993); Johansson (1998).

1 Basal leaves deeply (over halfway to nearly all the way to the petiole) 5-9-lobed, the lobes oblanceolate, membranous (to fairly stiff when growing in an exposed setting), each lobe further divided into 2-4 lobules, the margin irregularly serrate, the venation not highly reticulate; cauline leaves 3-7-lobed; [rather widespread in our area]..... ***T. carolinensis***

- 1 Basal leaves shallowly (less than halfway to the petiole) 3 (-5)-lobed, thickly chartaceous and stiff, lobes round/deltoid, outer lobes usually shallowly 1-lobed, margin regularly crenate/dentate, venation highly reticulate; cauline leaves unlobed to shallowly 3-5-lobed, lobes deltoid; [endemic to Ridge and Valley of TN].....*T. species 1*

***Trautvetteria caroliniensis*** (Walter) Vail, Tassel-rue, False Bugbane. Streambanks, seepages, grassy balds, moist forests, swamp forests, very rarely in calcareous longleaf pine savanna ecotones. Late May-July. Sw. PA and KY to GA, AL, and Panhandle FL, primarily in the Southern and Central Appalachians, disjunct on calcareous sites in AR (Sundell et al. 1999), e. TX (Floden 2011), IN, IL, and MO. The discovery of this species in the edge of a calcareous savanna (Camp Branch Savanna, Brunswick County, NC) in the outer Coastal Plain was surprising; the small population has since apparently been destroyed by intensive silvicultural practices. *T. nervata* Greene, named from the Coastal Plain of s. GA, needs additional evaluation (Floden 2011); the type specimen is striking in its deeply and multiply divided leaf segments. [= G, S, Z; < *T. caroliniensis* – RAB, F, FNA, GW, Pa, W, WV; = *T. caroliniensis* var. *caroliniensis* – C, K; > *T. nervata* Greene

***Trautvetteria species 1***. Dolomitic fens. Endemic (so far as known) to Claiborne County, ne. TN.

**18. *Ficaria* Schaeffer 1760 (Lesser Celandine)**

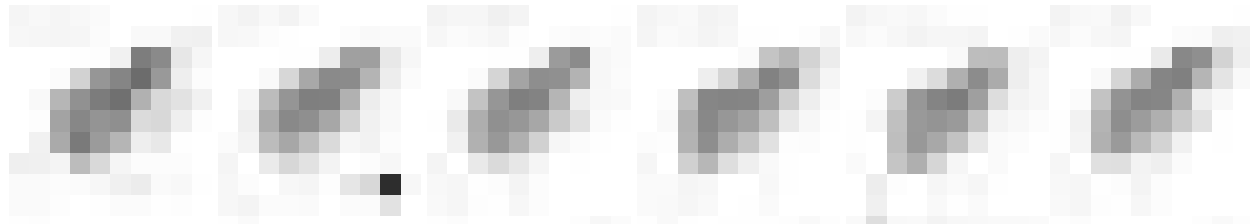
A genus of about 5 species, herbs, or Europe west to c. Asia. Best treated as a genus separate from *Ranunculus*, based on morphology and molecular phylogenetics; *Myosurus* is (for instance) more closely related to *Ranunculus* than is *Ficaria* (Paun et al. 2005; Emadzade et al. 2010). Post et al. (2009) analyze the presence in North America of the various infrataxa recognized in Europe and find evidence that all are naturalizing. The species is reported to be developing into a seriously invasive species in ne. United States and adjacent Canada (Axtell, DiTommaso, & Post 2010). References: Sell (1994)=Z; Stace (2010)=Y; Paun et al. (2005).

- 1 Leaves up to 8 cm long and 9 cm wide; petioles up to 28 cm long; petals 17-26 mm long, 4-15 (-18) mm wide; achenes 3-5 mm long, 2-3.5 mm wide.
- 2 Stem robust and erect; bulbils absent in leaf axils after flowering; petals 9-15 (-18) mm wide.....*F. verna* ssp. *chrysocephala*
- 2 Stem rather robust, but straggling; bulbils present in leaf axils after flowering; petals 4-12 mm wide.....*F. verna* ssp. *ficariiformis*
- 1 Leaves up to 4 cm long and 4 cm wide; petioles up to 15 cm long; petals 6-20 mm long, 2-9 mm wide; achenes 2.5-3.5 mm long, 1.7-2.2 mm wide.
- 3 Leaves crowded at base with few on short stems; petiole to 10 cm long; petals 2.5-6 mm wide.....*F. verna* ssp. *calthifolia*
- 3 Leaves less crowded at base and more numerous on the elongating stem; petiole to 15 cm long (at least some on a plant > 10 cm long); petals 2-9 mm wide.
- 4 Bulbils not present in leaf axils after flowering; achenes well-developed; petals 4-9 mm wide.....*F. verna* ssp. *fertilis*
- 4 Bulbils present in leaf axils after flowering; achenes poorly developed (rarely fertile, and then only several per flower); petals 2-5 mm wide.....*F. verna* ssp. *verna*

\* ***Ficaria verna* Hudson ssp. *calthifolia*** (Reichenbach) Nyman. Disturbed rich forests and bottomlands, mesic suburban forests, lawns, naturalized locally from horticultural plantings; native of ec. and se. Europe. Naturalized in the US in CT, DE, DC, IL, KY, MD, MA, MI, MO, NJ, NY, OH, OR, PA, TN, VA, WA, WV, WI (Post et al. 2009). [< *Ranunculus ficaria* Linnaeus – C, F, FNA, G, Pa, WV; < *R. ficaria* var. *bulbifera* Marsden-Jones – K; = *Ranunculus ficaria* Linnaeus ssp. *calthifolius* (Reichenbach) Arcangeli – Z]

\* ***Ficaria verna* Hudson ssp. *chrysocephala*** (P.D. Sell) Stace. Disturbed areas; native of e. Mediterranean Europe. Naturalized in the US in MD, NY, OR, WA (Post et al. 2009). [= Y; < *Ranunculus ficaria* Linnaeus – C, F, FNA, G; < *R. ficaria* var. *bulbifera* Marsden-Jones – K; = *Ranunculus ficaria* Linnaeus ssp. *chrysocephalus* P.D. Sell – Z]

\* ***Ficaria verna* Hudson ssp. *fertilis*** (Lawralrée ex Laegaard) Stace. Disturbed areas; native of w. Europe. Naturalized in the US in DC, IL, MD, MA, NY, PA, WA, WV (Post et al. 2009). [= Y; < *Ranunculus ficaria* Linnaeus – C, F, FNA, G, Pa; < *R. ficaria* var. *bulbifera* Marsden-Jones – K; = *Ranunculus ficaria* Linnaeus ssp. *ficaria* – Z]



\* ***Ficaria verna* Hudson ssp. *ficariiformis*** (F.W. Schultz) B. Walln. Disturbed rich forests and bottomlands, mesic suburban forests, lawns, naturalized locally from horticultural plantings; native of c. and w. Mediterranean Europe. First reported for NC by Krings et al. (2005). Naturalized in the US in MO, NY, NC, OH, PA, TX (Post et al. 2009). [= Y; < *Ranunculus ficaria* Linnaeus – C, F, FNA, G, Pa; < *R. ficaria* var. *bulbifera* Marsden-Jones – K; = *Ranunculus ficaria* Linnaeus ssp. *ficariiformis* (F.W. Schultz) Rouy & Fouc. – Z]

\* ***Ficaria verna* Hudson ssp. *verna***. Disturbed rich forests and bottomlands, mesic suburban forests, lawns, naturalized locally from horticultural plantings; native of Europe. Naturalized in the US in CT, DC, DE, MA, MD, MI, MO, NH, NJ, NY, OH, OR, PA, VA, WA, WV (Post et al. 2009). [= Y; < *Ranunculus ficaria* Linnaeus – C, F, FNA, G, Pa, WV; < *R. ficaria* var. *bulbifera* Marsden-Jones – K; = *Ranunculus ficaria* Linnaeus ssp. *bulbilifer* Lambinon – Z]

**19. *Myosurus* Linnaeus 1753 (Mousetail)**

A genus of about 15 species, annual scapose herbs, nearly cosmopolitan (lacking in e. Asia and tropical regions), with a center of diversity in w. North America. References: Whittemore in FNA (1997); Campbell (1952)=Z; Tamura in Kubitzki, Rohwer, & Bittrich (1993).

*Myosurus minimus* Linnaeus, Mousetail. Usually in disturbed areas, such as fields in floodplains. March-May. The species is circumboreal and also found in various places in the Southern Hemisphere. Widely distributed in North America, Eurasia, and the Southern Hemisphere. A number of subspecies have been described; if these are recognized, our material is the typic ssp. *minimus*. The pre-Columbian occurrence of *Myosurus* in our area is uncertain; it may well be an alien, early introduced from sc. North America. [= RAB, C, F, FNA, G, GW, K, S; > *M. minimus* ssp. *minimus* – Z]

**20. *Ranunculus* Linnaeus 1753 (Buttercup, Crowfoot, Spearwort)**

A genus of about 600 species, perennial and annual herbs, nearly cosmopolitan (most diverse in temperate and boreal regions of the Northern Hemisphere). The subgenera are distinctive and have often been recognized at the generic level; two are represented in our area (after removal of *Ficaria* as a separate genus). Distributions given in many works (including Harvill et al. 1992) for the *R. hispidus* complex are apparently garbled by differences in taxonomic concepts. I am here following Duncan's (1980) taxonomic entities, though recognizing some of his varieties as species. References: Whittemore in FNA (1997); Duncan (1980)=Z; Keener (1976)=Y; Keener & Hoot (1987)=X; Paun et al. (2005); Tamura in Kubitzki, Rohwer, & Bittrich (1993). Keys adapted, in part, from C, GW, X, Y, and Z. [also see *Ficaria*]

**Identification notes:** Mature or relatively mature achenes are necessary for the identification of some species. Shape and pubescence of the receptacle is also a frequently used taxonomic character, best judged by stripping off the achenes.

- 1 Petals dull, white; achenes roughly transverse-ridged; plants aquatic, the leaves finely dissected to merely shallowly lobed; [native, occurring in circumneutral waters]; [subgenus *Batrachium*] ..... **Key A**
- 1 Petals shiny, yellow (sometimes fading or bleaching to whitish); achenes usually not transverse-ridged (though often variously ornamented); plants aquatic or terrestrial, the leaves various; [native or introduced, occurring in various habitats]; [subgenus *Ranunculus*].
- 2 Cauline leaves all simple, mostly lanceolate, either entire, denticulate, or serrate, but not lobed or deeply divided; [native, occurring in marshes or other wetlands]; [section *Flammula*] ..... **Key B**
- 2 Cauline leaves (at least most them) lobed, divided, or compound; [native or introduced, occurring in various habitats].
- 3 Basal leaves not divided, mostly cordate, reniform, or ovate (and merely toothed), distinctly unlike the deeply divided cauline leaves; achenes turgid, ovoid, 1-2.5 mm long, without pronounced marginal rims; petals 1.5-6.5 mm long; [native, occurring in mesic to dry forests and woodlands, and also (especially *R. abortivus*) weedy]; [section *Epirotas*] ..... **Key C**
- 3 Basal leaves mostly deeply parted or compound, the cauline leaves generally similar but smaller and often less divided; achenes various, 1-5 mm long, with or without pronounced marginal rims; petals 2-15 mm long; [native or introduced, occurring in various habitats].
- 4 Achenes markedly spiny, papillose, or tuberculate (the protuberances few and small in *R. sardous*, keyed both here and below); [introduced, usually weedy and in disturbed habitats]; [section *Echinella*] ..... **Key D**
- 4 Achenes smooth (rarely pubescent or papillose); [native or introduced, occurring in various habitats].
- 5 Achenes turgid, 1-1.5 (-2) mm long, the marginal rims scarcely or not at all evident, the achenes corky-thickened at their bases for dispersal by floating; [of mucky marshes or ditches, or aquatic in pools]; [section *Hecatonia*] ..... **Key E**
- 5 Achenes moderately turgid or flattened, 1.5-3.8 mm long, with a pronounced (at 10× or more) marginal rim appearing as a differentiated border or flange, more-or-less flattened, and separated from the central bulge of the achene by a concavity or even a groove, the achenes not corky-thickened at their bases; [of mostly terrestrial or in bottomland forests]; [section *Ranunculus*] ..... **Key F**

**Key A – subgenus *Batrachium* (White Water Crowfoots)**

- 1 Leaves floating, shallowly lobed; receptacles glabrous ..... *R. hederaceus*
- 1 Leaves submersed (or stranded by falling water levels), dissected into filiform segments; receptacles hispid.
- 2 Leaves firm (not collapsing when removed from water); free petioles much shorter than the dilated stipular base; leaves usually much shorter than the internode above; achene beaks 0.7-1.5 mm long ..... *R. longirostris*
- 2 Leaves flaccid (collapsing when removed from water); free petioles about as long as the dilated stipular base; leaves usually about as long as the internode above; achene beaks 0.1-0.3 (-0.5) mm long ..... *R. trichophyllus* var. *trichophyllus*

**Key B – subgenus *Ranunculus*, section *Flammula* (simple-leaved buttercups) (Spearworts)**

- 1 Petals 1-3 (-5), 1-2 mm long, about as long as the sepals; annual ..... *R. pusillus*
- 1 Petals (4-) 5-9, distinctly longer than the sepals; annual or perennial.
- 2 Cauline leaves 6-14 cm long; sepals 4-7 mm long; achene beak 1.0-1.3 mm long ..... *R. ambigens*
- 2 Cauline leaves 1-6.5 cm long; sepals 1.5-4 mm long; achene beak 0.1-0.6 mm long.
- 3 Cauline leaves linear, < 1 mm wide; achenes 1.2-1.6 mm long ..... *R. flammula* var. *reptans*
- 3 Cauline leaves ovate to lanceolate, 4-24 mm wide; achenes 0.8-1.0 mm long ..... *R. laxicaulis*

**Key C – subgenus *Ranunculus*, section *Epirotas***

- 1 Achene beaks (0.6-) 0.7-1.0 mm long; petals < ½ as long as the sepals; sepals hirsute ..... *R. allegheniensis*

- 1 Achene beaks 0.1-0.3 mm long; petals > ½ as long as the sepals; sepals glabrous to sparsely long-villous.
- 2 Petals 4-8 mm long, longer than the sepals.....*R. harveyi*
- 2 Petals 1.5-3.5 mm long, slightly shorter than the sepals.
- 3 Leaves and stems glabrous or nearly so (or the upper stem puberulent); basal leaves 1-6 (-10) cm wide, reniform to cordate at the base; roots usually all filiform.....*R. abortivus*
- 3 Leaves and stems villous, at least toward the base; basal leaves 1-2.5 cm wide, truncate to cuneate (rarely cordate) at the base; roots sometimes in part fusiform-thickened.....*R. micranthus*

**Key D – subgenus *Ranunculus*, section *Echinella***

- 1 Flowers sessile, opposite the petioles; sepals 3; petals 3.....*R. platensis*
- 1 Flowers pedunculate, axillary; sepals usually 5; petals usually 5.
- 2 Petals 1-2 (-3) mm long; receptacles glabrous.....*R. parviflorus*
- 2 Petals (3-) 4-12 mm long; receptacles pubescent.
- 3 Achenes bodies 1.5-3 mm long, 30-60 per head; achene beak ca. 0.5 mm long; achene with conical protuberances or short spines, to 0.16 mm long; achene beak 0.1-0.5 mm long.
- 4 Achene with a few conical protuberances; petals 5-12 mm long; plant sparsely to densely hirsute; achenes 30-40 per head.....*R. sardous*
- 4 Achene with numerous short spines; petals (3-) 4-5 mm long; plant with a few, widely scattered, long hairs; achenes 40-60 per head..*R. trilobus*
- 3 Achenes 3-5 mm long, 4-20 per head; achene beak 1.5-3.0 mm long; achene conspicuously spiny, the longer spines mostly 0.30-0.85 mm long.
- 5 Achenes 4-9 per head, in a single whorl; achene margins spiny, as also the faces; beak of the achene 2.5-3 mm long.....*R. arvensis*
- 5 Achenes 10-20 per head, in several whorls; achene margins smooth, the spines restricted to the faces; beak of the achene 1.5-2.5 mm long.....*R. muricatus*

**Key E – subgenus *Ranunculus*, section *Hecatonia***

- 1 Petals 6-14 mm long; achene body 1.3-2.5 mm long, the beak 0.7-1.5 mm long; plants with submersed leaves dissected into numerous linear segments; [aquatic].....*R. flabellaris*
- 1 Petals 2-4 (-5) mm long; achene body 0.8-1.2 mm long, the beak 0-0.1 mm long; plants without distinctive, dissected submersed leaves; [terrestrial or semi-aquatic].....*R. sceleratus* var. *sceleratus*

**Key F – subgenus *Ranunculus*, section *Ranunculus***

- 1 Petals 2-6 mm long, about as long as the sepals.
- 2 Basal leaves simple; achene beak strongly hooked.....*R. recurvatus* var. *recurvatus*
- 2 Basal leaves 3-foliolate; achene beak straight or nearly so.
- 3 Petals 4-6 mm long, 3.5-5 mm wide; achene beak 1.0-1.2 mm long; [WV northward].....*R. macounii*
- 3 Petals 2-4 mm long, 1.25 mm wide; achene beak 0.6-0.8 mm long; [widespread].....*R. pensilvanicus*
- 1 Petals 5-15 mm long, (1.3-) 1.5× or more as long as the sepals; achene beak straight, flexuous, slightly curved, or hooked, 0.2-3.0 mm long.
- 4 Achene beaks recurved or hooked, the stigmatic surface elongate, along the upper (curved) side of the style (beak) (visible at 10×); [introduced, usually weedy in disturbed habitats].
- 5 Stems repent, rooting at the nodes.....*R. repens*
- 5 Stems erect, not rooting at the nodes.
- 6 Petals 5-8 mm long; plant a soft-based annual; achene face usually with at least a few conical protuberances (if examined carefully at 10× or more).....*R. sardous* [of section *Echinella*]
- 6 Petals 8-16 mm long; plant a cormose or hard-based perennial; achene face truly smooth.
- 7 Sepals spreading; stems not cormose-thickened at the base; larger leaves appearing (3-) 5-parted, all of the segments sessile; plant to 12 dm tall.....*R. acris*
- 7 Sepals tightly reflexed; stems cormose-thickened at the base; larger leaves pinnately 3-5-parted, the terminal segment long-stalked; plant to 6 dm tall.....*R. bulbosus*
- 4 Achene beaks straight or slightly curved, flexuous, the stigmatic surface limited to the tip of the style (beak); [native, normally in more-or-less natural habitats].
- 8 Larger leaves mostly pinnately 3-7-foliolate, the terminal leaflet larger than the lateral leaflets, the leaflets (especially the terminal) often further cleft or lobed, the blade usually longer than wide in outline, the segments often rather narrow; naked receptacle conical, tapering gradually to the apex (the region of staminal attachment as thick as the region of gynoecial attachment, which tapers through all or nearly all of its length, best seen by stripping off the achenes); rhizome regenerating totally each growing season, producing both fibrous and (at the end of the growing season) tuberous roots (1.3-4.9 mm in diameter); [rare in our area, in calcareous, mafic, or ultramafic sites with prairie affinities].....*R. fascicularis*
- 8 Larger leaves mostly palmately 3-foliolate, the terminal leaflet about the same size as the lateral leaflets, the leaflets sometimes further cleft or lobed, the blade usually as wide as long or wider; naked receptacle clavate or ellipsoid (the region of staminal attachment distinctly narrower than the region of gynoecial attachment, thus forming a waist, from which the gynoecial region expands and then tapers to the apex); rhizome regenerated partially each growing season, producing uniform, fibrous roots (up to 3.0 mm in diameter); leaves usually simple and ovate, or trifoliate with ovate leaflets; [collectively widespread in our area].
- 9 Achenes wide-margined (wider portions of the margin 1/4 to 2/3 as wide as the achene body); plants colonial, sending out stolons (by the time of fruiting) which root at the nodes, forming new plants; sepals reflexed at full anthesis.....*R. carolinianus*
- 9 Achenes narrow-margined (wider portions of the margin 1/8 or less as wide as the achene body); plants usually erect or repent by the time of fruiting (if repent sometimes forming adventitious roots at the nodes, but not generally developing new plants); sepals spreading at full anthesis (sometimes reflexed later).
- 10 Plants repent; aerial shoots 50-80 (-91) cm long at time of fruiting; [generally of swamps and marshes].....*R. caricetorum*

10 Plants erect; aerial shoots 14-45 (-60) cm long at time of fruiting; [generally of upland habitats] ..... *R. hispidus*

*Ranunculus abortivus* Linnaeus, Kidneyleaf Buttercup. Low fields, disturbed areas, bottomlands, lawns, roadsides. (February-) March-June. NL (Labrador) to AK, south to FL, TX, and CO. A common weed in shady and sunny places. [= RAB, FNA, GW, K, Pa, S, W, WV, Y; > *R. abortivus* var. *abortivus* - C, F, G; > *R. abortivus* var. *indivisus* Fernald - F]

\* *Ranunculus acris* Linnaeus, Tall Buttercup, Bitter Buttercup. Pastures, fields, roadsides, disturbed areas; native of Europe. May-August. [= RAB, C, F, FNA, G, GW, Pa, S, W, WV, Y; > *R. acris* var. *acris* - K]

*Ranunculus allegheniensis* Britton, Allegheny Buttercup, Mountain Crowfoot. Cove forests, rich forested slopes. April-June. MA west to OH, south to w. NC and ne. TN, an Appalachian endemic. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV, Y]



*Ranunculus ambigenus* S. Watson, Water-plantain Crowfoot, Water-plantain Spearwort. Marshes. April-June. ME west to MN, south to VA, NC, ne. TN, w. TN, and LA. [= RAB, C, F, FNA, G, GW, K, Pa, W, WV, Y; = *R. obtusiusculus* Rafinesque - S]

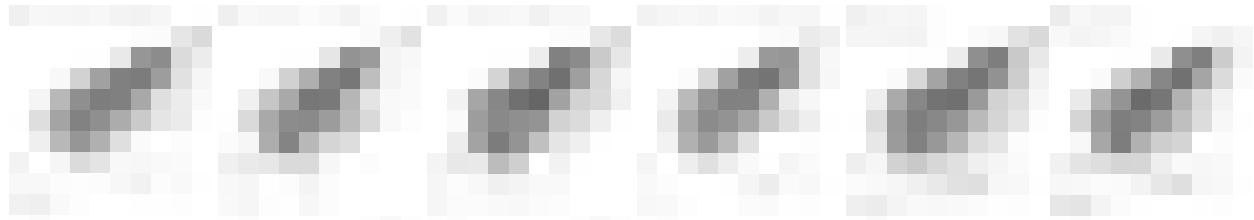
\* *Ranunculus arvensis* Linnaeus, Corn Crowfoot, Hungerweed. Fields, disturbed areas; native of Europe. April-June. [= C, FNA, G, GW, K, WV, X, Y; > *R. arvensis* var. *arvensis* - RAB; > *R. arvensis* var. *tuberculatus* (A.P. de Candolle) Koch - RAB]

\* *Ranunculus bulbosus* Linnaeus, Bulbous Buttercup. Fields, roadsides, disturbed areas; native of Europe. April-June. [= RAB, C, FNA, GW, K, Pa, S, W, WV, Y; > *R. bulbosus* var. *bulbosus* - F; > *R. bulbosus* var. *dissectus* Barbey - F; > *R. bulbosus* var. *valdepubens* (Jordan) Briquet - F]

*Ranunculus caricetorum* Greene, Northern Swamp Buttercup, Marsh Buttercup. Swampy forests and marshes. April-August. NB west to s. MB, south to NJ, n. VA, s. OH, and s. MO; reports of this species farther 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, Pa, Z; = *R. septentrionalis* Poirlet - GW, W, Y, misapplied; > *R. septentrionalis* var. *caricetorum* (Greene) Fernald - F, G; > *R. septentrionalis* var. *pterochrysum* Linnaeus Benson - G; > *R. septentrionalis* var. *septentrionalis* - F, G]

*Ranunculus carolinianus* A.P. de Candolle, Carolina Buttercup. Swamp forests, wet woodlands, open marshy wetlands. April-August. NY west to s. ON, WI, and MN, south to n. peninsular FL, LA, and e. TX. This species is tetraploid (n = 16). [= RAB, F, G, GW, W, WV, Y; = *R. hispidus* Michaux var. *nitidus* (Chapman) T. Duncan - C, FNA, K, Pa, Z; > *R. palmatus* Elliott - S; > *R. septentrionalis* - S]

*Ranunculus fascicularis* Muhlenberg ex Bigelow, Thick-root Buttercup, Early Buttercup. Wet flats with prairie affinities (with *Camassia scilloides*), rocky barrens and glades over mafic rocks (such as gabbro or diabase), ultramafic outcrop barrens (over olivine), limestone barrens. March-June. MA and NY west to s. ON, MN, and se. MB, south to c. NC, nc. SC, sw. GA, and e. TX; occurrences which are both south of New England and east of the Appalachians are scattered and disjunct. This species is tetraploid (n = 16). [= C, FNA, GW, K, Pa, S, W, Y, Z; > *R. fascicularis* var. *fascicularis* - F, G]



*Ranunculus flabellaris* Rafinesque, Yellow Water Crowfoot. Pools in floodplains of small stream swamps, other stagnant or slowly moving waters. March-May. ME west to BC, south to ne. NC, KY, IN, IL, LA, OK, UT, and CA. [= RAB, C, F, FNA, G, GW, K, Pa, Y; = *R. delphinifolius* Torrey ex Eaton - S]

*Ranunculus flammula* Linnaeus var. *reptans* (Linnaeus) E. Meyer, Creeping Spearwort. Shallow water. Circumboreal, south in North America to NJ, WV, MI, MN, and WY. [= FNA, PA; = *R. flammula* Linnaeus var. *filiformis* (Michaux) Hooker - C, G, K; = *R. reptans* Linnaeus var. *reptans* - F]

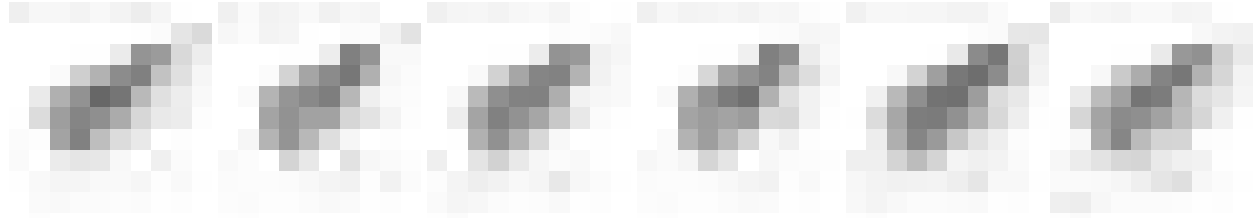
*Ranunculus harveyi* (A. Gray) Britton. Forests and prairies. IN, IL, MO, and OK south to TN, AL, and LA. [= C, F, G; = *R. harveyi* var. *harveyi* - FNA, K; < *R. harveyi* - C, F, G]

*Ranunculus hederaceus* Linnaeus, Ivy-leaved Water Crowfoot, Longstalked Crowfoot. Coastal brackish marshes, other circumneutral marshes. April-June. Se. PA south to SC on the Coastal Plain; disjunct in NL (Newfoundland); also in Europe. Perhaps questionable whether native in North America. [= RAB, C, F, FNA, G, GW, K, Pa, Y]

*Ranunculus hispidus* Michaux, Hispid Buttercup, Hairy Buttercup. Rich moist forests, creekbanks, mesic to dry woodlands and forests, bottomlands. March-June. MA and VT west to s. ON, n. IL, and se. KS, south to e. and c. NC, s. GA, s. AL, AR, and ne. OK. This species is tetraploid (n = 16). [= RAB, GW, S, W, Y; = *R. hispidus* var. *hispidus* - C, FNA, K, Pa, Z; > *R. hispidus* var. *hispidus* - F, G, WV; > *R. hispidus* var. *falsus* Fernald - F; > *R. hispidus* var. *marilandicus* (Poirlet) L. Benson - G; > *R. hispidus* var. *eurylobus* L. Benson - F, G, WV]

*Ranunculus laxicaulis* (Torrey & A. Gray) Darby, Coastal Plain Spearwort. Marshes, swamps, tidal cypress swamps. 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* Engelm. – C; > *R. laxicaulis* – GW, Y; > *R. subcordatus* E.O. Beal – GW, Y; ? *R. oblongifolius* Elliott – S, misapplied]



***Ranunculus longirostris*** Godron, White Water Crowfoot. Submerged in streams. Sw. QC west to SK, ID, and OR, south to DE, VA, KY, nc. TN, AL, AR, TX, NM, and AZ. [= C, F, GW, K, WV, Y; < *R. aquatilis* Linnaeus var. *diffusus* – FNA; ? *R. circinatus* Sibthorp – G; ? *Batrachium trichophyllum* – S, misapplied]

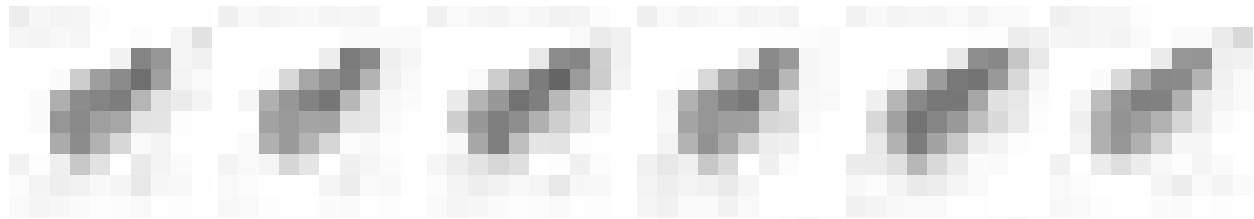
***Ranunculus macounii*** Britton. Bogs, marshes. June. NL (Newfoundland) west to AK, south to MI, IA, TX, NM, AZ, CA; disjunct in WV. [= C, F, FNA, G, K, WV]

***Ranunculus micranthus*** Nuttall, Small-flowered Buttercup, Rock Buttercup. Rich forests. April-June. MA west to SD, south to e. VA, c. NC, sc. TN, WV, OH, and OK. [= RAB, C, FNA, G, GW, K, Pa, S, W, WV, Y; > *R. micranthus* var. *micranthus* – F; > *R. micranthus* var. *delitescens* (Greene) Fernald – F]

\* ***Ranunculus muricatus*** Linnaeus. Ditches and marshes; native of Europe. April-June. [= RAB, FNA, GW, K, S, X, Y]

\* ***Ranunculus parviflorus*** Linnaeus, Small-flowered Buttercup, Stickseed Crowfoot. Disturbed areas; native of Europe. February-July. [= RAB, C, F, FNA, G, GW, K, S, W, X, Y]

***Ranunculus pensylvanicus*** f., Bristly Buttercup. Wet meadows, floodplains. NL (Newfoundland) west to AK, south to s. PA (Rhoads & Klein 1993; Rhoads & Block 2007), DE, DC, MD (Whittemore in FNA 1997), WV, OH, n. IN, n. IL, MN, and AZ; also in ne. Asia. [= C, F, FNA, G, K, Pa, WV]



\* ***Ranunculus platensis*** Sprengel. Lawns, ditches; native of South America. [= FNA, GW, K, X, Y]

***Ranunculus pusillus*** Poir. Low Spearwort. Marshes, ditches, other wet habitats. April-June. S. NY south to c. peninsular FL, west to TX, north in the interior to OH, IN, and MO. [= RAB, C, F, FNA, G, GW, Pa, S, W, WV, Y; > *R. pusillus* var. *pusillus* – K]

***Ranunculus recurvatus*** Poir. var. *recurvatus*, Hooked Buttercup, Hooked Crowfoot. Bottomland forests, cove forests, swamps, mesic slope forests. April-June. ME and QC west to MN, south to sw. GA, MS, and OK. Var. *tropicus* (Grisebach) Fawcett & Rendle occurs in Puerto Rico {and elsewhere?}. [= FNA, K; < *R. recurvatus* – RAB, C, G, GW, Pa, S, W, Y; > *R. recurvatus* var. *recurvatus* – F, WV; > *R. recurvatus* var. *adpressipilis* Weatherby – F, WV]

\* ***Ranunculus repens*** Linnaeus, Creeping Buttercup, Meg-many-feet. Low meadows, disturbed areas; native of Europe. [= RAB, FNA, G, GW, K, Pa, S, W, Y; > *R. repens* var. *repens* – C, F, WV; > *R. repens* var. *degeneratus* Schur – C; > *R. repens* var. *glabratus* A.P. de Candolle – C, F; > *R. repens* var. *pleniflorus* Fernald – F, WV]

\* ***Ranunculus sardous*** Crantz, Sardinian Buttercup, Hairy Buttercup. Low fields, disturbed areas; native of Europe. April-July. [= RAB, C, F, FNA, G, GW, K, Pa, X, Y]

***Ranunculus sceleratus*** Linnaeus var. *sceleratus*, Cursed Buttercup, Celery-leaf Crowfoot. Marshes, ditches, and stream margins. June-September. The species is circumboreal, ranging south in North America (partly introduced, at least southward) to n. FL, LA, TX, and CA. Var. *sceleratus* is widespread and the only variety in e. North America; var. *multifidus* occurs in w. North America. The epithet is sometimes misspelled "*scleratus*." [= C, F, FNA, G, K; < *R. sceleratus* – RAB, GW, Pa, S, W, Y]



***Ranunculus trichophyllus*** Chaix var. *trichophyllus*, White Water Crowfoot. Submerged in water of acidic streams. *R. trichophyllus* is circumboreal, ranging south in North America to NJ, VA, nc. TN, PA, MN, SD, NM, AZ, and CA. Var. *trichophyllus* ranges south to the southern limit of the species. This taxon was reported as far south as NC by G and S; the documentation is unknown and the species was not treated by RAB. The more northern var. *calvescens* W. Drew, with the receptacle glabrous or with a few scattered hairs (vs. hirsute with tufted hairs), ranges south to PA and MI. [= C, F, K; < R.

*aquatilis* Linnaeus var. *diffusus* Withering – FNA, Pa; < *R. trichophyllus* – WV, Y; ? *R. aquatilis* Linnaeus var. *capillaceus* (Thuill.) A.P. de Candolle – G; ? *Batrachium flaccidum* (Persoon) Ruprecht – S]

\* ***Ranunculus trilobus*** Desfontaines. Fields, roadsides, ditches; native of sw. Europe. [= FNA, K, X, Y]

**116. NELUMBONACEAE** Dumortier 1829 (Lotus-lily Family) [in PROTEALES]

A family of 1 genus and 2 species, aquatic herbs, of temperate and subtropical e. North America and e. Asia. References: Wiersema in FNA (1997); Williamson & Schneider in Kubitzki, Rohwer, & Bittrich (1993).

***Nelumbo*** Adanson 1763 (Lotus-lily, Lotus, Sacred-lotus, Sacred-bean)

A genus of 2 species, aquatic herbs, of temperate and subtropical e. North America and e. Asia. References: Williamson & Schneider in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** *Nelumbo* can be immediately distinguished in vegetative condition from the other "pads" (*Nymphaea*, *Nuphar*, and *Nymphoides*) by its peltate leaves, and from the peltate *Brasenia* by the much larger size and roundness of the leaves.

- 1 Petals yellow; mature fruits ("nuts") usually < 1.25× as long as wide ..... *N. lutea*
- 1 Petals pink or white; mature fruits ("nuts") usually > 1.5× as long as wide.....*N. nucifera*

***Nelumbo lutea*** Willdenow, Yonkapin, American Lotus-lily, Yellow Lotus, Yockernut, Water-chinquapin, Pond-nuts. Ponds, natural lakes. June–September. NY and s. ON west to MN and IA, south to s. FL and e. TX, and south into the West Indies and Mexico. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV; *N. pentapetala* (Walter) Fernald]

\* ***Nelumbo nucifera*** Gaertner, Sacred-lotus, Oriental Lotus-lily, Pink Lotus. Ponds and lakes; native of Asia. June–September. [= RAB, C, F, FNA, G, GW, K]

**117. PLATANACEAE** Dumortier 1829 (Plane-tree Family) [in PROTEALES]

A family of a single genus and about 7 species (and several additional infrataxa), trees, of North America south to Central America and w. Asia to se. Asia. Probab`ly with a close relationship to the Proteaceae (Angiosperm Phylogeny Group 2009), and sometimes included there (Angiosperm Phylogeny Group 1998, 2003). References: Kaul in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

***Platanus*** Linnaeus 1753 (Plane-tree, Sycamore)

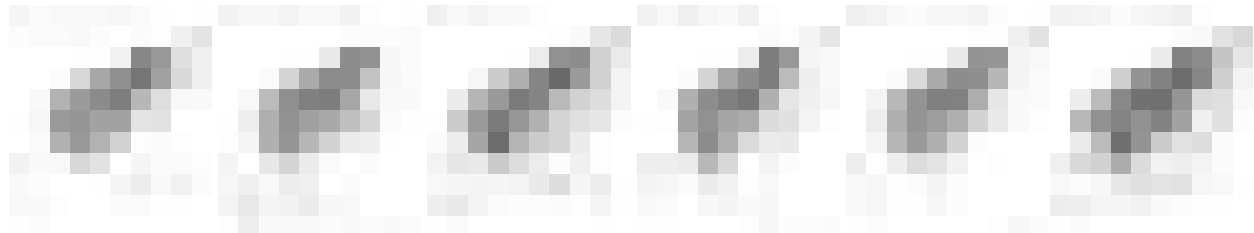
A genus of about 7 species (and several additional infrataxa), trees, of North America south to Central America and w. Asia to se. Asia. References: Kaul in FNA (1997); Grimm & Denk (2010)=Y; Nixon & Poole (2003)=Z; Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** The exposed white inner bark on the middle and upper trunks make *Platanus occidentalis* recognizable at long distances, especially in winter.

- 1 Fruiting heads 1-3 per peduncle; bark exposed by peeling green; lobes of leaves elongate, often longer than wide; [rarely escaped cultivar].....*P. xacerifolia*
- 1 Fruiting heads 1 per peduncle; bark exposed by peeling mostly white; Lobes of leaves broad, broader than long; [common, widespread native tree].....*P. occidentalis*

\* ***Platanus xacerifolia*** Willdenow [*occidentalis*×*orientalis*], London Planetree. Disturbed areas; hybrid of our native species and the Eurasian *P. orientalis*, planted as a street tree and reported as "occasionally escaping" (Rhoads & Black 2007). [= FNA, Pa]

***Platanus occidentalis*** Linnaeus, Sycamore, Plane-tree. Riverbanks and alluvial forests, streambanks, sometimes weedy on rocky roadcuts. April–May; September–November. S. ME west to s. ON, MI, and MN, south to w. FL and TX. One of the largest trees in e. North America, and probably the largest that is widespread in the Piedmont of our area. *P. palmeri* Kuntze, sometimes treated as *P. occidentalis* var. *palmeri* (Kuntze) Nixon & Poole ex Geerinck but better interpreted as a species (Grimm & Denk 2010), occurs from central TX south into Coahuila. [= Y; = *P. occidentalis* var. *occidentalis* – Z; < *P. occidentalis* – RAB, C, FNA, G, GW, K, Pa, S, W, WV; > *P. occidentalis* var. *occidentalis* – F; > *P. occidentalis* var. *glabrata* (Fernald) Sargent – F]





**121. BUXACEAE** Dumortier 1822 (Boxwood Family) [in BUXALES]

A family of 5 genera and about 100 species, mainly shrubs, mainly of the Northern Hemisphere. References: von Balthazar, Endress, & Qiu (2000); Channell & Wood (1987); Köhler in Kubitzki, Bayer, & Stevens (2007).

- 1 Plant a woody shrub; leaves opposite, < 1 cm wide.....**Buxus**  
 1 Plant a suffrutescent herb; leaves alternate, 1.5-7 cm wide.....**Pachysandra**

**Buxus** Linnaeus 1753 (Boxwood)

A genus of about 50-90 species, shrubs, of tropical to temperate areas of Europe, Africa, West Indies, Central America, and e. Asia; Köhler in Kubitzki, Bayer, & Stevens (2007).

\* **Buxus sempervirens** Linnaeus, Boxwood. Persistent for decades at abandoned homesites; native of Europe. Popular for hedges and landscaping; also cultivated in the Mountains for wreathing. [= K]

**Pachysandra** Michaux 1803 (Pachysandra)

A genus of 4-5 species, 1 of e. North America, the others of e. Asia, suffruticose herbs and shrubs. References: Robbins (1968)=Z; Köhler in Kubitzki, Bayer, & Stevens (2007).

- 1 Leaves subcoriaceous, semi-evergreen, pubescent, mottled with several shades of green (more apparently so at some seasons than others); inflorescences lateral from near the base of the plant; [native plant of rich forests].....**P. procumbens**  
 1 Leaves coriaceous, evergreen, glabrous, dark green; inflorescences terminal; [cultivated alien plant, rarely persistent].....**P. terminalis**

**Pachysandra procumbens** Michaux, Mountain Pachysandra, Allegheny-spurge. Moist rich woods. March-April; July-August. C. KY south to w. NC, nw. SC, w. GA, Panhandle FL (Jackson County only), AL, MS, and e. LA (on loess in the Tunica Hills). Its distribution (and, for that matter, that of the genus as a whole) appears to be relictual and to reflect a poor ability to disperse itself and colonize new territory. Channell & Wood (1987) refer to *P. procumbens* as a "nonaggressive if not 'senile' species with a very low evolutionary potential." The only locations for this species in NC are in Polk County, NC, which has other notable disjunctions of species which normally occur west of the Blue Ridge (*Veratrum woodii*, *Smilax lasioneura*). [= RAB, C, F, G, K, Pa, S, W, WH, Z]

\* **Pachysandra terminalis** Siebold & Zuccarini, Pachysandra, Japanese-spurge. Persistent after cultivation, and spreading vegetatively to adjacent forests; commonly cultivated, rarely persistent to naturalized, native of China and Japan. This species is a popular ground-cover, difficult to eradicate once well-established. [= RAB, C, F, G, K, Pa, Z]

**127. ALTINGIACEAE** Lindley 1846 (Sweet-gum Family) [in SAXIFRAGALES]

A family of 2 genera and about 12 species, trees, of e. Asia, Indomalaysia, e. North America, Central America, and e. Mediterranean. Various molecular studies show that *Liquidambar* is better separated from the Hamamelidaceae (Hoot, Magallón, and Crane 1999). References: Endress in Kubitzki, Rohwer, & Bittrich (1993); Hoot, Magallón, and Crane (1999).

**Liquidambar** Linnaeus 1753 (Sweet Gum)

A genus of 4-5 species, trees, north temperate, of e. North America, Central America (Mexico to Nicaragua), e. Asia (s. China, Taiwan, Vietnam), and e. Mediterranean (Turkey, Rhodos, Cyprus). References: Endress in Kubitzki, Rohwer, & Bittrich (1993); Li & Donoghue (1999).

**Liquidambar styraciflua** Linnaeus, Sweet Gum, Red Gum. Swamp forests, floodplains, moist forests, depressional wetlands, old fields, disturbed areas. April-May; August-September. CT west to s. OH, s. IL and OK, south to s. FL, TX, and Guatemala. One of the most spectacular of our trees in the fall; a single tree often has a mixture of green, yellow, orange, dark red, bronze, and purple leaves. The sap was previously gathered as a source of chewing gum. The bark is one of the favorite foods of beavers. Although sometimes thought of as a small and weedy tree, *Liquidambar* reaches its greatest abundance and size in Coastal Plain swamp forests, where it can reach 2 meters in diameter. Along with such species as *Pinus taeda*, *Quercus phellos*, and others, *Liquidambar* is a good example of a primarily bottomland tree which has proven to be an excellent colonizer of disturbed uplands. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV]

**128. HAMAMELIDACEAE** R. Brown 1818 (Witch-hazel Family) [in SAXIFRAGALES]

A family of ca. 27 genera and ca. 87 species, trees and shrubs, tropical to temperate, and especially e. Asian. References: Meyer in FNA (1997); Endress in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Leaves 5-7-palmately lobed and palmately veined, glabrous..... [see *Liquidambar* in *ALTINGIACEAE*]  
 1 Leaves unlobed, pinnately veined, stellate-pubescent beneath (at least when young).  
 2 Petals 0; stamens 12-32; flowers numerous in dense globose or elongate spikes; leaves with a symmetric or asymmetric (oblique) base, the lateral veins marginal for a distance of at least 2-3 mm; [tribe *Fothergillieae*] ..... *Fothergilla*  
 2 Petals 4; stamens 4; flowers few in small clusters; leaves with a weakly to strongly asymmetric (oblique) base, the lateral veins included in the blade tissue or barely exposed for a distance of <1 mm; [tribe *Hamamelideae*]..... *Hamamelis*

***Fothergilla* Murray in Linnaeus 1774 (Witch-alder)**

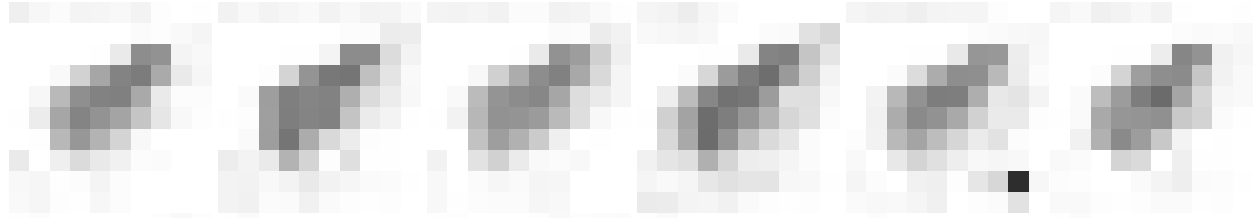
A genus of 2 species, shrubs, of temperate e. North America. References: Meyer in FNA (1997); Weaver (1969)=Z; Darke (2008); Ranney et al. (2007); Endress in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** *Fothergilla major* often occurs with *Hamamelis virginiana*, with which it is easily confused in vegetative condition; a reliable character is the base of the lateral veins (marginal in *Fothergilla*, included in leaf tissue in *Hamamelis*). Most of the cultivated material of *Fothergilla*, including the best known cultivar 'Mount Airy,' are *Fothergilla* × *intermedia* Ranney & Fantz, a pentaploid hybrid of tetraploid *F. gardenii* and hexaploid *F. major* (Ranney et al. 2007; Darke 2008).

- 1 Leaves stellate-pubescent above, up to 6 cm long and 5 cm wide (the largest < 5.2 cm wide); stamens 12-24; capsules 6.5-10.5 (-13) mm long, the persistent hypanthium 3.4-5 mm long; seeds 4.8-6.3 mm long; [of wet savannas, pocosins, and pocosin margins of the Coastal Plain] ..... *F. gardenii*  
 1 Leaves glabrous or sparsely stellate-pubescent above, up to 12 cm long and 10 cm wide (the largest > 5.2 cm wide); stamens (18-) 22-32; capsules 8-15.2 mm long, the persistent hypanthium 4-9.2 mm long; seeds 6.2-7.8 mm long; [of rocky habitats of the Mountains and Piedmont] ..... *F. major*

***Fothergilla gardenii* Linnaeus, Coastal Witch-alder.** Wet savannas, pocosins, and pocosin margins. March-May; September-October. Se. NC (and allegedly se. VA) south to Panhandle FL and s. AL. An ornamental prized for its small size and attractive fall color. [= RAB, F, FNA, GW, K, Z; > *F. gardenii* - S, orthographic variant; > *F. parvifolia* Kearney - S]

***Fothergilla major* (Sims) Loddiges, Large Witch-alder.** Dry ridgetop forests of middle elevation ridges in the mountains, especially along the Blue Ridge Escarpment, summits and upper slopes of Piedmont monadnocks, north-facing bluffs in the lower Piedmont. April-May; July-October. C. NC west to ne. TN, south to nc. GA and nc. AL; disjunct in AR. [= RAB, FNA, K, S, W, Z; > *F. monticola* Ashe]



***Hamamelis* Linnaeus 1753 (Witch-hazel)**

A genus of 5-6 species, shrubs and small trees, of e. North America and e. Asia (China and Japan). The other North American species, *H. vernalis* Sargent, is endemic to the Ozark/Ouachita region of AR, OK, and MO. References: Leonard (2006)=X; Meyer in FNA (1997); Lane (2005)=Z; Jenne (1966)=Y; Wen & Shi (1999); Endress in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Outer surface of calyx scarlet; petals 7-14 mm long, red or reddish (often yellow-tipped), flowering late December to early February; leaves 12-24 cm long, 5-17 cm wide, densely stellate-pubescent below, usually with 11 lateral veins (6 on one side of the leaf, 5 on the other); [plants of pineland ravines in s. AL and s. MS] ..... *H. ovalis*  
 1 Outer surface of calyx yellow; petals 6-8 mm long, yellow, flowering October-January; leaves 3.7-16.7 cm long, 2.5-13 cm wide, glabrous to densely stellate-pubescent beneath, usually with 9 or 10 lateral veins (5 on one side of the leaf, 4-5 on the other); [plants widespread in our area]  
 2 Stellate trichomes of the leaves moderately dense to dense, averaging 0.09 mm across, with 7-11 rays; leaves (3.6-) avg. 6.4 (-10.3) cm long, (1.8-) avg. 4.1 (-6.2) cm wide; petals 7-15 mm long, 0.5-0.8 mm wide; [e. SC south to Panhandle FL, west to se. LA in the Coastal Plain] ..... *H. virginiana* var. *henryae*  
 2 Stellate trichomes of the leaves sparse to moderately dense, averaging 0.16-0.40 mm across, with 3-6 (-8) rays; leaves (4.7-) avg. 9.9 (-14.0) cm long, (3.9-) avg. 6.6 (-9.2) cm wide; petals 15-20 mm long, 1 mm wide; [widespread in our area].... *H. virginiana* var. *virginiana*

***Hamamelis ovalis* S.W. Leonard, Running Witch-hazel, Southern Red Witch-hazel, Bigleaf Witch-hazel.** Dry-mesic pineland ravines. Late December-early February. Originally believed to be possibly endemic to sc. MS (Perry County) (Leonard 2006), but recently found in s. AL (Keener & Webb, in prep.). [= X]

***Hamamelis virginiana* Linnaeus var. *henryae* Jenne ex C. Lane, Small-leaved Witch-hazel.** Sandhill margins, xeric hammocks, streamheads. November-January. E. SC (Horry and Hampton counties), s. GA, and Panhandle FL west to se. LA.

Though cited in Lane (2005) as var. *henryi*, the honoree is collector Mary G. Henry; thus the honorific epithet should be corrected to the feminine. Additional study is needed of these small-leaved Coastal Plain populations. [*H. virginiana* – FNA, GW, K, S, WH; = *H. virginiana* var. *henryi* Jenne ex C. Lane – Y, Z, orthographic error]

*Hamamelis virginiana* Linnaeus var. *virginiana*, Northern Witch-hazel. Moist to dryish forests. October-December; October-November (of the following year). QC and NS west to n. MI and MN, south to FL and TX. The bark is still gathered in large quantities in the Southern Appalachians, as the source for witch hazel liniment. The name "witch-hazel" alludes to its superficial resemblance to *Corylus*, the true hazel, and to its "perverse" habit of flowering in the fall, as it drops its leaves. [= Y, Z; < *H. virginiana* – RAB, C, FNA, G, GW, K, Pa, S, W, WH, WV; > *H. virginiana* var. *parvifolia* Nuttall – F; > *H. virginiana* var. *virginiana* – F]

### 131. ITEACEAE J. Agardh 1858 (Sweetspire Family) [in SAXIFRAGALES]

A family of 1 genus and about 27 species, shrubs, of e. and se. Asia (about 25 species), e. North America (1 species), and sub-Saharan Africa (1 species). References: Kubitzki in Kubitzki, Bayer, & Stevens (2007).

#### *Itea* Linnaeus 1753 (Virginia-willow, Sweetspire, Tassel-white)

A genus of about 27 species, shrubs and trees, all but 2 (ours and 1 in sub-Saharan Africa) are in e. and se. Asia. The closest relative of our species is *I. japonica* Oliver, of Japan. Various treatments in a very broadly-conceived Saxifragaceae (RAB, F, G, GW, W), a less comprehensive Grossulariaceae (C, K), a narrow Escalloniaceae, or a very narrow (single genus) Iteaceae (S), the relationships of *Itea* remain problematic. Recent molecular data suggest that the relationship between *Itea* and other woody "saxifragaceous" genera (including *Escallonia*) is only distant (Morgan & Soltis 1993). *Itea* is here conservatively treated in a narrow Iteaceae. References: Morin in FNA (2009); Spongberg (1972); Morgan & Soltis (1993); Bohm et al. (1999); Kubitzki in Kubitzki, Bayer, & Stevens (2007).

**Identification notes:** Sometimes confused needlessly with *Clethra*, whose much more coarsely serrate, obovate leaves contrast with the serrulate, elliptic leaves of *Itea*. Also often confused with *Eubotrys racemosa* in vegetative condition.

*Itea virginica* Linnaeus, Virginia-willow, Sweetspire, Tassel-white. Moist forests and thickets, especially along the banks of small streams. May-June. S. NJ south to s. FL and west to e. TX and OK, north in the interior (especially in the Mississippi Embayment) to s. IL and se. MO. [= RAB, C, F, FNA, K, G, GW, Pa, S, W, WH]

### 132. GROSSULARIACEAE A.P. de Candolle 1805 (Currant Family) [in SAXIFRAGALES]

A family of one genus, of the northern hemisphere and montane South America (Andes). The familial distinction from the Saxifragaceae is supported by recent molecular data, though the affinities of Grossulariaceae and Saxifragaceae (sensu stricto) are closer than those of many other groups traditionally included in the Saxifragaceae, such as *Parnassia*, *Lepuropetalon*, and *Penthorum* (Morgan & Soltis 1993). References: Weigend in Kubitzki, Bayer, & Stevens (2007).

#### *Ribes* Linnaeus 1753 (Currant, Gooseberry)

A genus of 150-200 species, temperate, of the Northern Hemisphere and montane South America. The genus is separated into distinctive subgenera, these sometimes maintained as full genera (as by S). Of the species treated here, the currants (subgenus *Ribes*) include *R. americanum*, *R. aureum* var. *villosum*, *R. glandulosum*, *R. lacustre*, *R. nigrum*, *R. rubrum*, and *R. triste*. The gooseberries (subgenus *Grossularia*) include *R. curvatum*, *R. cynosbati*, *R. echinellum*, *R. hirtellum*, *R. missouriense*, *R. rotundifolium*, and *R. uva-crispa*. The dried "currants" commonly available in stores are actually raisins made from a small variety of grape, and have nothing to do with *Ribes*. A molecular study suggests that recognition of *Grossularia* as a genus distinct from *Ribes* is not warranted, though it does form a monophyletic group nested within *Ribes* s.l. (Senters & Soltis 2003; Weigend, Mohr, & Motley 2002). References: Morin in FNA (2009); Sinnott (1985)=Z; Weigend, Mohr, & Motley (2002); Spongberg (1972); Schultheis & Donoghue (2004); Senters & Soltis (2003); Weigend in Kubitzki, Bayer, & Stevens (2007). Key adapted from C, F, and Z.

- 1 Flowers solitary or in corymbs of 2-4; pedicels not jointed just beneath the ovary or fruit, the fruit not disarticulating at maturity and thus the fruit shed with the entire pedicel; stems generally with (0-) 1-3 nodal spines and sometimes also with internodal bristles (especially on young, vigorous growth) (though these sometimes absent or nearly so in some species); [subgenus *Grossularia*].
  - 2 Ovary and fruit glabrous.
    - 3 Stamens (at full anthesis) 3-4.5 mm long, about equaling the calyx lobes .....*R. hirtellum*
    - 3 Stamens (at full anthesis) 6-12 mm long, exerted well beyond the calyx lobes.
      - 4 Calyx tube white; stamens 9-12 mm long; nodal spines 1-3 per node, 7-18 mm long, stout.....*R. missouriense*
      - 4 Calyx tube purplish or purplish-green; stamens 6-8 mm long; nodal spines 0-1 (-2) per node, 3-11 mm long, slender.....*R. rotundifolium*
  - 2 Ovary and fruit hairy or bristly.
    - 5 Stamens (at full anthesis) 9-15 mm long, exerted well beyond the calyx lobes; calyx lobes 4-7 mm long; petals 2-3 mm long.....*R. echinellum*

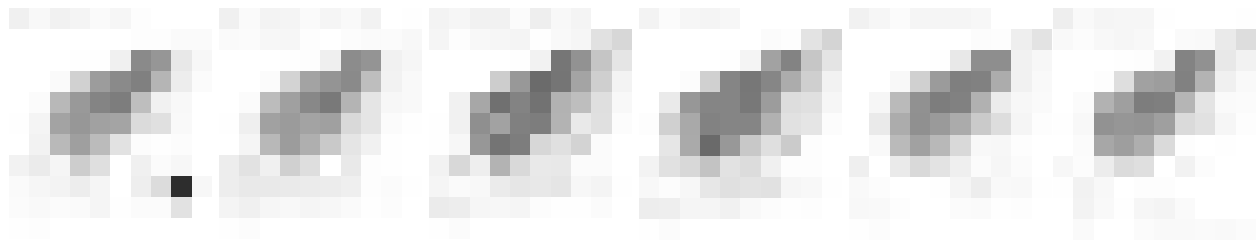
- 5 Stamens (at full anthesis) <7.5 mm long, shorter than the calyx lobes; calyx lobes **either** 2.5-4 mm long **or** 7.5-9 mm long; petals 1-2.5 mm long.
- 6 Calyx lobes 7.5-9 mm long; stamens 6-7.5 mm long.....*R. curvatum*
- 6 Calyx lobes 2.5-4 mm long; stamens 1-2 mm long or 4-6 mm long
- 7 Fruit hispid; stamens 1-2 mm long; peduncles 7-25 mm long; pedicels 5-16 mm long; [of native habitats of the Mountains] .....*R. cynosbati*
- 7 Fruit glandular-pubescent; stamens 4-6 mm long ; peduncles < 5 mm long; pedicels < 5 mm long; [alien] .....*R. uva-crispa*
- 1 Flowers in racemes of 4-many; pedicels jointed just beneath the ovary or fruit, a portion of the pedicel thus remaining attached to the plant when mature sfruit or aborted flowers are shed, the fruit disarticulating at maturity; stems lacking nodal spines and internodal bristles (except *R. lacustre*); [subgenus *Ribes*].
- 8 Ovaries and fruits bristly or spiny with gland-tipped hairs.
- 9 Stems lacking internodal bristles and nodal spines; racemes ascending to erect; fruit dark red when mature .....*R. glandulosum*
- 9 Stems (especially young, vigorous growth) with internodal bristles and sometimes internodal spines; racemes spreading to drooping; fruit purple or black when mature .....*R. lacustre*
- 8 Ovaries and fruits glabrous or with sessile glands.
- 10 Lower leaf surface with scattered golden glands; fruit black when mature (except sometimes in *R. aureum* var. *villosum*).
- 11 Bracts of the pedicels 0.5-2 mm long; ovaries and fruits with sessile glands; fruits black when mature .....*R. nigrum*
- 11 Bracts of the pedicels 3-10 mm long; ovaries and fruits glabrous; fruits black, red, brown, or orange when mature.
- 12 Pedicels 0.1-2 mm long, shorter than the lanceolate bracts (which are 3-10 mm long); fruits black when mature .....*R. americanum*
- 12 Pedicels 2-8 mm long, about as long as the obovate bracts (which are 4-9 mm long); fruits black (rarely red, orange, brown, or yellow) when mature.....*R. aureum* var. *villosum*
- 10 Lower leaf surface lacking golden glands.
- 13 Hypanthium narrowly tubular, 6-20 mm long; fruits black (rarely red, orange, brown, or yellow) when mature; sepals golden yellow .  
.....*R. aureum* var. *villosum*
- 13 Hypanthium saucer-shaped, < 1 mm long; fruits bright red when mature; sepals brown, greenish brown, or greenish purple.
- 14 Pedicels glabrous; petals cream to pinkish; anther sacs separated by a connective as broad as the anther sacs; erect shrub [cultivated and sometimes persisting or escaping] .....*R. rubrum*
- 14 Pedicels stipitate-glandular; petals reddish purple; anther sacs almost adjacent, the connective much narrower than the sacs; declining or ascending shrub; [native] .....*R. triste*

#### Auxiliary Key to widely distributed native *Ribes* of the Mountains

- 1 Leaves usually 5-10 cm long and wide, serrate or doubly serrate with sharp teeth; plants usually without nodal spines; inflorescence a raceme of 4-15 flowers; pedicel jointed below the fruit .....*R. glandulosum*
- 1 Leaves 1-5 cm long and wide, serrate with rounded teeth; plants usually with nodal spines; inflorescence a raceme of 1-4 flowers; pedicel not jointed below the fruit.
- 2 Ovary with glandular hairs which become stiff spines on the mature fruit; leaf bases cordate to deeply cordate (rarely truncate or cuneate), the angle of leaf tissue mostly 190-230°, moderately to sparsely silvery-pilose beneath, usually on the surface as well as on the veins and in the vein axils; stamens at full anthesis equaling the petals .....*R. cynosbati*
- 2 Ovary and fruit glabrous; leaf bases rounded or cuneate (rarely truncate or cordate), the angle of leaf tissue mostly 130-170°, glabrescent to sparsely pubescent beneath (mostly on the veins and in the vein axils); stamens at full anthesis exceeding the petals .....*R. rotundifolium*

*Ribes americanum* P. Miller, American Black Currant. Moist forests, marl marshes. April-June. NS west to AB, south to w. VA, WV, e. and nc. KY (Clark et al. 2005), ne. TN, IN, NE, and NM. [= C, F, FNA, G, K, Pa, W, WV]

*Ribes aureum* Pursh var. *villosum* A.P. de Candolle, Buffalo Currant. {habitats}, disturbed areas, meadows. MA, ON, MN, ND, and MT south to MD, TN, AR, TX, and NM; the original eastward extent unclear because of occasional cultivation and naturalization). It is reported as occurring as a native species as far east as Montgomery County in nc. TN (Chester, Wofford, & Kral 1997). [= FNA, K; = *R. odoratum* H. Wendland – C, F, G, Pa, WV]



*Ribes curvatum* Small, Granite Gooseberry. Rocky upland forests. E. TN, AR, and OK south to GA, AL, LA, and TX. Also reported for NC by Sinnott (1985); the specimens came from cultivated plants in a botanist's garden, so there is no evidence that *R. curvatum* is a native or naturalized component of NC's flora. [= FNA, K; = *Grossularia curvata* (Small) Coville & Britton – S]

*Ribes cynosbati* Linnaeus, Prickly Gooseberry, Dogberry. Moist slopes, periglacial boulderfields, grassy balds, mostly at high elevations. May-June; July-September. NB, ON, MN, and ND south to w. NC, e. TN, n. GA, n. AL, AR, and OK. [= RAB, C, FNA, G, K, Pa, W, WV, Z; > *R. cynosbati* var. *cynosbati* – F; > *R. cynosbati* var. *glabratum* Fernald – F; = *Grossularia cynosbati* (Linnaeus) P. Miller – S]

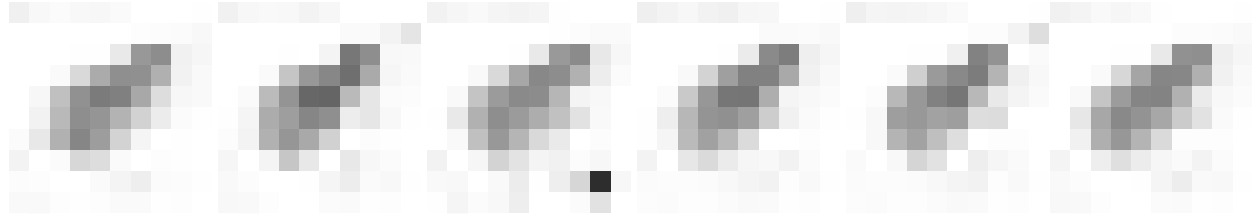
*Ribes echinellum* (Coville) Rehder, Miccosukee Gooseberry. Mesic, nutrient-rich forests. March-April; June-September. This species has a remarkable range, known only from a small area of McCormick County, SC and the vicinity of Lake

Micosukee, Jefferson County, FL. Godfrey (1988) has a detailed description of *R. echinellum*. Catling, Dumouchel, & Brownell (1998) discuss its pollination biology. [= FNA, K, RAB, WH, Z; = *Grossularia echinella* Coville – S]

***Ribes glandulosum*** Grauer, Skunk Currant, Mountain Currant. Periglacial boulderfields, high elevation seeps, spruce-fir forests. May-June; June-September. NL (Newfoundland) west to AK, south to VT, MI, MN, and BC, and in the Appalachians south to w. NC and e. TN. [= RAB, C, F, FNA, G, K, Pa, S, W, WV]

***Ribes hirtellum*** Michaux, Northern Gooseberry. Rocky forests. May-June; June-September. NL (Newfoundland) west to AB, south to WV (Tucker County), n. NJ, s. PA, OH, IN, IL, IA, and NE. [= C, FNA, K, Pa; > *R. hirtellum* var. *hirtellum* – F, G]

***Ribes lacustre*** (Persoon) Poirlet, Bristly Black Currant, Spiny Swamp Currant. Forests, acid swamps. May-June; June-September. NL (Labrador) to AK, south to MA, PA, w. VA, TN (allegedly), n. OH, MI, MN, SD, CO, UT, and CA. Reported for AL (FNA). The alleged documentation for the inclusion of *R. lacustre* in the flora of VA is a sterile specimen at WILLI that is not definitely identifiable (Wieboldt, pers. comm.). [= C, F, FNA, G, K, Pa, W, WV]



***Ribes missouriense*** Nuttall, Missouri Gooseberry. Forests, rock outcrops. April-June; May-July. W. WV, sw. OH, IN, WI, MN, and e. ND south to KY, e. TN (Roane and Grainger counties), s. IL, MO, n. AR, and KS, with scattered occurrences (perhaps escapes from cultivation) in CT, NJ, PA, MD, VA, and WV. [= C, F, FNA, G, K, WV, Z; = *Grossularia missouriensis* (Nuttall) Coville & Britton – S]

\* ***Ribes nigrum*** Linnaeus, Garden Black Currant, Cassis. Disturbed areas; native to Europe. Cultivated in ne. United States, rarely as far south as our area (in MD and NJ according to FNA); it may escape. [= C, F, FNA, G, K]

***Ribes rotundifolium*** Michaux, Appalachian Gooseberry. Moist slopes, balds, boulderfields, rocky forests, mostly at high elevations south of VA. April-May; June-September. An Appalachian endemic: MA, CO, and NY south to w. NC and e. TN. [= RAB, C, F, FNA, G, K, Pa, W, WV, Z; = *Grossularia rotundifolia* (Michaux) Coville & Britton – S]

\* ***Ribes rubrum*** Linnaeus, Garden Red Currant. Persistent from cultivation and escaped to adjacent fence-rows and disturbed areas; native of Europe. Late April-May; June-August. [= FNA, K, Pa; > *R. sativum* Syme – C, F, G, WV]

***Ribes triste*** Pallas, Swamp Red Currant, Wild Red Currant. Boggy forests, seepage wetlands. May-July. NL (Labrador) west to AK, south to MD, WV (Mineral, Pocahontas, and Randolph counties), OH, MN, SD, MT, ID, and OR. [= C, F, FNA, G, K, Pa, WV]

\* ***Ribes uva-crispa*** Linnaeus, Garden Gooseberry, European Gooseberry. Fencerows, disturbed areas; native of Europe. Cultivated in ne. United States. [= C, FNA; = *Ribes uva-crispa* Linnaeus var. *sativum* A.P. de Candolle – K, Pa; > *R. uva-crispi* – C; = *R. grossularia* Linnaeus – F, G, WV]



### 133. SAXIFRAGACEAE A.L. de Jussieu 1789 (Saxifrage Family) [in SAXIFRAGALES]

If narrowly circumscribed (as here), a family of about 35 genera and 500-650 species, herbs (mainly perennial), nearly cosmopolitan, but especially diverse in warm temperate and cold temperate regions of North America and Eurasia. The circumscription of a much narrower Saxifragaceae is clearly warranted, based on a wide variety of data, and recently strongly corroborated by molecular data (Morgan & Soltis 1993). References: Wells & Elvander in FNA (2009); Spongberg (1972); Morgan & Soltis (1993); Soltis in Kubitzki, Bayer, & Stevens (2007). [also see GROSSULARIACEAE, HYDRANGEACEAE, ITEACEAE, PARNASSIACEAE, and PENTHORACEAE]

- 1 Leaves compound.....*Astilbe*
- 1 Leaves simple (sometimes cleft or lobed).
  - 2 Stem creeping, the leaves all cauline, opposite; leaves short-petioled or sessile, < 2 cm long.....*Chrysosplenium*
  - 2 Stem erect, the leaves mostly or entirely basal, alternate (stem leaves opposite in *Mitella*); leaves long-petioled, > 4 cm long (except short-petioled or sessile and sometimes < 4 cm long in *Micranthes*).
  - 3 Basal leaves short-petioled or sessile, the petioles 0-1× as long as the blade; basal leaves cuneate or rounded at the base; leaf venation predominately pinnate.
    - 4 Corolla bilaterally symmetrical, the 3 upper petals distinctly clawed (the petal blade with a cordate or truncate base) and with 2 yellow spots, the 2 lower petals smaller, cuneate, and not spotted; leaf margins coarsely dentate.....*Hydatice*

- 4 Corolla radially symmetrical; leaf margins entire to serrate ..... *Micranthes*
- 3 Basal leaves long-petioled, the petioles (1-) 2-5× as long as the blade; basal leaves cordate at the base; leaf venation predominantly palmate.
- 5 Stem leaves opposite; petals fimbriate; inflorescence a raceme; flowers on pedicels 1.5-3 mm long ..... *Mitella*
- 5 Stem leaves absent or alternate; petals not fimbriate; inflorescence a panicle or raceme; flowers mostly on pedicels > 3 mm long.
- 6 Inflorescence racemose; stamens 10 ..... *Tiarella*
- 6 Inflorescence paniculate; stamens 5.
- 7 Seeds winged, 1.3-1.5 mm long; leaves cleft < ½ way to base; hypanthium fused to the pistils only at their bases; stems normally with several petiolate leaves much like the basal leaves (though typically somewhat smaller) ..... *Sullivantia*
- 7 Seeds papillose, echinate, smooth, or slightly ridged, 0.4-0.7 mm long; leaves cleft > ½ way to base (in *Boykinia*) or < ½ way (in *Heuchera*); hypanthium fused to the lower half or more of the pistils; stems with (in *Boykinia*) or without (in *Heuchera*) several petiolate leaves.
- 8 Stems normally with several petiolate leaves much like the basal leaves (though typically somewhat smaller); ovary with 2 locules; leaves cleft > ½ way to base ..... *Boykinia*
- 8 Stems with only very reduced sessile bracts unlike the basal leaves; ovary with 1 locule; leaves cleft < ½ way to base ..... *Heuchera*

*Astilbe* Buchenau-Hamilton ex D. Don 1825 (False Goat's-beard)

A genus of 14-25 species, perennial herbs, of e. Asia and e. North America. References: Mellichamp in FNA (2009); Soltis in Kubitzki, Bayer, & Stevens (2007).

**Identification notes:** Superficially, *Astilbe* is quite similar to *Aruncus* (Rosaceae). *Astilbe* may be distinguished by the following characteristics: pubescence of the stem and lower leaf surface glandular, plants monoecious, carpels 2 per flower, stamens 10 per flower (vs. *Aruncus*: pubescence nonglandular, plants dioecious, carpels 3-4 per flower, stamens 15-20 per flower).

- 1 Leaves serrate, the teeth sharp; fruit conic-lanceolate, tapering gradually, 4-5 mm long ..... *A. biternata*
- 1 Leaves crenate, the teeth rounded (but with a prominent mucronate tip); fruit ovoid, abruptly contracted to the tip, 3 mm long ..... *A. crenatiloba*

*Astilbe biternata* (Ventenat) Britton, Appalachian False Goat's-beard. Cove forests, seepage slopes. May-June; July-August. VA, sw. WV, and KY south to n. GA. [= C, F, G, K, S, W; < *A. biternata* – RAB, FNA (also see *A. crenatiloba*)]

*Astilbe crenatiloba* (Britton) Small, Roan Mountain False Goat's-beard. Mountain forests. July?; September. Known only from Roan Mountain, Carter County, TN and very rare or extinct. This species has apparently not been seen since the original collections (11 September 1885) by N.L. Britton and Mrs. Britton ("Tennessee. Base of Roan Mountain. Collected on the slope of Roan Mountain, East Tennessee, along the trail from 'Cloudland' to the Roan Mountain station of the E.T. & W.N.C.R.R."); the habitat, phenology, and other characteristics of this species are therefore poorly known. The morphologic characters are striking. [= K, S, W; < *A. biternata* – RAB, FNA]

*Boykinia* Nuttall 1834 (Boykinia)

A genus of 7 species, herbs, of e. Asia, e. North America, and w. North America, a classic relictual distribution. The other species are distributed primarily in the Pacific Northwest or Rocky Mountains, with several endemics in Japan and an endemic in the unglaciated portions of AK and e. Siberia. References: Gornall in FNA (2009); Soltis in Kubitzki, Bayer, & Stevens (2007)

**Identification notes:** Sometimes mistaken in vegetative condition for *Trautvetteria*, which is a coarser plant, often occupying similar habitats.

*Boykinia aconitifolia* Nuttall, Brook-saxifrage, Aconite-saxifrage, Eastern Boykinia. Streambanks, riverbanks, in crevices in spray cliffs around waterfalls, seepages. June-July. A Southern Appalachian endemic: sw. VA and s. WV, south through w. NC, e. TN, and nw. SC, to n. GA and ne. AL. Apparently closely related to the Japanese endemic *B. lycoctonifolia* (Maximowicz) Engler. [= RAB, C, F, G, GW, K, W; = *Therophon aconitifolium* (Nuttall) Millspaugh – S; > *B. turbinata* (Rydberg) Fedde; > *Therophon turbinatum* Rydberg]

*Chrysosplenium* Linnaeus 1753 (Golden-saxifrage)

A genus of about 60 species, herbs, of Europe, ne. Asia, n. North America, n. Africa, and temperate South America. References: Freeman & Levens in FNA (2009); Soltis in Kubitzki, Bayer, & Stevens (2007).

*Chrysosplenium americanum* Schweinitz ex Hooker, Golden-saxifrage, Water-mat, Water-carpet. In shallow seepage in shade. March-June. QC west to SK, south to e. VA, w. NC, n. GA, e. TN, and IN. [= RAB, C, F, FNA, G, GW, K, Pa, S, W]

*Heuchera* Linnaeus 1753 (Alumroot)

A genus of about 37 species, perennial herbs, of North America. Soltis (1985) found that speciation in *Heuchera* "apparently occurs with little divergence at genes coding for isozymes." Vegetatively, *Heuchera* resembles *Tiarella* and *Mitella*. References: Wells & Shipes in FNA (2009); Wells (1984)=Z; Rosendahl, Butters, & Lakela (1936)=Y; Wells (1979); Soltis in Kubitzki, Bayer, & Stevens (2007). The keys adapted from Wells (1984).

- 1 Calyx glandular-villous, white or pink, often with green-tipped lobes, 1.3-3.3 mm long, 1.1-2.9 mm in diameter; free hypanthium 0.1-0.4 mm long; petals linear or oblanceolate, 2-3× as long as the calyx lobes, glabrous; plants flowering (June-) July-October.
  - 2 Leaves with widely to narrowly triangular lobes and triangular teeth; petals linear, often coiled; seeds echinate; internodes of floral branches 0.3-2.9 mm long.
    - 3 Leaves deeply and sharply lobed, the terminal lobe wider than long; bracts of the inflorescence oblong to spatulate, at least the lower ones toothed; [of the Alleghenies, Cumberlands, and Interior Low Plateau] ..... *H. villosa* var. *macrorrhiza*
    - 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 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 exerted 0.2-1.5 mm beyond the calyx and styles included or exerted up to 1.1 mm beyond the calyx; calyx subglobose..... *H. caroliniana*
    - 6 At the onset of anthesis the stamens exerted 3 mm or more beyond the calyx and styles exerted 2.6 mm or more beyond the calyx; calyx urceolate or campanulate.
      - 7 Petioles densely hirsute; free hypanthium (1.1-) avg. 1.5 (-1.9) mm long ..... *H. hirsuticaulis*
      - 7 Petioles glabrous, short-pubescent, or scantily hirsute; free hypanthium **either** (0.6-) avg. 1.1 (-1.5) mm long **or** (1.5-) avg. 1.7 (-1.9) mm long.
        - 8 Free hypanthium 0.6-1.5 mm long; petals greenish, white, creamy, or pink, the margins entire or bearing short teeth..... *H. americana*
        - 8 Free hypanthium 1.5-1.9 mm long; petals purple or pink, the margins fimbriate..... *H. hispida*
  - 5 Free hypanthium > 2 mm long; calyx weakly to strongly zygomorphic; calyx subglobose, campanulate, or tubular.
    - 9 Stigmas included within the calyx (the calyx lobes extending 1.3-5.3 mm beyond the stigma tips); calyx tubular; calyx lobes and petals inflexed, closing the mouth of the flower..... *H. longiflora*
    - 9 Stigmas barely included within the calyx (the calyx lobes extending up to 0.6 mm beyond the stigma tips) to moderately exerted beyond it; calyx subglobose or campanulate; calyx lobes and petals erect or spreading, not closing the mouth of the flower.
      - 10 Calyx 2.8-4.5 mm long, subglobose; [of the Piedmont of sc. VA southward to SC] ..... *H. caroliniana*
      - 10 Calyx 5.5-13.2 mm long, narrowly campanulate; [primarily of the Mountains and upper Piedmont of VA and nc. NC].
        - 11 Flowers large, with white, exerted petals; [of high elevations (usually over 1000 m) on strongly acidic substrates, such as quartzitic sandstones, in w. VA and adjacent e. WV]..... *H. alba*
        - 11 Flowers smaller, with greenish or purplish-green petals; [of lower elevations on circumneutral or subacidic substrates] ..... *H. pubescens*

***Heuchera alba*** Rydberg. Quartzitic outcrops at high elevations. July-September. Further study of *H. alba* Rydberg is needed; its recognition as distinct from *H. pubescens* is probably warranted (R. Bartgis, pers. comm.). It apparently differs from *H. pubescens* in its large flowers with white, exerted petals (vs. greenish or purplish-green petals), and occurs at higher elevations (usually over 1000 m) on acidic substrates, such as quartzitic sandstones (vs. at lower elevations on circumneutral or subacidic substrates). [= FNA, K, WV; < *H. pubescens* – C, F, S, W, Z; < *H. pubescens* var. *brachyandra* Rosendahl, Butters, & Lakela – F, G, Y]

***Heuchera americana*** Linnaeus, American Alumroot. Rocky forests, rock outcrops, particularly where soils are subacidic to circumneutral. April-August. CT and NY west to s. ON, n. IN, s. IL, and sc. MO south to c. GA, c. AL, n. MS, n. LA, and ne. TX. *H. americana* is the most widespread species of *Heuchera* in e. North America. Within the range of *H. caroliniana*, *H. americana* is nearly absent. [= C, Pa; > *H. americana* var. *americana* – F, G, WV; = *H. americana* var. *americana* – FNA, K, Z; < *H. americana* – RAB, W; > *H. americana* var. *heteradenia* Fernald – F; > *H. americana* var. *subtruncata* Fernald – F; > *H. americana* var. *brevipetala* Rosendahl, Butters, & Lakela – G, Y; > *H. calycosa* Small – S; > *H. curtisii* – S; > *H. lancipetala* Rydberg – S; > *H. americana* var. *typica* – Y; > *H. americana* var. *calycosa* (Small) Rosendahl, Butters, & Lakela – Y]



***Heuchera caroliniana*** (Rosendahl, Butters, & Lakela) E.F. Wells, Carolina Alumroot. Rocky forests, rock outcrops, particularly where soils are subacidic to circumneutral, replacing *H. americana* in much of the upper Piedmont. April-June.

Endemic to the Piedmont of sc. VA, NC, and nc. SC; first found in VA (Henry County) by T.F. Wieboldt in 2002 (Belden et al. 2004). [= FNA, K, Z; = *H. americana* Linnaeus var. *caroliniana* Rosendahl, Butters, & Lakela - Y; < *H. americana* - RAB, S]

***Heuchera hirsuticaulis*** (Wheelock) Rydberg. River bluffs (GA), bluffs and outcrops. S. MI west to n. IL and sw. MO, south to c. TN, nw. AR, and ne. OK; disjunct in e. GA (Screven County). Considered by Wells (1984) to represent fertile hybrids between *H. americana* var. *americana* and *H. richardsonii*; here regarded as a stabilized taxon, with numerous occurrences beyond the distribution of one or the other alleged parent. East to w. KY (Medley 1993), w. and c. TN (D. Estes, pers. comm. 2008), and e. GA (Screven County specimens at NCU). [= *H. americana* Linnaeus var. *hirsuticaulis* (Wheelock) Rosendahl, Butters, & Lakela - FNA, K, Z; > *H. americana* Linnaeus var. *hirsuticaulis* (Wheelock) Rosendahl, Butters, & Lakela - F, Y; > *H. americana* var. *interior* Rosendahl, Butters, & Lakela - F, Y] {add to synonymy, C, G, S}

***Heuchera hispida*** Pursh, Purple Alumroot. Calcareous rocky forests, rock outcrops, particularly where soils are subacidic to circumneutral. April-June. S. PA south through MD, WV, and VA to nw. NC. This species is intermediate between *H. americana* and *H. pubescens*; it is almost certainly of hybrid origin. The treatment of this hybrid derivative of *H. americana* and *H. pubescens* as *H. americana* var. *hispida* (a variety of one parent) seems undesirable. Since it partly replaces its parents within its range, occurs in populations away from one or both parent, and is not strictly intermediate, it seems best to accord it species status. [= F, G, S, WV, Y; < *H. americana* - RAB, W; = *H. xhispida* Pursh - C; = *H. americana* var. *hispida* (Pursh) E.F. Wells - FNA, K, Z]

***Heuchera longiflora*** Rydberg, Long-flowered Alumroot. Rich shaded forests and woodlands over calcareous rocks such as limestone, dolostone, or calcite-cemented shales, siltstones, or sandstones, in circumneutral soils. May-June. This species is nearly limited to sedimentary rocks, occurring in e. and c. KY, s. OH, sw. WV, sw. VA, ne. TN, w. NC, and c. AL (?). In NC, it occurs primarily in the sedimentary window around Hot Springs, and is possibly limited to Madison, Buncombe, and Haywood counties. Wells (1984) calls it "most distinctive", "characterized by a unique combination of floral characters: long, tubular calyx, deeply included styles, inflexed calyx lobes and petals that close the mouth of the flower obliquely, and horizontal orientation of the flowers." [= C, F, FNA, G, K, W, WV, Z; = *H. pubescens* - RAB, misapplied; > *H. longiflora* - S; > *H. aceroides* Rydberg - S; > *H. scabra* Rydberg - S; > *H. longiflora* Rydberg var. *aceroides* (Rydberg) Rosendahl, Butters, & Lakela - Y; > *H. longiflora* var. *typica* - Y]

***Heuchera parviflora*** Bartling, Cave Alumroot. Shaded cliff bases, usually under overhangs, on grotto floors, behind waterfalls where humidity is high but not in the spray zone, nearly always in deeply shaded situations where little or no direct sunlight falls. July-September. An uncommon species throughout its range (ec. TN, KY, s. WV, sw. VA, w. NC, n. GA, n. AL, s. MO, s. IL, and s. IN), *H. parviflora* is probably most common in the gorge and waterfall country of sw. NC and in the Cumberland Plateau of TN and KY. In deeply shaded sites, it is often the only vascular plant present. The closely related species *H. puberula* Mackenzie & Bush [*H. parviflora* var. *puberula* (Mackenzie & Bush) E.F. Wells] occurs in s. MO and nc. AR, with scattered disjunct sites as far east as c. KY, c. TN, and s. IN. [= RAB, S, W; = *H. parviflora* var. *parviflora* - C, FNA, K, Z; > *H. parviflora* var. *parviflora* - F, G; > *H. parviflora* var. *rugelii* (Shuttleworth) Rosendahl, Butters, & Lakela - F, G, WV, Y; > *H. parviflora* var. *typica* - Y]

***Heuchera puberula*** Mackenzie & Bush. Shaded cliff bases, usually under overhangs, on grotto floors, behind waterfalls where humidity is high but not in the spray zone, nearly always in deeply shaded situations where little or no direct sunlight falls. C. KY (Medley 1993), s. IN, s. IL, and s. MO south to n. AL and c. AR. [= F, G, Y; = *H. parviflora* Bartling var. *puberula* (Mackenzie & Bush) E.F. Wells - FNA, K, Z]



***Heuchera pubescens*** Pursh, Marbled Alumroot. Rocky forests, rock outcrops, particularly where soils are subacidic or circumneutral. May-July. Primarily a species of the Ridge and Valley Province of PA, MD, WV, and VA, *H. pubescens* ranges south to only a few locations in the upper Piedmont of NC. See discussion under *H. alba*. The report in RAB of the occurrence of *H. pubescens* in Madison County, NC, is apparently erroneous; Wells (1984) shows *H. pubescens* reaching its southern limit just south of the VA border, and not occurring at all in KY, TN, or the mountains of NC. She found the bract characters used in the key in RAB to be unreliable. Reported by Hill & Horn (1997) for South Carolina {report needs verification}. [= FNA, K, Pa, WV; < *H. pubescens* - C, S, W, Z (also see *H. alba*); >> *H. pubescens* var. *brachyandra* Rosendahl, Butters, & Lakela - F, G, Y; > *H. pubescens* var. *pubescens* - F; > *H. pubescens* var. *typica* - Y]

\* ***Heuchera sanguinea*** Engelmänn var. *sanguinea*, Coral Bells. Cultivated as an ornamental "wildflower;" native of w. North America. [= K; < *H. sanguinea* - FNA, G; = *H. sanguinea* var. *typica* - Y] {not keyed; not mapped; rejected as a component of the flora}

***Heuchera villosa*** Michaux var. ***macrorhiza*** (Small) Rosendahl, Butters, & Lakela, Giant Alumroot. Cliffs, riverbanks. July-October. S. WV, s. OH, and s. IN south through c. KY and c. TN to n. AL and ne. MS. This taxon has usually been disregarded in recent years, but is recognized by Chester et al. (1997). In its purest form, this plant seems to be very distinct from typical *H. villosa*, and actually may be more closely related to *H. arkansana*. The existence of intermediates and intergrades with *H. villosa* var. *villosa* muddies the taxonomic waters, however, and the overall best treatment seems to be at the varietal level. Some intermediates occur in the primary area, as in w. VA. [= G; < *H. villosa* var. *villosa* - C, FNA, K, Z; > *H. villosa* var. *macrorhiza* - F, WV, Y; = *H. macrorhiza* Small - S; > *H. villosa* var. *intermedia* Rosendahl, Butters, & Lakela - F, WV, Y]



*Heuchera villosa* Michaux var. *villosa*, Crag-jangle, Rock Alumroot. In crevices of rock outcrops, or in thin soil over boulders, a characteristic component of the flora of high elevation cliffs and summits (to at least 1920 m), not particular about the rock type, occurring on a wide range of rock types in our area, including felsic gneisses and schists, mafic gneisses, granites, quartzites, and others, probably the most acidophilic of our species of *Heuchera*. Late June–October. W. VA and s. WV south through w. NC and e. TN to nw. SC, n. GA, ne. AL (primarily a Southern Blue Ridge endemic). In the Ozarks of AR it is replaced by the related *H. arkansana* Rydberg [*H. villosa* var. *arkansana* (Rydberg) E.B. Smith] with shorter and narrower inflorescence, shorter pedicels, and larger flowers. [= G; < *H. villosa* – RAB, W; < *H. villosa* var. *villosa* – C, FNA, K, Z; > *H. villosa* var. *villosa* – F; = *H. villosa* – S; > *H. villosa* var. *typica* – Y; >> *H. villosa* var. *intermedia* Rosendahl, Butters, & Lakela – F, Y]

*Hydaticea* Necker ex Gray 1821 (Appalachian Saxifrage)

A genus of about 12 species, herbs, of temperate w. North America, Europe, and e. North America. References: Lanning (2009)=Y.

*Hydaticea petiolaris* (Rafinesque) Small, Cliff Saxifrage. In crevices in exposed rock outcrops at high elevations, other rock outcrops (moist to rather dry), periglacial boulderfields, rocky seeps. June–August. A Southern Appalachian endemic: nw. VA, WV, and KY south to e. TN, w. NC, sw. SC, and ne. GA. The orange anthers are an attractive contrast to the white petals (the three upper with two yellow spots each). [= S, Y; = *Micranthes petiolaris* (Rafinesque) Bush – FNA, Z; = *Saxifraga michauxii* Britton – RAB, C, F, G, GW, K, W, WV]

*Hydaticea species 1*. In seepage on granite. Endemic, so far as is known, to Pickens County, SC. Under study by Patrick McMillan. {not yet keyed}



*Micranthes* Haworth 1812 (Saxifrage)

A genus of about 60–75 species, perennials, mostly of north temperate, boreal, and arctic regions of North America, South America, and Eurasia. As shown by molecular data, *Saxifraga*, as often broadly defined, is polyphyletic, and all of our species either belong in *Micranthes* (Soltis 1995, Soltis et al. 1996, Mort & Soltis 1999), or with further separation into *Micranthes* and *Hydaticea* (as followed here). Soltis et al. (1996) demonstrate that *Micranthes* is closely allied with *Heuchera*, *Mitella*, and *Tiarella*, less closely related to *Astilbe*, *Boykinia*, *Sullivantia*, and *Chrysosplenium*, and least closely related to the bulk of *Saxifraga*. References: Elvander & Brouillet in FNA (2009); Lanning (2009)=Y; Brouillet & Gornall (2007)=Z; Soltis in Kubitzki, Bayer, & Stevens (2007). Key based on various sources, including Lanning (2009).

- 1 Larger leaf blades oblanceolate, 4–10× as long as wide.
  - 2 Leaf margin entire to crenate; petals greenish-white, lacking yellowish spots ..... *M. pensylvanica*
  - 2 Leaf margin coarsely serrate; petals white, either 3 or 5 of them with yellowish spots.
    - 3 Leaves with mostly 12–40 teeth per side; pubescence of the leaves and scapes mostly nonglandular; corolla radially symmetrical; filaments strongly clavate; [mostly of shaded seepages and brook-banks] ..... *M. micranthidifolia*
    - 3 Leaves mostly with 4–8 teeth per side; pubescence of the leaves and scapes mostly gland-tipped; corolla bilaterally symmetrical, the 3 upper petals distinctly clawed (the petal blade with a cordate or truncate base) and with 2 yellow spots, the 2 lower petals smaller, cuneate, and not spotted; filaments filiform; [mostly of rock outcrops and seepages, often exposed, but sometimes shaded] ..... [*Hydaticea petiolaris*]
- 1 Larger leaf blades ovate or obovate, 1–3 (–4)× as long as wide.
  - 4 Leaf margins entire or with obscure teeth mostly < 1 mm long; leaves to 5 (–9) cm long and 2.5 cm wide; filaments 1–1.5 mm long; ovary partly inferior, the hypanthium partly adnate to the ovary; petals spatulate and cuneate, but not clawed; petals not spotted; [widespread in our area].
    - 5 Inflorescence remaining compact with age; inflorescence axis sparsely short-hairy, the hairs not glandular (or with a very few glandular hairs interspersed; pedicels glabrous or nearly so; petals 2–3.5 mm long; [of granite outcrops in GA, otherwise in sc. US] ..... *M. texana*
    - 5 Inflorescence branching with age, some branches often lower than the midpoint of the plant's height; inflorescence axis glandular-hairy; pedicels glandular-hairy; petals 3.5–6 mm long; [widespread in our area] ..... *M. virginensis*
  - 4 Leaf margins with coarse teeth mostly 2–10 mm long; leaves to 15 cm long and 8 cm wide; filaments 2.5–3.5 mm long; ovary superior, the hypanthium free from the ovary; petals (either 3 or 5 of them) moderately to strongly clawed; petals (either 3 or 5 of them each with 2 yellow spots; [of the Mountains and upper Piedmont].
    - 6 Leaves not petiolate, cuneate to the base, gradually increasing in width from the base to the widest point; corolla bilaterally symmetrical, the 3 upper petals distinctly clawed and with yellow spots, the 2 lower smaller, cuneate, and not spotted ..... [*Hydaticea petiolaris*]
    - 6 Leaves petiolate, the blade rather abruptly contracted to the petiole; corolla radially symmetrical, all the petals alike.
      - 7 Sepals erect, later spreading; filaments filiform (use 10×) ..... *M. careyana*
      - 7 Sepals spreading, later reflexed; filaments slightly clavate (use 10×) ..... *M. caroliniana*

***Micranthes careyana*** (A. Gray) Small, Carey Saxifrage. Moist rock outcrops and cliffs, often under overhangs, often in moist soil at the base of a vertical or overhanging rock outcrop. May-June. A Southern Appalachian endemic: e. TN and nw. NC south to sw. NC and se. TN. Lanning (2009) has clarified the taxonomy of the *M. careyana* / *caroliniana* complex through molecular and morphological study. [= FNA, S, Z; = *Saxifraga careyana* A. Gray – RAB, C, F, G, GW, K, W]

***Micranthes caroliniana*** (A. Gray) Small, Carolina Saxifrage. Moist rock outcrops and cliffs, often under overhangs, often in moist soil at the base of a vertical or overhanging rock outcrop. May-June. A Southern Appalachian endemic: sw. VA south to nw. NC and ne. TN. [= FNA, S, Z; = *Saxifraga caroliniana* A. Gray – RAB, C, F, G, K, W; > *M. caroliniana* – S; > *M. tennesseensis* Small – S]

***Micranthes micranthidifolia*** (Haworth) Small, Branch-lettuce. Wet soils of seepages, in the beds of high elevation brooks, brookbanks; rocky seepages. May-June. A Southern and Central Appalachian endemic: e. PA and WV, south to e. TN, w. NC, nw. SC, and ne. GA. This plant is gathered in considerable quantities as a spring green in the mountains of our area, and can sometimes be seen for sale in local grocery stores. The common name refers to the plant's habit; "branches" are mountain streams. [= FNA, S, Z; = *Saxifraga micranthidifolia* (Haworth) Steudel – RAB, C, F, G, GW, K, Pa, W, WV]

***Micranthes pensylvanica*** (Linnaeus) Haworth, Swamp Saxifrage. Mountain bogs, mucky seeps. April-June. ME west to MN, south to e. VA, c. and w. NC, and MO. [= FNA, Z; = *Saxifraga pensylvanica* Linnaeus – RAB, C, F, K, Pa, W, WV; > *S. pensylvanica* ssp. *pensylvanica* – G]

***Micranthes texana*** (Buckley) Small, Texas Saxifrage. Granite outcrops. Found in 1980 by Jim Allison on a small granite outcrop in McDuffie County, GA. It is uncertain whether its occurrence in GA represents a natural disjunction or a freak introduction (J. Allison, pers. comm.). [= FNA, S, Z; = *Saxifraga texana* Buckley – F, G, K]

***Micranthes virginensis*** (Michaux) Small, Early Saxifrage. Rock outcrops, moist alluvial and slope forests, streambanks, riverbanks. March-May. NB west to MB, south to c. GA, LA, and AR. [= FNA, S, Z; = *Saxifraga virginensis* Michaux – RAB, C, F, G, GW, Pa, W, WV; > *S. virginensis* var. *virginensis* – K]



***Mitella*** Linnaeus 1753 (Miterwort)

As traditionally circumscribed, a genus of about 20 species, herbs, of cold temperate e. North America, w. North America, and e. Asia. Soltis (2007) and Okuyama, Pellmyr, & Kato (2008) indicate that *Mitella* as currently circumscribed is polyphyletic and is likely to be divided; our species will remain in *Mitella*. References: Soltis & Freeman in FNA (2009); Soltis in Kubitzki, Bayer, & Stevens (2007).

***Mitella diphylla*** Linnaeus, Two-leaved Miterwort. Moist rich forests, especially in the Mountains, and especially rocky. April-June. QC west to MN, south to e. VA, w. NC, nw. SC, ne. GA, nw. GA, and MO. The fringed petals will reward a close look. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV]

### ***Saxifraga*** Linnaeus 1753 (Saxifrage)

A genus of ca. 390 species, herbs (mainly perennial), of mainly north temperate regions. References: Brouillet & Elvander in FNA (2009). [also see *Hydaticea* and *Micranthes*]

- 1 Plant perennial via stolons; leaves orbicular, cordate at the base, broadly rounded at the tip, serrate; flowers bilaterally symmetrical or asymmetrical ..... *S. stolonifera*  
 1 Plant annual; leaves elongate, cuneate at base, tridentate at the tip; flowers radially symmetrical..... *S. tridactylites*

\* ***Saxifraga stolonifera*** Meerburgh, Creeping Saxifrage, Strawberry-begonia, Strawberry-geranium. Frequently cultivated, sometimes persistent or spreading in suburb; native of China and Japan. Reported for Jackson County, NC, by Kartesz (2010). [= FNA, K2] {not yet keyed}

\* ***Saxifraga tridactylites*** Linnaeus, Rue-leaved Saxifrage. Gravel and thin soils along roads and highways; native of Mediterranean Europe, n. Africa, and w. Asia. [= FNA, K2] {not yet keyed}

### ***Sullivantia*** Torrey & A. Gray 1842 (Sullivantia)

A genus of 3-4 species, perennial herbs, of c. North America. References: Soltis in FNA (2009); Soltis (1980)=Z; Soltis in Kubitzki, Bayer, & Stevens (2007).

*Sullivantia sullivantii* (Torrey & A. Gray) Britton, *Sullivantia*. Moist limestone cliffs. June-August. *S. sullivantii* has a very scattered, relictual distribution, known from w. VA (Russell County), e. KY, ne. TN (Claiborne County), s. OH, IL, sw. WI, ne. IA, se. MN, and MO. [= C, F, FNA, G, K, Z]

*Tiarella* Linnaeus 1787 (Foamflower)

A genus of 3-6 species, perennial herbs, of temperate North America and e. Asia. References: Jog in FNA (2009); Lakela (1937)=Y; Spongberg (1972)=Z; Wherry (1940, 1949)=X; Fernald (1943)=V; Soltis in Kubitzki, Bayer, & Stevens (2007).

*Tiarella cordifolia* Linnaeus. Moist forests, cove forests, rock outcrops. April-June. NS west to ON and WI, south to w. NC, nw. SC, sw. GA, AL, MS, and MO. Several taxa have been recognized (or not) in eastern North American *Tiarella*. The characters used to recognize additional species or varieties are often missing on herbarium sheets and also seem to be imperfectly correlated. *T. wherryi* (or var. *collina*) is alleged to differ from *T. cordifolia* s.s. in lacking stolons (vs. having stolons), capsules 6-10 mm long and round-tipped (vs. 8-12 mm long and subacuminate), and lower fruiting pedicels 6-10 mm long (vs. 7-13 mm long). Additional taxa have sometimes been recognized; see Lakela (1937), Wherry (1940, 1949), Fernald (1943), and Spongberg (1972) for discussion. Further study is needed; for now, I have opted (without great confidence) for a broad approach. [= FNA, Pa, S, W; > *T. cordifolia* – F, V, WV, Z; > *T. cordifolia* var. *cordifolia* – RAB, C, G, K; > *T. macrophylla* Small – S (type a combination of *Heuchera* and *Tiarella*); > *T. cordifolia* var. *typica* – Y; > *T. wherryi* Lakela – F, V, Z; > *T. cordifolia* Linnaeus var. *collina* Wherry – RAB, C, G, K; > *T. cordifolia* var. *collina* – X; > *T. wherryi* – X, Y; > *T. cordifolia* var. *austrina* – K, X, Y]

134. **CRASSULACEAE** A.P. de Candolle 1825 (Stonecrop Family) [in SAXIFRAGALES]

A family of about 34-35 genera and 1100-1410 species, succulent shrubs and herbs, nearly cosmopolitan, but with centers of diversity in s. Africa and Mexico. References: Moran in FNA (2009); Thiede & Eggli in Kubitzki, Bayer, & Stevens (2007).

- 1 Leaves connate at the base, opposite; flowers solitary in the axils of leaves; flowers 3-4-merous; [subfamily *Crassuloideae*].....*Crassula*
- 1 Leaves distinct, whorled or alternate; flowers in terminal cymose inflorescences; flowers 4-5 (-8)-merous.
  - 2 Petals connate as a tube; leaves serrate, bearing plantlets in the serrations; [subfamily *Kalanchoideae*].....*Bryophyllum*
  - 2 Petals distinct or at most basally connate; leaves entire, crenate, or serrate, but not bearing plantlets along the margin; [subfamily *Sempervivoideae*].
    - 3 Plants with spheroidal basal rosettes consisting of dozens or more spirally arranged leaves; flowers 8-16-merous.....[*Sempervivum*]
    - 3 Plants with or without basal rosettes (if rosettes present, these not as above); flowers 4-6-merous
      - 4 Perennials without rosettes, the stems 0.5-10 dm tall (dying back in winter to the rootstock); leaves large, relatively thin in texture, usually 5-25 times as wide as thick, often crenate; flowers pink, purple, white, or greenish.
        - 5 Flowers 5-merous, bisexual; flowering stems 2-10 dm tall, from an underground, tuberous base; average leaves 3-11 cm long, 1-5 cm wide; ovaries attenuate at the base; [tribe *Telephieae*] .....*Hylotelephium*
        - 5 Flowers 4 -(5)-merous, usually unisexual and then the plants dioecious; flowering stems 0.5-4 dm tall, from axils of brown scale-leaves clothing a stout rootstock at least in part exposed aboveground; average leaves 1-5 cm long, 0.4-1.5 cm wide; ovaries not attenuate at the base; [tribe *Umbiliceae*] .....*Rhodiola*
      - 4 Perennials or annuals with or without rosettes, the stems < 2 dm tall (the perennials with stems persistent through the winter); leaves smaller, flat or terete, relatively thicker, entire; flowers white or yellow; [tribe *Sedeeae*].
        - 6 Carpels united basally (to about 1/3 their length); petals cucullate, initially partly enclosing 4 of the 8 stamens; follicles dehiscent by a tear-shaped valve on the lower surface; stem and leaves normally red; [of granitic flatrocks of the Piedmont of NC and SC] ...  
.....*Diamorpha*
        - 6 Carpels free; petals flat, never enclosing any of the 8 anthers; follicle dehiscent by a longitudinal slit along the adaxial (upper) suture; stem and leaves normally green, sometimes somewhat pink or reddish; [collectively of various habitats, including granitic flatrocks of GA, NC, SC, and VA].....*Sedum*

*Bryophyllum* Salisbury 1805

A genus of about 30 species, perennial herbs, of islands of the Indian Ocean. Sometimes treated as a subgenus of *Kalanchoe*. Moran in FNA (2009).

\* *Bryophyllum daigremontianum* (Raymond-Hamet & H. Perrier) A. Berger, Maternity Plant, Devil's Backbone, Alligator-plant, Mother-of-millions. Disturbed areas; native of Madagascar. January-December. [= FNA; = *Kalanchoe daigremontianum* Raymond-Hamet & H. Perrier – K, WH]



**Crassula** Linnaeus 1753

A genus of 195-250 species, nearly cosmopolitan (centered in s. Africa). Mort et al. (2009) provide strong evidence supporting the inclusion of *Tillaea* in *Crassula*. References: Moran in FNA (2009); Mort et al. (2009); Thiede & Egli in Kubitzki, Bayer, & Stevens (2007).

- 1 Seeds rugulose; leaves 2-6 mm long, the apex acute; sepals 0.5-1.5 mm long.....*C. aquatica*
- 1 Seeds with sharp-pointed papillae; leaves 1.5-3 mm long, the apex acute; sepals 0.4-0.6 mm long .....*C. drummondii*

***Crassula aquatica*** (Linnaeus) Schönland, Pygmyweed. Tidal marshes and shores, artificial lake. Occuring in tidal marshes and shores, south to MD and se. PA, and also in GA and AL (Kartesz 1999, FNA). [= FNA, K, Pa; = *Tillaea aquatica* Linnaeus – GW; = *Tillaeastrum aquaticum* (Linnaeus) Britton – S]

\* ***Crassula drummondii*** (Torrey & A. Gray) Fedde. Waste area around wool-combing mill, perhaps merely a waif; native of sc. United States. [= FNA, K; = *Tillaea drummondii* Torrey & A. Gray]



***Crassula longipes*** (Rose) Bywater & Wickens. {AL, GA}. [= K] {not yet keyed; synonymy incomplete}

**Diamorpha** Nuttall 1818 (Elf-orpine)

A monotypic genus, a succulent annual, endemic to se. North America. References: Wilbur (1988a)=Z; Moran in FNA (2009); Clausen (1975)=Y; Thiede & Egli in Kubitzki, Bayer, & Stevens (2007).

***Diamorpha smallii*** Britton ex Small, Elf-orpine. In very thin soil (generally less than 2 cm deep) of vernal wet depressions on granite flatrocks and other granitic outcrops. April-May; May-June. Primarily limited to granitic flatrocks of the Piedmont, ranging from sc. VA to ec. AL, and on sandstone from se. TN south into c. AL. This species is both one of the most typical and one of the most interesting of the dozens of species endemic (or largely so) to granite flatrocks of the southeastern Piedmont. See Wilbur (1988a) for a thorough discussion of the muddled nomenclatural history of this remarkable species, as well as for a detailed summary of systematic and ecological information. [= FNA, GW, K, Z; = *Sedum smallii* (Britton ex Small) H.E. Ahles – RAB, W; = *Diamorpha cymosa* (Nuttall) Britton ex Small – Y; > *Diamorpha cymosa* – S; > *Diamorpha smallii* – S]

**Hylotelephium** H. Ohba 1977 (Live-for-ever)

A genus of about 30 species, of temperate Eurasia and North America. References: Moran in FNA (2009); Clausen (1975)=Z; Thiede & Egli in Kubitzki, Bayer, & Stevens (2007). Key based on Moran in FNA (2009).

- 1 Petals 2× as long as the sepals; nectaries wider than long; flowers fertile; [native] .....*H. telephioides*
- 1 Petals 2.5-4× as long as the sepals; nectaries longer than wide; flowers sterile (rarely fertile); [introduced].
  - 2 Flowers white or greenish; cymes lax, subcorymbose; leaves not markedly reduced upward from base of plant upward....*H. erythrostickum*
  - 2 Flowers deep pink to purple; cymes densely subglobose; leaves typically strongly reduced in size from base of plant upward .....*H. telephium*

\* ***Hylotelephium erythrostickum*** (Miquel) H. Ohba, Garden Orpine, Live-for-ever. Disturbed areas; native of Europe. August-September; September-October. [= FNA, K; ? *Sedum spectabile* Boreau – Pa, RAB, misapplied; = *Sedum ×erythrostickum* – C; ? *Sedum alboroseum* Baker – F, G, Z; ? *Sedum ×alboroseum* Baker – Pa]

***Hylotelephium telephioides*** (Michaux) H. Ohba, Allegheny Live-for-ever. Rock outcrops, mostly at high to moderate elevations, ascending to 2000 m. July-September; August-October. Essentially a Central and Southern Appalachian endemic, *H.*

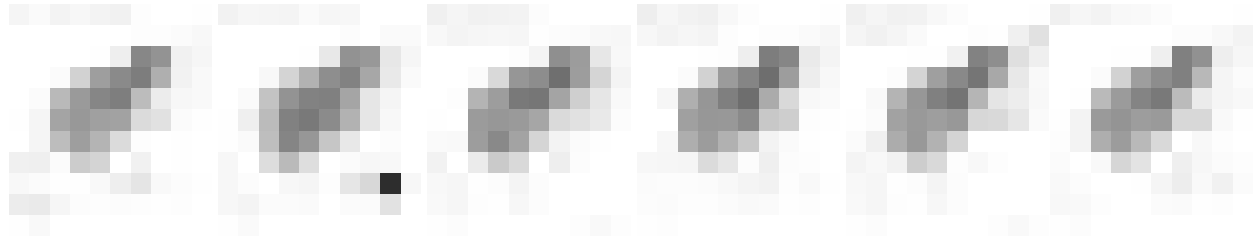
*telephioides* ranges from s. PA south to w. NC, with a few outlying populations to the west in s. IL, s. IN, and w. KY. The species is apparently not known from TN. [= FNA, K; = *Sedum telephioides* Michaux – RAB, C, F, G, Pa, W, WV, Z; = *Anacampseros telephioides* (Michaux) Haworth – S]

\* ***Hylotelephium telephium*** (Linnaeus) H. Ohba, Live-for-ever. Disturbed areas; native of Europe. September-October; October-November. [= FNA; > *Sedum purpureum* (Linnaeus) Link – RAB, C, F, WV, Z; > *S. telephium* – F, Pa; > *Sedum telephium* Linnaeus ssp. *purpureum* (Link) Schinz & R. Keller – G; > *Sedum telephium* ssp. *fabaria* (Koch) Schinz & Keller – G; = *Hylotelephium telephium* ssp. *telephium* – K]

***Rhodiola*** Linnaeus 1753 (Roseroot)

A genus of about 40-60 species, of cold temperate and boreal areas of the northern hemisphere. Thiede & Eggli (2007) place *Rhodiola* in a separate tribe from *Sedum* s.s. References: Moran in FNA (2009); Clausen (1975)=Z; Thiede & Eggli in Kubitzki, Bayer, & Stevens (2007).

***Rhodiola rosea*** Linnaeus, Roseroot. High elevation rocky summits. July-August; August-September. Circumboreal, widely distributed in northern Europe, Asia, and North America, south in e. North America to e. PA and thence disjunct to Roan Mountain (Mitchell County, NC) and Grandfather Mountain (Avery County, NC), where nearly (if not completely) extirpated. Dwarfed, high elevation forms of *Hylotelephium telephioides*, with narrow, nearly toothless leaves, have been confused with *Rhodiola rosea*; they are perhaps readily distinguished only in flower or fruit. [= FNA, K; = *Sedum rosea* (Linnaeus) Scopoli – Pa, Z; = *Sedum rosea* (Linnaeus) Scopoli var. *rosea* – C; < *S. rosea* var. *rosea* – F; < *S. rosea* – RAB, G, W; > *Rhodiola roanensis* Britton – S; > *Sedum rosea* (Linnaeus) Scopoli var. *roanense* (Britton) Berger]



***Sedum*** Linnaeus 1753 (Stonecrop, Orpine, Sedum)

A genus of perhaps 200 species, depending on circumscription. There is considerable controversy about the circumscription of the genus *Sedum*. *Diamorpha* is usually separated, but Thiede & Eggli (2007) include it in *Sedum*; the separation of *Rhodiola* and *Hylotelephium* have been more controversial, but Thiede & Eggli (2007) place these in separate tribes from *Sedum* s.s. Other segregates which would affect the species treated below have been proposed, such as *Chetyson*, *Clausenellia*, and *Spathulata* (see synonymy). References: Ohba in FNA (2009); Clausen (1975)=Z; Calie (1981)=Y; Thiede & Eggli in Kubitzki, Bayer, & Stevens (2007). [also see *Diamorpha*, *Hylotelephium*, and *Rhodiola*]

**Identification notes:** Other species of *Sedum* are grown as ornamentals, especially in rock gardens; some are aggressive and rather weedy and can be expected eventually to become a naturalized part of our flora.

- 1 Leaves primarily whorled in 3's or 4's (to 5's).
  - 2 Largest leaves distinctly spatulate, much wider than thick, 8-20 mm wide; flowers and fruits 4-merous; petals white; [native, of moist forest and rock outcrops]; [section *Ternata*].....*S. ternatum*
  - 2 Largest leaves linear-lanceolate, oblanceolate, or elliptic, almost as thick as wide, < 7 mm wide; flowers and fruits 5-merous; petals yellow; [alien].
    - 3 Leaves 4 (-5) per whorl; flowering shoots erect.....*S. mexicanum*
    - 3 Leaves 3 (-4) per whorl; flowering shoots pendulous, creeping, or ascending.
      - 4 Flowering shoots pendulous or ascending; leaves linear-lanceolate .....*S. lineare*
      - 4 Flowering shoots creeping or ascending; leaves oblanceolate to elliptic ..... *S. sarmentosum*
- 1 Leaves primarily alternate.
  - 4 Flowers and fruits 5-merous; [plants aliens].
    - 5 Leaves 2-5 mm long; petals yellow.....*S. acre*
    - 5 Leaves 6-15 mm long; petals yellow or white.
      - 6 Petals white; flowers 5-merous.....*S. album*
      - 6 Petals yellow; flowers (5-) 7 (-9) merous .....*S. rupestre*
  - 4 Flowers and fruits 4-merous; [plants natives].
    - 7 Leaves of flower-bearing stems linear, sagittate-spurred at the base (the spurs clasping the stem); petals pink to white; annual; [section *Ternata*].....*S. pulchellum*
    - 7 Leaves of flower-bearing stems narrowly elliptic, oblanceolate, spatulate, cuneate or short-spurred at the base (not clasping); petals white; perennial or annual.
      - 8 Plants annual; sepals 0.4-1 mm long; petals 1.4-4.2 mm long; [restricted to shallow soils of granitic flatrocks of the Piedmont, from s. NC south to wc. GA]; [section *Terrorum*] .....*S. pusillum*
      - 8 Plants perennial; sepals 2-9 mm long; petals 4-9 mm long; [of outcrops of various rocks, not as above]; [section *Ternata*].

- 9 Leaves of flowering stems with width/thickness ratio of >2.0; seeds averaging 0.8 mm long; leaves pale green or bluish green, sometimes with a glaucous coating; [of MD south through VA and WV to sc. and sw. NC]..... *S. glaucophyllum*
- 9 Leaves of flowering stems with width/thickness ratio of <1.7; seeds averaging 0.7 mm long; leaves green or gray-green, but not glaucous; [of se. TN south into AL and GA]..... *S. nevii*

\* *Sedum acre* Linnaeus, Wallpepper, Mossy Stonecrop, Golden Carpet, Gold-moss, Bitter Stonecrop. Rock outcrops, gravel parking lots, disturbed areas, commonly cultivated; native of Europe. May-June; June-July. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, WV, Z]

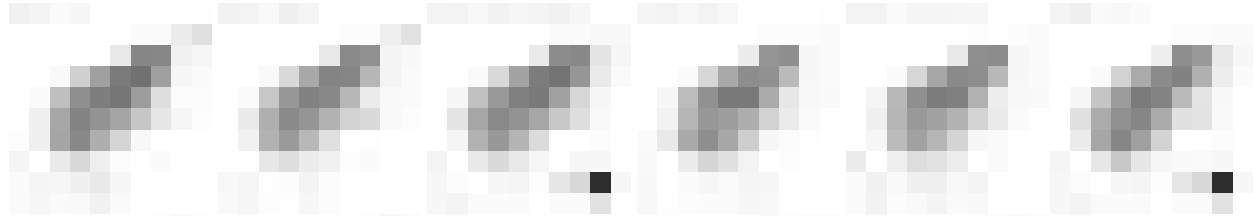
\* *Sedum album* Linnaeus, White Stonecrop. Disturbed areas; native of Eurasia. Introduced and naturalized as far south as se. PA and WV. [= C, F, FNA, G, K, Pa, Z; = *Oreosedum album* (Linnaeus) Grulich]

*Sedum glaucophyllum* Clausen, Cliff Stonecrop. Rock outcrops, usually basic and/or sedimentary. May-June; June-July. Endemic to the Central and Southern Appalachians (extending into the Piedmont), known from MD, WV, VA, and NC (reports for GA are based on confusion with *S. nevii*). This species is complex, with several ploidies and morphologies represented, some at least showing geographic integrity and perhaps worthy of taxonomic recognition. Material in sw. NC (south of the Asheville Basin) has been identified as polyploid and differs in many ways from more typical *S. glaucophyllum*, in some ways suggesting the similar and closely related *S. nevii* A. Gray (known from nearby TN and AL). Further study is needed of this group. [= C, F, FNA, K, W, WV, Y, Z; < *S. nevii* A. Gray – RAB, G, S]

\* *Sedum lineare* Thunberg. Margin of granitic flatrock; native of e. Asia. Duncan (1985) discusses the establishment of this species in Columbia County, GA. [= FNA, K, Z]

\* *Sedum mexicanum* Britton, Mexican Stonecrop. Dry, disturbed areas; native of Mexico or perhaps e. Asia. [= FNA, WH]

*Sedum nevii* A. Gray, Nevius's Stonecrop. Gneiss rock outcrops on river bluffs. Endemic to se. TN (Polk County, just west of Cherokee County, NC) (Chester, Wofford, & Kral 1997), nc. and ec. AL, and wc. GA (where it occurs on gneiss outcrops along the Chattahoochee River in Muscogee and Harris counties), and reported for s. WV (Greenbrier County) by Harmon, Ford-Wertz, & Grafton (2006). [= FNA, K, W, Y, Z; < *S. nevii* – S (also see *S. glaucophyllum*)]



*Sedum pulchellum* Michaux, Widow's-cross. Calcareous rock outcrops. E. TN (Monroe, Knox, and Bradley counties) (Chester, Wofford, & Kral 1997) and nw. GA (Jones & Coile 1988) west to KS, OK, and TX. [= C, F, FNA, G, K, W, Y, Z; > *Chetyson pulchella* (Michaux) A. & D. Löve; > *Sedum pulchellum* – S; > *Sedum vigilimontis* Small – S; > *Chetyson vigilimontis* (Small) A. & D. Löve]

*Sedum pusillum* Michaux, Puck's Orpine. In very thin soil (generally less than of vernal wet depressions on granite flatrocks, often in mats of the moss *Hedwigia ciliata*). March-April; April-May. Endemic to granite flatrocks of the southeastern Piedmont, from sc. NC south to wc. GA. Superficially rather similar to *Diamorpha smallii*, and historically confused with it (see Wilbur 1988 for details). Wyatt (1983) discusses the reproductive biology of this species. [= RAB, FNA, GW, K, S, Z; = *Tetrorum pusillum* (Michaux) Rose]

\* *Sedum rupestre* Linnaeus. Disturbed rock outcrops; native of Europe. Reported for nc. GA (Jones & Coile 1988), as *S. reflexum* Linnaeus. [= FNA; = *S. reflexum* Linnaeus – C, K, misapplied; = *Petrosedum reflexum* (Linnaeus) Grulich, misapplied]

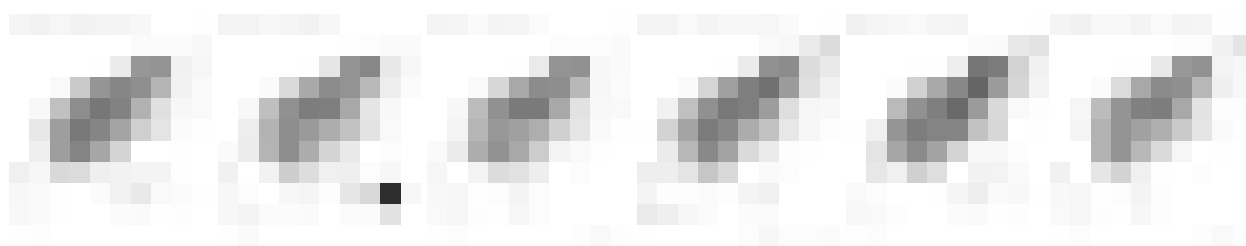
\* *Sedum sarmentosum* Bunge. Xeric rock outcrops, disturbed areas; native of China. May-June; June-July. [= RAB, C, F, FNA, G, K, Pa, W, WH, WV, Z]

*Sedum ternatum* Michaux, Mountain Stonecrop. Moist forests, coves, bottomlands, shaded rock outcrops. April-June; May-July. NJ west to IA and AR, south to nw. GA and AL. [= RAB, C, F, FNA, G, K, Pa, S, W, WV, Y, Z; = *Clausenellia ternata* (Linnaeus) A. & D. Löve]

### *Sempervivum* Linnaeus 1753 (Hen-and-chickens, Houseleek)

A genus of 40-100 species, perennials, of Eurasia. References: Lis in FNA (2009).

\* *Sempervivum tectorum* Linnaeus, Hen-and-chickens, Houseleek. Disturbed areas, cultivated as a rock garden and potted plant, rarely persistent; native of Europe. *S. tectorum* is reported for VA by Massey (1961) as "escapes from cultivation;" the documentation of this is unknown, but the record has been perpetuated by Kartesz (1999), Lis in FNA (2009), and others. [= FNA, C, F, K]



**137. PENTHORACEAE** Rydberg ex Britton 1901 (Ditch-stonecrop Family) [in SAXIFRAGALES]

A family of one genus and 2 species, herbs, of e. North America and e. Asia. *Penthorum* has been variously placed in the Crassulaceae, Saxifragaceae, or in the Penthoraceae. Haskins & Hayden (1987) concluded that *Penthorum* was best treated in a monogeneric Penthoraceae, a conclusion based on extensive anatomical evidence. Among those who do not favor a monotypic family, there is nearly evenly divided opinion between the Crassulaceae and Saxifragaceae; this in itself perhaps supports segregation in the Penthoraceae. Molecular evidence supports the recognition of the Penthoraceae, and suggests closer affinities with the Haloragaceae than with either the Crassulaceae or the Saxifragaceae (Morgan & Soltis 1993). References: Thiede in Kubitzki, Bayer, & Stevens (2007); Freeman in FNA (2009).

***Penthorum*** Linnaeus 1753 (Ditch-stonecrop, Penthorum)

A genus of 2 species, herbs, of e. North America and e. and se. Asia. The only other species in the genus is *P. chinense* Pursh, of e. Russia, China, Korea, and Japan. References: Freeman in FNA (2009); Haskins & Hayden (1987)=Z; Thiede in Kubitzki, Bayer, & Stevens (2007).

***Penthorum sedoides*** Linnaeus, Ditch-stonecrop, American Penthorum. Shores, drawdown areas, moist forests, floodplain forests, moist disturbed areas, ditches. June-October. NB west to MB, south to Panhandle FL and TX; introduced from BC south to OR. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV, Z]

**138. HALORAGACEAE** R. Brown 1814 (Water-milfoil Family) [in SAXIFRAGALES]

A family of 8-9 genera and about 150 species, aquatic and wetland herbs, but also shrubs and trees, cosmopolitan but centered in the Southern Hemisphere, especially Australia. The family has sometimes spelled "Haloragidaceae." References: Kubitzki in Kubitzki, Bayer, & Stevens (2007).

- 1 Leaves whorled or alternate; stamens 4 or 8; carpels 4; emerged leaves bract-like and much-reduced (except in *M. aquaticum*) ..... ***Myriophyllum***
- 1 Leaves alternate; stamens 3; carpels 3; emerged leaves foliaceous, little if at all reduced..... ***Proserpinaca***

***Myriophyllum*** Linnaeus 1753 (Water-milfoil)  
(contributed by B.A. Sorrie and A.S. Weakley)

A genus of about 68 species, aquatic and wetland herbs, cosmopolitan, with a primary center of diversity in Australia and secondary centers in North America and Asia. The species taxonomy and infrageneric classification used here follow Moody & Les (2010). References: Moody & Les (2010)=X; Crow & Hellquist (2000)=Z; Aiken (1981)=Y.

**Identification notes:** Stranded plants of *M. heterophyllum* and *M. humile* (and perhaps others) produce leaves that are reduced in size. Leaves and bracts become pectinate or pinnate, so that plants resemble *M. pinnatum*. Such plants are the source of nearly all inland records of *M. pinnatum* in the VA-NC-SC-GA area. *M. heterophyllum* usually flowers and fruits when stranded and may be distinguished from *M. pinnatum* by its much denser disposition of leaves and bracts, and by its dull red fruits obscurely tuberculate (vs. tan or pale brown fruits strongly tuberculate). From stranded *M. humile*, *M. heterophyllum* may be distinguished by leaves and bracts which are clearly whorled and much more densely disposed. *M. humile* differs from *M. pinnatum* by its wholly alternate leaves and bracts, and by its smooth fruits.

- 1 Leaves reduced to small scales or absent; stems short, erect from substrate; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*]..... ***M. tenellum***
- 1 Leaves well-developed, pinnately divided with filiform segments; stems elongate, suspended in the water column and/or floating.
  - 2 Flowers/fruits absent and emerged shoots with leaves closely similar in size and shape to submersed ones; widespread alien; [subgenus *Myriophyllum*; section *Pectinatum*]..... ***M. aquaticum***
  - 2 Flowers/fruits present; emerged shoots present or not.
    - 3 Flowers/fruits in axils of leaves.
      - 4 Leaves whorled; emerged stems present and with feathery leaves; [subgenus *Myriophyllum*; section *Pectinatum*] ..... ***M. aquaticum***
      - 4 Leaves strictly alternate; flowers/fruits on submersed stems (forma *capillaceum*) or on emerged stems with pinnatifid or pectinate leaves (forma *natans*) ; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylastrum*] ..... ***M. humile***
    - 3 Flowers/fruits in erect spikes emerged from water, flowers/fruits subtended by bracts much smaller than the normally submersed leaves.

- 5 Uppermost flowers/fruits alternate; leaves alternate or whorled or both; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylostrum*].
- 6 Bracts much shorter than floral internodes, varying from pectinate to entire; fruit surface smooth or papillose .....*M. laxum*
- 6 Bracts usually longer than floral internode, pinnatifid to pectinate; fruit surface strongly tuberculate .....*M. pinnatum*
- 5 Uppermost flowers/fruits opposite; leaves whorled (technically pseudo-whorled in many *M. heterophyllum*) (note that early season plants of *M. pinnatum* may have flowers opposite, but at least some leaves will be alternate).
- 7 Bracts usually > 2× as long as pistillate flowers; stems drying brown, pale brown, or reddish.
- 8 Bracts throughout inflorescence pectinate to pinnatifid; winter buds scattered along stem, clavate, falling by early winter; [of DE and northward]; [subgenus *Myriophyllum*; section *Myriophyllum*; subsection *Isophylleae*].....*M. verticillatum*
- 8 Distal bracts subentire to serrate, proximal bracts pectinate to serrate; winter buds developed only at base of stem or on rhizomes, usually persisting; [widespread]; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylostrum*] .....*M. heterophyllum*
- 7 Bracts usually < 2× as long as pistillate flowers; stems drying pale tan or whitish]; [subgenus *Myriophyllum*; section *Myriophyllum*; subsection *Myriophyllum*].
- 9 Midstem leaves with 11 or fewer segments on each side of rachis; leaves rounded at apex; stem diameter more-or-less uniform; stem tips usually green; winter buds produced; [native, of DE and northward] .....*M. sibiricum*
- 9 Midstem leaves with 12 or more segments on each side of rachis; many leaves appear truncate or clipped at apex; stem diameter below inflorescence is up to 2× diameter of lower stem; stem tips usually reddish; no winter buds; [widespread alien]. .....*M. spicatum*

**Alternate key**

- 1 Leaves reduced to small scales or absent; stems short, erect from substrate; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylostrum*].....*M. tenellum*
- 1 Leaves well-developed, pinnately divided with filiform segments; stems elongate, suspended in the water column and/or floating.
- 2 Flowers/fruits produced in axils of submersed leaves; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylostrum*]... *M. humile*
- 2 Flowers/fruits produced in axils of emerged leaves or on emerged shoots with bracts (reduced bracteal leaves).
- 3 Emerged shoots with feathery leaves about same size and shape as submersed leaves; flowers/fruits rarely produced; [widespread alien] [subgenus *Myriophyllum*; section *Pectinatum*] .....*M. aquaticum*
- 3 Emerged shoots with bracts subtending flowers/fruits; these bracts much different in shape than submersed leaves. [stranded plants may produce bracts and leaves of similar size and shape, but these not feathery].
- 4 All flowers/fruits alternate; fruits smooth; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylostrum*] ..... *M. humile*
- 4 All flowers/fruits opposite or whorled (or the lower opposite and the upper alternate in *M. pinnatum*).
- 5 Bracts usually longer than the internodes; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylostrum*].
- 6 Leaves whorled or pseudo-whorled; fruits with low bumps ..... *M. heterophyllum*
- 6 Leaves strictly alternate; fruits strongly tuberculate ..... *M. pinnatum*
- 5 Bracts usually shorter than the internodes.
- 7 All bracts pectinate to pinnatifid; [subgenus *Myriophyllum*; section *Myriophyllum*; subsection *Isophylleae*] ..... *M. verticillatum*
- 7 Bracts vary from entire to pectinate.
- 8 Leaves alternate, pseudo-whorled, or both; plain green; [of se. VA and southward] ; [subgenus *Brachytheca*; section *Tessaronia*; subsection *Spondylostrum*] .....*M. laxum*
- 8 All leaves whorled, grayish green; [collectively widespread]; [subgenus *Myriophyllum*; section *Myriophyllum*; subsection *Myriophyllum*].
- 9 Midstem leaves with 11 or fewer segments on each side of rachis; leaves rounded at apex; stem diameter more-or-less uniform; stem tips usually green; winter buds produced; [native, of DE and northward] .....*M. sibiricum*
- 9 Midstem leaves with 12 or more segments on each side of rachis; many leaves appear truncate or clipped at apex; stem diameter below inflorescence is up to 2× the diameter of the lower stem; stem tips usually reddish; no winter buds; [widespread alien].....*M. spicatum*

\* *Myriophyllum aquaticum* (da Conceição Vellozo) Verdcourt, Parrot-feather. Ditches, slow-moving rivers, pools, ponds; native of South America. April-June. An introduced species now widespread in se. United States, north to NY, WV, and MO. [= C, GW, K, Pa, W, X, Y, Z; = *M. brasiliense* Cambessedes – RAB, F, G, WV; = *M. proserpinacoides* Gillies ex Hooker & Arnott – S]

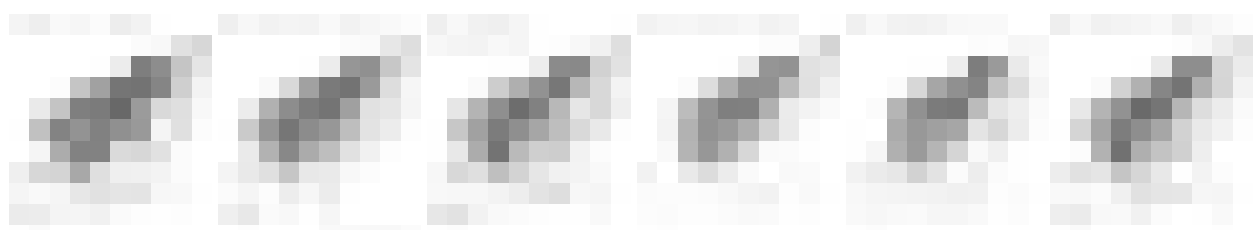
*Myriophyllum heterophyllum* Michaux, Southern Water-milfoil. Ditches, slow-moving waters of rivers and streams, pools, ponds. April-July. NY west to ON and MN, south to FL and TX. [= RAB, C, F, G, GW, K, Pa, S, WV, X, Y, Z]

*Myriophyllum humile* (Rafinesque) Morong. Millponds, slow-moving water of streams. NS west to MN, south to DE, MD, VA, and IL. [= C, F, G, K, Pa, X, Y, Z]

*Myriophyllum laxum* Shuttleworth ex Chapman, Loose Water-milfoil. Limesink depression ponds (dolines), spring-runs, rarely also in lakes. June-October. Se. VA south to n. FL, s. AL, and s. MS (Sorrie & Leonard 1999). *M. laxum* and *M. heterophyllum* both have reddish submersed stems and present difficulties in identification when in sterile condition. *M. laxum* has a total of 7-15 (-17) segments per leaf, vs. (15-) 17-31 (-37) segments in *M. heterophyllum*. Documented for VA by a 1922 specimen from Princess Anne County at GH (Sorrie, pers. comm.). [= RAB, GW, K, X, S, Y]

*Myriophyllum pinnatum* (Walter) Britton, Sterns, & Poggenburg, Alternate-leaved Water-milfoil. Pools, ditches. June-October. MA west to IA and SD, south to GA and TX. [= RAB, C, F, G, GW, K, S, W, WV, X, Y, Z]





**Myriophyllum sibiricum** Komarov, Common Water-milfoil. Quiet circumneutral to alkaline waters. NL (Labrador) west to AK, south to VA, WV, IL, MO, NM, and CA; also in n. Eurasia. [= C, G, K, Pa, X, Z; > *M. exalbescens* Fernald – F, Y]

\* **Myriophyllum spicatum** Linnaeus, Eurasian Water-milfoil. Ponds and impoundments. {habitat and range in our area uncertain}, native of Eurasia. Confused with *M. sibiricum*. An introduced species, now widespread in e. United States. Reported for South Carolina by Hill & Horn (1997). [= C, GW, K, Pa, W, X, Y, Z]

**Myriophyllum tenellum** Bigelow, Leafless Water-milfoil. Natural lakes (Carolina bay lakes), typically growing on the sandy bottoms in water 1-2 meters deep. NL (Newfoundland) west to MN, south to PA and NJ, and disjunct south to a few occurrences in NC; report from Virginia Beach, VA is false. [= C, F, G, K, Pa, X, Y, Z]

**Myriophyllum verticillatum** Linnaeus. Quiet waters. A circumboreal species, south in North America to DE, MD, n. WV, IN, NE, TX, and CA. [= C, G, K, Pa, X, Y, Z; > *M. verticillatum* var. *pectinatum* Walloth – F]

**Proserpinaca** Linnaeus 1753 (Mermaid-weed)

A genus of 2-3 species, aquatic and wetland herbs, of e. North America and the West Indies. References: Catling (1998)=Z.

- 1 Bracteal (emersed) leaves serrate; submersed pectinate leaves with 8-14 pairs of divisions 5-30 mm long; fruits 2.3-6.0 mm wide.
- 2 Fruit 2.3-4.0 mm wide, acutely angled, not winged, the sides of the capsule more-or-less planar..... ***P. palustris* var. *crebra***
- 2 Fruit (3.5-) 4.0-6.0 mm wide, sharply angled (to somewhat winged), the sides of the capsule concave..... ***P. palustris* var. *palustris***
- 1 Bracteal (emersed) leaves pinnatifid to pectinate; submersed pectinate leaves with 4-12 pairs of divisions 2-7.5 mm long; fruits 2.0-3.6 mm wide.
- 3 Leaves with a flattened rachis 1-4 mm wide, the 7-12 pairs of divisions 2.0-3.5 mm long; fruits 2.3-3.6 mm wide ..... ***P. intermedia***
- 3 Leaves with a filiform rachis (midrib) 0.2-1.0 mm wide, the 4-9 pairs of divisions 2.0-7.5 mm long; fruits 2.0-2.8 mm wide..... ***P. pectinata***

**Proserpinaca intermedia** Mackenzie, Intermediate Mermaid-weed. Wet places. July-September. NS to SC on the Coastal Plain; disjunct in sc. TN. This taxon is intermediate in morphology between *P. palustris* and *P. pectinata*; whether it warrants species status is unclear. If merely a rarely produced first-generation hybrid, it should be treated as a hybrid binomial (*P. ×intermedia*); if it forms independent, self-reproducing populations, it should probably be treated as a species. [= RAB, C, F, G, K, Z; < *P. palustris* – GW]

**Proserpinaca palustris** Linnaeus var. ***amblyogona*** Fernald. Swamps. Occurs east to KY, TN, and GA. [= C, F, G, K; < *P. palustris* – GW, S] {not yet keyed}



**Proserpinaca palustris** Linnaeus var. ***crebra*** Fernald & Griscom, Common Mermaid-weed. Wet places, swamp forests. June-October. Throughout e. North America and south to the Caribbean and Central America. [= C, F, G, K, Pa, WV, Z; < *P. palustris* – RAB, S, W, WH; < *P. palustris* – GW (also including *P. intermedia*)]

**Proserpinaca palustris** Linnaeus var. ***palustris***, Coastal Mermaid-weed. Wet places, swamp forests. June-October. MA (?) to FL and west to LA, on the Coastal Plain. [= C, F, G, K, Pa, Z; < *P. palustris* – RAB, S, W, WH; < *P. palustris* – GW (also including *P. intermedia*)]

**Proserpinaca pectinata** Lamarck, Feathery Mermaid-weed. Bogs, savannas, ditches, other wet places. June-October. NS south to s. FL and west to w. LA, mostly on the Coastal Plain, but scattered inland as well, as in c. TN. [= RAB, C, F, G, GW, K, Pa, S, WH, Z]

**140. VITACEAE** A.L. de Jussieu 1789 (Grape Family) [in VITALES]

A family of about 14 genera and 750-850 species, vines (rarely small trees or herbs), of tropical, subtropical, and temperate regions of the Old and New Worlds. References: Ren et al. (2011); Tröndle et al. (2010); Péros et al. (2011); Soejima & Wen (2006); Wen in Kubitzki, Bayer, & Stevens (2007).

- 1 Branches and leaves distinctly fleshy, the leaves > 1 mm thick when fresh; leaves 3-foliolate .....5. *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 .....2. *Parthenocissus*
    - 3 Tendrils twining, lacking adhesive disks.
      - 4 Petals separate at their tips, falling individually; pith continuous through the node.....1. *Ampelopsis*
      - 4 Petals connate at their tips, falling together; pith interrupted by a diaphragm at each node (*Vitis*) or continuous through the node (*Muscadinia*).
        - 5 Tendrils simple; bark adherent (on all but the largest stems), with prominent lenticels; pith continuous through nodes; leaves relatively small (< 10 cm long and wide) and coarsely toothed, never deeply lobed.....3. *Muscadinia*
        - 5 Tendrils bifid to trifid; bark shedding, the lenticels inconspicuous; pith interrupted by diaphragms at nodes; leaves relatively large (well-developed leaves usually > 10 cm wide and long) and finely toothed, often deeply lobed .....4. *Vitis*
  - 2 Leaves compound with (3-) 5-numerous leaflets.
    - 6 Leaves bipinnate to tripinnate .....1. *Ampelopsis*
    - 6 Leaves 3-5 (-7)-foliolate.
      - 7 Leaves pedately 5-foliolate (the lateral 2 leaflets on either side borne on a common stalk) ..... 6. *Cayratia*
      - 7 Leaves palmately 3-5 (-7)-foliolate (the petiolules of all leaflets joined at the summit of the petiole).
        - 8 Leaflets pinnately lobed; tendrils twining, lacking adhesive tips; berries yellow to orange when ripe.....1. *Ampelopsis*
        - 8 Leaflets toothed or entire; tendrils not twining, usually terminating in adhesive tips; berries dark blue when ripe.....2. *Parthenocissus*

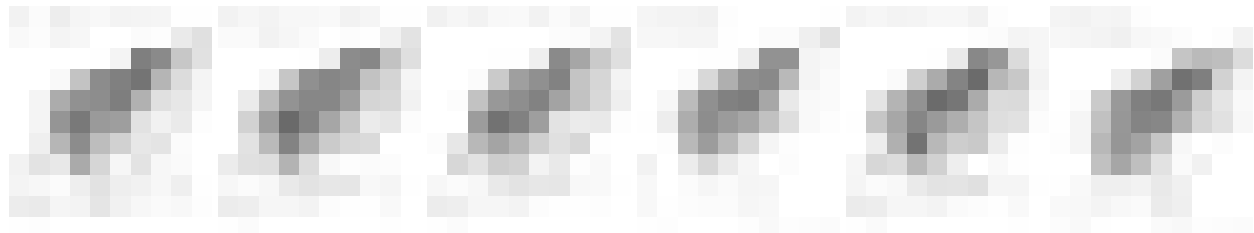
**1. *Ampelopsis* Michaux 1803 (Peppervine)**

A genus of about 25 species, woody vines, of temperate and subtropical America and Asia. Perhaps to be split based on molecular phylogenetics, with section *Leeaceifoliae* (*A. arborea* and *A. megalophylla*) elevated to a new genus (Soejima & Wen 2006). References: Soejima & Wen (2006); Wen in Kubitzki, Bayer, & Stevens (2007).

- 1 Leaves bipinnate to tripinnate, with > 11 leaflets; [native and alien species]; [section *Leeaceifoliae*].
  - 2 Leaflets 2-6 cm long; [common native species of mesic to wet habitats] .....*A. arborea*
  - 2 Leaflets 5-12 cm long (at least the larger > 8 cm long); [introduced species]..... [*A. megalophylla*]
- 1 Leaves simple and palmately veined (grape-like), or palmately 5-foliolate (the leaflets additionally pinnately lobed); [alien species]; [section *Ampelopsis*].
  - 3 Leaves palmately 5-foliolate, the leaflets additionally pinnately lobed .....*A. aconitifolia*
  - 3 Leaves simple, grape-like, to 12 cm long and 9 cm wide.
    - 4 Leaves 3 (-5) lobed; young twigs pubescent .....*A. brevipedunculata*
    - 4 Leaves not lobed; young twigs glabrous .....*A. cordata*

\* *Ampelopsis aconitifolia* Bunge. Planted as an ornamental, rarely escaping to suburban woodlands; native of n. China. [= K] *Ampelopsis arborea* (Linnaeus) Koehne, Peppervine. Swamp forests, marshes, wet thickets, moist to wet maritime forests. June-October. Se. VA (and MD?) south to s. FL, west to TX and n. Mexico, north in the interior to s. IL and sw. WV. [= RAB, C, F, G, GW, K, S, W, WH, WV]

\* *Ampelopsis brevipedunculata* (Maximowicz) Trautvetter, Porcelain-berry. Thickets and disturbed areas, native of ne. Asia. May-August; September-October. [= RAB, C, F, K, Pa; < *A. heterophylla* (Thunberg) Siebold & Zuccarini - S; = *A. heterophylla* (Thunberg) Siebold & Zuccarini var. *brevipedunculata* (Maximowicz) C.L. Li]



*Ampelopsis cordata* Michaux, Raccoon-grape, False-grape. Moist forests, bottomlands, and thickets, particularly where disturbed. May-July. E. VA south to Panhandle FL, west to TX, north in the interior to s. OH, s. IN, s. IL, MO, and NE; also introduced at scattered sites inland. [= RAB, C, F, G, GW, K, S, W, WH]

\* *Ampelopsis megalophylla* Diels & Gilg, Bigleaf Peppervine. Planted in the Southeast, and has the potential to naturalize; native of China. Reports of its occurrence as naturalized in MS are based on *Cayratia* (S.W. Leonard, pers. comm.. 2006). [not mapped; rejected as a component of our flora]

**2. *Parthenocissus* Planchon 1887 (Virginia-creeper, Woodbine)**

A genus of about 15 species, woody vines, of temperate Asia and North America. References: Wen in Kubitzki, Bayer, & Stevens (2007).

- 1 Leaves 3-lobed to 3-foliolate; [introduced ornamental, rarely escaped].....*P. tricuspidata*

- 1 Leaves (3-) 5 (-7)-foliolate (only a few leaves on a plant 3-foliolate); [native].
- 2 Inflorescence with a well-developed (zigzag) central axis, the dichotomous branches very unequal, the inflorescence therefore paniculiform; tendrils many-branched, usually with numerous adhesive disks (though young shoots may not have the disks yet formed); leaves usually dull above; [widespread in our area] ..... *P. quinquefolia*
- 2 Inflorescence without a well-developed central axis, the dichotomous branches relatively equal, the inflorescence therefore corymbiform, as wide or wider than long, with 2-3 main branches; tendrils few-branched, usually lacking adhesive disks (though sometimes swollen at the tip); leaves usually glossy above; [from e. VA and n. WV northward]..... *P. vitacea*

*Parthenocissus quinquefolia* (Linnaeus) Planchon, Virginia-creeper. Swamp forests, bottomlands, maritime forests and thickets, rock outcrops, mesic forests. May-July; July-August. ME west to IA and NE, south to s. FL and TX. [= RAB, C, F, G, K, Pa, W, WH, WV; > *P. quinquefolia* – S; > *P. hirsuta* (Pursh) Graebner – S]

\* *Parthenocissus tricuspidata* (Siebold & Zuccarini) Planchon, Boston-ivy. Frequently grown for ornament, rarely persisting or escaped; native of Japan and China. [= C, F, G, K, Pa] {not mapped}

*Parthenocissus vitacea* (Kner) A. Hitchcock. Maritime thickets, rich alluvial forests, roadsides, and dumps. QC west to MB, WY, and CA, south to e. VA, n. WV, OH, MO, TX, and AZ. [= C, G, K; = *P. inserta* (Kerner) Fritsch – F, Pa, probably misapplied; = *Cissus verticillata* (Linnaeus) Jarvis]

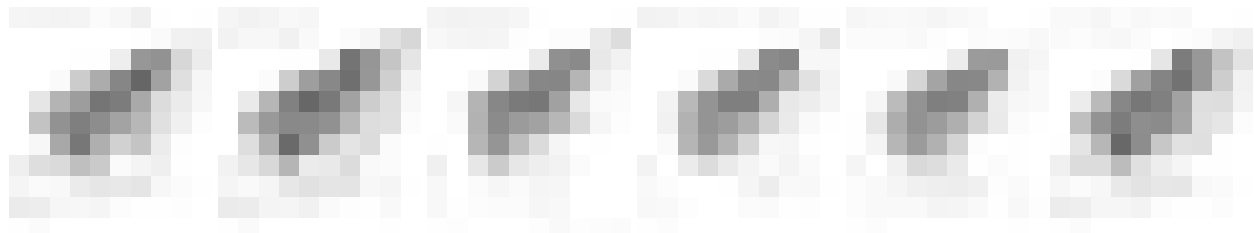
### 3. *Muscadinia* (Planchon) Small (Muscadine, Scuppernong)

A genus of 2 species and 4 taxa, woody vines, of se. North America (including Mexico) and the West Indies. In the past decade, a number of molecular phylogenetic studies of the Vitaceae have been undertaken, using different genes and different sampling within the family; overall, they all corroborate the clear distinction of the muscadines from the true grapes. Some studies suggest that muscadines are sister to *Vitis* s.s., while others show equivocal results as to whether *Muscadinia* + *Vitis* is a monophyletic group. Overall, and even if *Muscadinia* is basal to but forms a monophyletic clade with *Vitis* s.s., recognition of *Muscadinia* at generic rank is warranted, based on the long-recognized morphological distinctiveness of *Muscadinia* vs. *Vitis* s.s. (see key), the genetic distance of it from *Vitis* s.s., the different chromosome numbers (40 in *Muscadinia*, 38 in *Vitis* s.s.), the frequent past and current recognition of *Muscadinia*, and the standards of morphological distinctiveness of genera in the Vitaceae (Ren et al. 2011; Péros et al. 2011; Tröndle et al. 2010; Rossetto et al. 2002; Soejima & Wen 2006; Weakley et al. 2011). References: Moore (1991)=Z; Ward (2006b)=Y; Weakley et al. (2011)=X; Wen in Kubitzki, Bayer, & Stevens (2007).

- 1 Mature fruits 5-10 (-13) mm in diameter; infructescences with 12-30 berries; leaf blades 3-8 cm long and wide; [of s. GA southward]..... *M. rotundifolia* var. *munsoniana*
- 1 Mature fruits 12-25 mm in diameter; infructescences with 2-8 (-12) berries; leaf blades usually > 6 cm long and wide; [widespread in our area]..... *M. rotundifolia* var. *rotundifolia*

*Muscadinia rotundifolia* (Michaux) Small var. *munsoniana* (J.H. Simpson ex Planchon) Weakley & Gandhi, Munson Grape, Bullace Grape. Pinelands, scrub, floodplain forests, banks of blackwater rivers. Late April-May; late July-September. Sc. GA and s. AL south to s. FL; Bahamas. Intergrading with *M. rotundifolia* in n. FL and probably best treated as a variety. A third variety, *Muscadinia rotundifolia* var. *pygmaea* (McFarlin ex D.B. Ward) Weakley & Gandhi, is narrowly endemic in scrub habitats of the c. FL peninsula (Ward 2006b; Weakley et al. 2011). [= X; = *M. munsoniana* (J.H. Simpson ex Planchon) Small – S; = *Vitis rotundifolia* Michaux var. *munsoniana* (J.H. Simpson ex Munson) M.O. Moore – K, Y, Z; < *V. rotundifolia* – WH; = *Vitis munsoniana* J.H. Simpson ex Munson]

*Muscadinia rotundifolia* (Michaux) Small var. *rotundifolia*, Muscadine, Scuppernong. Dry upland forests (especially sandy or rocky), other forests, swamps, dunes, roadsides, thickets. May-June; August-October. DE west to s. WV, KY, and MO, south to n. FL and TX. Cultivars of this species are popular in the Southeastern United States as table grapes and the source of a distinctive wine. [= X; = *Vitis rotundifolia* Michaux – RAB, C, F, GW, W, WV; = *Vitis rotundifolia* Michaux var. *rotundifolia* – K, Y, Z; = *Muscadinia rotundifolia* (Michaux) Small – S; < *V. rotundifolia* – WH]



### 4. *Vitis* Linnaeus 1753 (Grape)

A genus of about 60-65 species, vines, of temperate regions of Eurasia and North America. References: Moore (1991)=Z; Ward (2006b)=Y; Wen in Kubitzki, Bayer, & Stevens (2007).

- 1 Tendrils simple; bark adherent (on all but the largest stems), with prominent lenticels; pith continuous through nodes; leaves relatively small (< 10 cm long and wide) and coarsely toothed, never deeply lobed..... [see *Muscadinia*]

- 1 Tendrils bifid to trifid; bark shedding, the lenticels inconspicuous; pith interrupted by diaphragms at nodes; leaves relatively large (well-developed leaves usually > 10 cm wide and long) and finely toothed, often deeply lobed ..... *Vitis*
- 2 Mature leaves glaucous beneath (the glaucescence sometimes rather obscured by pubescence); nodes often glaucous; [series *Aestivales*].
  - 3 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*
  - 3 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*
- 2 Mature leaves not glaucous beneath; nodes not glaucous.
  - 4 Tendrils or inflorescences present at 3 or more consecutive nodes; leaves densely pubescent beneath; [series *Labruscae*] ..... *V. labrusca*
  - 4 Tendrils or inflorescences present at only 2 consecutive nodes; leaves glabrous or moderately pubescent beneath.
    - 5 Leaves reniform, glabrous beneath at maturity; tendrils absent, present only opposite the uppermost nodes, or sometimes extending down the stem; [section *Ripariae*] ..... *V. rupestris*
    - 5 Leaves cordate to cordate-ovate, glabrous to pubescent beneath at maturity; tendrils present opposite most nodes.
      - 6 Nodal diaphragms < 1 mm wide, usually < 0.5 mm wide; growing shoot tips enveloped by enlarging, unfolded leaves; [section *Ripariae*] ..... *V. riparia*
      - 6 Nodal diaphragms > 1 mm wide; growing shoot tips not enveloped by enlarging, unfolded leaves.
        - 7 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*].
          - 8 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*
          - 8 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*
        - 7 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 *Cinerecentes*].
          - 9 Branchlets of the season sparsely to densely hirtellous pubescent, often with arachnoid pubescence as well; leaf undersurfaces usually more-or-less uniformly hirtellous on the veins; [western, east to w. KY, w. TN, sc. AL, and Panhandle FL] ..... *V. cinerea* var. *cinerea*
          - 9 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].
            - 10 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*
            - 10 Branchlets slightly to densely arachnoid-pubescent; nodes usually not banded with red pigmentation; leaves slightly to densely arachnoid-pubescent beneath; [mostly of the Coastal Plain] ..... *V. cinerea* var. *floridana*

*Vitis aestivalis* Michaux var. *aestivalis*, Summer Grape. Forests and woodlands, mostly upland. May-June; September-October. MA west to MO and IA, south to s. FL and e. TX. [= RAB, C, F, G, K, WV, Y, Z; = *V. aestivalis* - S; < *V. aestivalis* - GW, Pa, W, WH; > *V. rufotomentosa* Small; > *V. simpsonii* Munson]

*Vitis aestivalis* Michaux var. *bicolor* Deam, Silverleaf Grape. Forests and woodlands, mostly upland. May-June; September-October. ON and MN south to n. GA and n. AL. [= Z; = *V. aestivalis* var. *argenteifolia* (Munson) Fernald - RAB, C, F, G, K, WV; = *V. bicolor* Le Conte - S; < *V. aestivalis* - GW, Pa, W]

*Vitis cinerea* (Engelmann in A. Gray) Engelmann ex Millardet var. *baileyana* (Munson) Comeaux, Possum Grape. Forests and woodlands, mostly bottomlands. Late May-June; September-October. S. PA, s. OH, and se. IN south to c. SC, c. GA, and AL. [= K, Pa, Z; = *V. baileyana* - RAB, C, F, G, S; < *V. vulpina* - GW; < *V. cinerea* - W, WV]

*Vitis cinerea* (Engelmann in A. Gray) Engelmann ex Millardet var. *cinerea*, Graybark Grape, Pigeon Grape. Hammocks, most forests. VA (?), w. KY, wc. TN, IN, and WI, south to Panhandle FL (Okaloosa County), sc. AL and TX. [= RAB, C, F, G, K, WH, Z; = *V. cinerea* - S; < *V. cinerea* - GW, W]

*Vitis cinerea* (Engelmann in A. Gray) Engelmann ex Millardet var. *floridana* Munson, Florida Grape. Hammocks, floodplain and other moist forests. Late May-June; August-October. Se. VA south to s. FL, west to s. MS. [= RAB, C, F, G, K, WH, Z; = *V. simpsonii* Munson - S, Y; < *V. cinerea* - GW, W]

*Vitis labrusca* Linnaeus, Fox Grape. Forests and woodlands, wet, moist, and dry. May-June; September-October. ME west to s. MI, south to n. GA, n. AL, and n. MS. [= RAB, C, GW, K, Pa, S, W, Z; > *V. labrusca* var. *labrusca* - F, G; > *V. labrusca* var. *subdentata* Fernald - F, G]

\* *Vitis ×labruscana* L.H. Bailey [*aestivalis* × *labrusca*], Concord Grape. Commonly cultivated as a table grape. It is sometimes persistent after cultivation. [= K, Pa; = *V. labruscana* L.H. Bailey - F] {not keyed; not mapped}

*Vitis mustangensis* Buckley, Mustang Grape. {habitats}. {Dates}. AR and s. OK south to s. LA and s. TX; disjunct in sc. AL. [= K] {add to synonymy; not yet keyed}

*Vitis palmata* Vahl, Red Grape, Cat Grape, Catbird Grape. Floodplain forests, riverbanks. Mid June-late June; late July-October. IN, sw. VA (Townsend, pers. comm. 2009), c. TN (Chester, Wofford, & Kral 1997), sc. GA (Jones & Coile 1988), and FL Panhandle west to MO, OK, and TX. [= C, F, G, GW, K, S, WH, Y, Z]

*Vitis riparia* Michaux, Riverbank Grape. Forests and woodlands, mostly moist to wet. April-June; August-September. NB west to se. SK, south to VA, NC, c. and w. TN, n. MS, LA, and e. TX, and in the Pacific Northwest. [= RAB, C, G, GW, K, Pa, Z, W, WV; > *V. riparia* var. *riparia* – F]

*Vitis rupestris* Scheele, Sand Grape. Along streams and in riverbank scour areas, especially in calcareous areas. April-June; August-September. MD, WV, sw. PA west to MO, south to VA, c. TN, and n. AR. [= C, F, K, Pa, W, S, WV, Z]

\* *Vitis vinifera* Linnaeus, European Wine Grape. Increasingly cultivated in our area, especially in VA and NC, now significant wine-producing areas. [= K, Pa] {not keyed}

*Vitis vulpina* Linnaeus, Frost Grape, Winter Grape, Chicken Grape. Forests and woodlands, primarily upland, but also in bottomlands. May-June; July-November. Se. NY west to MO and e. KS, south to c. peninsular FL and nc. TX. [= RAB, C, F, G, K, Pa, W, WH, WV, Y, Z; < *V. vulpina* – GW; > *V. vulpina* – S; > *V. cordifolia* Michaux – S]

### 5. *Cissus* Linnaeus 1753

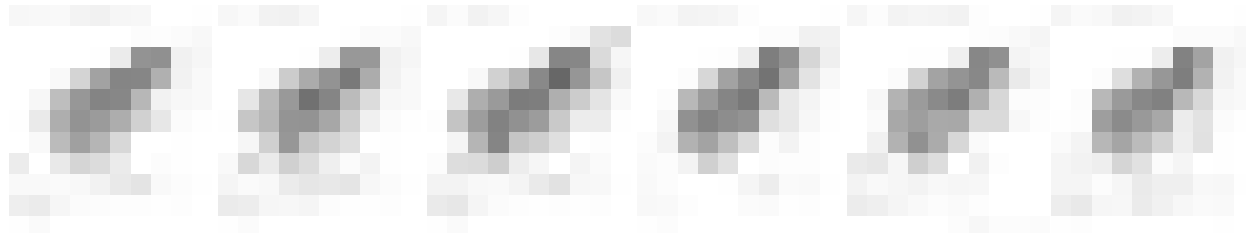
A genus of about 350 species, woody vines, herbaceous vines, and rarely shrubs, of tropical and rarely warm temperate areas. References: Wen in Kubitzki, Bayer, & Stevens (2007).

*Cissus trifoliata* (Linnaeus) Linnaeus, Marine-ivy. Coastal hammocks, dunes, disturbed coastal areas, the more northerly occurrences introduced. Se. SC (Jasper County) south through GA, FL, and west along the Gulf Coast to TX, AR, and Mexico. [= K, S, WH; > *C. incisa* (Nuttall) Des Moulins – GW, S]

### 6. *Cayratia* A.L. de Jussieu 1818 (Bushkiller)

A genus of 50-63 species, woody and herbaceous vines, of the Old World tropics and subtropics. References: Krings & Richardson (2006); Wen in Kubitzki, Bayer, & Stevens (2007).

\* *Cayratia japonica* (Thunberg) Gagnepain, Bushkiller, Sorrel Vine. Disturbed areas, suburban woodlands; native of temperate and subtropical se. Asia. July-August. Reported for NC from several suburban areas, as in Forsyth County (Krings & Richardson 2006) and Mecklenburg, Davidson, and Franklin counties (Soule et al. 2008). Also reported as naturalized in AL (Hansen & Goertzen 2006), MS, LA, and TX. [= K]



### 141. *KRAMERIACEAE* Dumortier 1829 (Krameria Family) [in ZYGOPHYLLALES]

A family of a single genus and about 15-18 species, herbs, shrubs, and trees, of warm (and usually dry) parts of s. North America, Central America, South America, and the West Indies. References: Robertson (1973); Simpson et al. (2004); Simpson in Kubitzki, Bayer, & Stevens (2007).

#### *Krameria* Loefling 1758 (Ratany)

A genus of 15-18 species, herbs, shrubs, and trees, hemiparasitic by haustoria. References: Robertson (1973)=Z; Simpson in Kubitzki, Bayer, & Stevens (2007).

*Krameria lanceolata* Torrey, Trailing Ratany, Sandspur. Sandhills. AR, TX, and s. KS west to se. CO, se. AZ, Chihuahua, and Coahuila; disjunct eastward in the Coastal Plain of Panhandle FL, peninsular FL, and GA (east to Bulloch, Bryan, Evans, and Emanuel counties, GA). [= K, WH, Z; > *K. spathulata* Small – S]

### 142. *ZYGOPHYLLACEAE* R. Brown 1814 (Creosote-bush Family) [in ZYGOPHYLLALES]

A family of about 22-27 genera and 230-285 species, trees, shrubs, and (rarely) herbs, of tropical and subtropical regions of the Old and New Worlds. References: Sheahan in Kubitzki, Bayer, & Stevens (2007).

- 1 Fruit with tubercles, at maturity separating into 10 mericarps ..... *Kallstroemia*
- 1 Fruit with spines, at maturity separating into 5 mericarps..... *Tribulus*

*Kallstroemia* Scopoli 1777

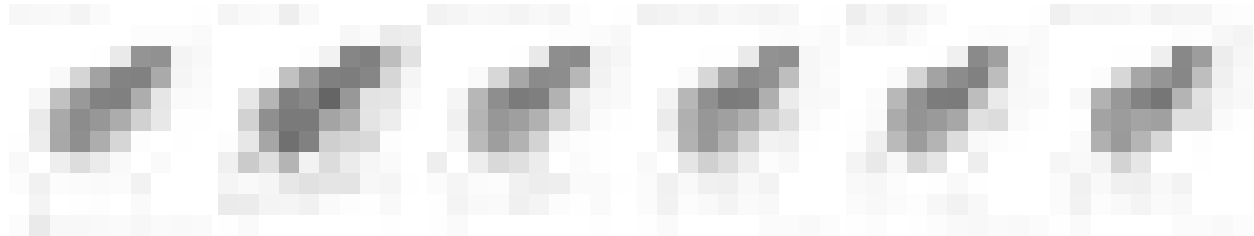
A genus of about 17 species, herbs, of tropical and subtropical America. References: Porter (1969)=Z; Sheahan in Kubitzki, Bayer, & Stevens (2007)

- 1 Ovary and fruit glabrous (rarely strigose) ..... *K. maxima*
- 1 Ovary and fruit pubescent..... *K. pubescens*

\* *Kallstroemia maxima* (Linnaeus) Hooker & Arnott, Greater Caltrop. Disturbed areas, dunes; native status uncertain, but probably early introduced from the Neotropics. SC south to FL; West Indies; Mexico (Sinaloa and Tamaulipas) south through Central America to northern South America (Venezuela, Colombia). Early collections from Charleston (Stephen Elliott) and Savannah suggest the likelihood of introduction via ballast. [= RAB, K1, K2, S, WH, Z]

\* *Kallstroemia parviflora* J.B.S. Norton, Texas Caltrop. Roadsides, other disturbed areas; native of sc. United States south into Mexico. Introduced eastward, as in MS and nw. LA (MacRoberts & MacRoberts 2011). [= K2, S] {not yet keyed; add Z synonymy}

\* *Kallstroemia pubescens* (G. Don) Dandy, Caribbean Caltrop. Disturbed areas; native of tropical America. [= K2, WH]



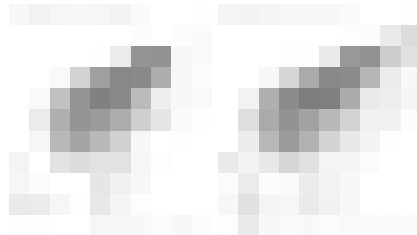
*Tribulus* Linnaeus 1753

A genus of about 25 species, herbs, of tropical and subtropical parts of the Old World (introduced in the New World). References: Sheahan in Kubitzki, Bayer, & Stevens (2007).

- 1 Petals 8-22 mm long; peduncle > 2 cm long; perennial ..... *T. cistoides*
- 1 Petals 3-5 mm long; peduncle < 1 cm long; annual ..... *T. terrestris*

\* *Tribulus cistoides* Linnaeus, Jamaican Fever-plant. Disturbed areas; native of Africa. [= K, S, WH]

\* *Tribulus terrestris* Linnaeus, Puncture-weed, Caltrop, Devil's-thorn. Dunes, sandy roadsides, ballast; native of Mediterranean Europe. June-December. [= RAB, C, F, G, K, Pa, S, WH]



**144. FABACEAE** Lindley 1836 or **LEGUMINOSAE** A.L. de Jussieu 1789 (Legume Family) [in FABALES]

A family of about 730 genera and 20,000 species, trees, shrubs, and herbs, cosmopolitan. References: Isely (1990)=SE (throughout the family treatment); Isely (1998)=I; Lewis et al. (2005); Wojciechowski, Lavin, & Sanderson (2004); Wilbur (1963a); Robertson & Lee (1976).

Subfamily Caesalpinioideae

Tribe Cercideae: 1. *Cercis*

Tribe Cassieae: 2. *Chamaecrista*, 3. *Senna*

Tribe Caesalpinieae: 4. *Gymnocladus*, 5. *Gleditsia*, 6. *Parkinsonia*

Subfamily Mimosoideae

Tribe Mimoseae: 7. *Neptunia*, 8. *Leucaena*, 9. *Desmanthus*, 10. *Dichrostachys*, 11. *Mimosa*

Tribe Acacieae: 12. *Acaciella*, 13. *Vachellia*

Tribe Ingeae: 14. *Calliandra*, 15. *Albizia*

Subfamily Faboideae (Papilionoideae)

- Tribe Sophoreae: 16. *Cladrastis*, 17. *Styphnolobium*, 18. *Maackia*
- Tribe Thermopsidae: 19. *Thermopsis*, 20. *Baptisia*
- Tribe Crotalariae: 21. *Crotalaria*
- Tribe Genisteae: 22. *Lupinus*, 23. *Cytisus*, 24. *Genista*, 25. *Ulex*
- Tribe Amorpheae: 26. *Amorpha*, 27. *Dalea*
- Tribe Dalbergiaceae: 28. *Zornia*, 29. *Chapmania*, 30. *Stylosanthes*, 31. *Arachis*, 32. *Aeschynomene*
- Tribe Indigoferae: 33. *Indigofera*
- Tribe Millettiae: 34. *Wisteria*, 35. *Tephrosia*
- Tribe Abreae: 36. *Abrus*
- Tribe Phaseoleae: 37. *Dioclea*, 38. *Canavalia*, 39. *Galactia*, 40. *Lackeya*, 41. *Clitoria*, 42. *Centrosema*, 43. *Apios*, 44. *Mucuna*, 45. *Rhynchosia*, 46. *Erythrina*, 47. *Pueraria*, 48. *Amphicarpaea*, 49. *Glycine*, 50. *Lablab*, 51. *Vigna*, 52. *Phaseolus*, 53. *Strophostyles*, 54. *Macroptilium*
- Tribe Desmodieae: 55. *Kummerowia*, 56. *Lespedeza*, 57. *Desmodium*, 58. *Hylodesmum*, 59. *Alysicarpus*
- Tribe Psoraleae: 60. *Orbexilum*, 61. *Pediomelum*, 62. *Cullen*
- Tribe Sesbaniae: 63. *Sesbania*
- Tribe Loteae: 64. *Scorpiurus*, 65. *Securigera*, 66. *Anthyllis*, 67. *Acmispon*, 68. *Lotus*
- Tribe Robiniae: 69. *Robinia*
- Tribe Galegeae: 70. *Glycyrrhiza*, 71. *Astragalus*
- Tribe Cicereae: 72. *Cicer*
- Tribe Trifolieae: 73. *Trifolium*, 74. *Ononis*, 75. *Melilotus*, 76. *Medicago*
- Tribe Fabeae: 77. *Vicia*, 78. *Lens*, 79. *Lathyrus*, 80. *Pisum*

- 1 Trees, shrubs, or woody vines; [subfamilies *Caesalpinioideae*, *Mimosoideae*, and *Faboideae*] ..... **Key A**
- 1 Herbs (including herbaceous vines).
  - 2 Leaves 4-many-foliolate.
    - 3 Leaves palmately compound, with 4 or more leaflets; [subfamily *Faboideae*] ..... **Key B**
    - 3 Leaves pinnately or bipinnately compound.
      - 4 Leaves bipinnately compound; [subfamily *Mimosoideae*] ..... **Key C**
      - 4 Leaves pinnately compound; [subfamilies *Faboideae* and *Caesalpinioideae*] ..... **Key D**
  - 2 Leaves 0-3-foliolate ; [subfamily *Faboideae*].
    - 5 Leaves unifoliolate, or with leaf or leaflet blades absent, replaced by a tendril (and with foliaceous stipules) ..... **Key E**
    - 5 Leaves trifoliolate.
      - 6 Leaves palmately trifoliolate ..... **Key F**
      - 6 Leaves pinnately 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*] ..... **1. Cercis**
  - 2 Shrubs or woody vines (rarely tree in *Erythrina*); leaves trifoliolate, unifoliolate, or reduced to phyllodial spines (if unifoliolate, < 2 cm wide); [subfamily *Faboideae*].
    - 3 Woody vine.
      - 4 Calyx 4.5-6 mm long; leaflets unlobed; [tribe *Phaseoleae*, subtribe *Diocleinae*] ..... **40. Lackeya**
      - 4 Calyx 10-12 mm long; leaflets generally lobed; [tribe *Phaseoleae*, subtribe *Glycininae*] ..... **47. Pueraria**
    - 3 Shrub or tree.
      - 5 Shrub or tree with twigs various, but not conspicuously green or flanged; leaves pinnately trifoliolate.
        - 6 Corolla 30-50 mm long, scarlet; legume with several seeds; leaflets lobed or not; [tribe *Phaseoleae*, subtribe *Erythrinae*] ..... **46. Erythrina**
        - 6 Corolla 8-15 mm long, purplish, pink, or white; legume 1-seeded; leaflets not lobed; [tribe *Desmodieae*, subtribe *Lespedezinae*] ..... **56. 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 ..... **25. 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 ..... **23. Cytisus**
          - 8 Leaves unifoliolate throughout; corolla 10-14 mm long ..... **24. Genista**
  - 1 Leaves pinnate or bipinnate.
    - 9 Woody vines; [subfamily *Faboideae*].
      - 10 Leaves even-pinnate; legume 3.5-4 cm long; seeds shiny scarlet and black; [tribe *Abreae*] ..... **[36. Abrus]**
      - 10 Leaves odd-pinnate; legume 4-15 cm long; seeds brown; [tribe *Millettiae*] ..... **34. Wisteria**
    - 9 Trees or shrubs.
      - 11 Leaves 2×-even-pinnate; [subfamily *Mimosoideae*]
        - 12 Inflorescence cylindrical, elongate, bicolored (the basal flowers sterile, with pink staminodes, the upper fertile, yellowish); [tribe *Mimoseae*] ..... **10. Dichrostachys**
        - 12 Inflorescence spherical or hemispheric, as wide as long, all the flowers fertile and of the same color.
          - 13 Stamens connate at the base; inflorescence pink, 2.5-5 cm in diameter; [tribe *Ingeae*]
            - 14 Petioles with glands; leaves with >4 pinnae pairs, each pinna with >10 pinnule pairs; inflorescence 2.5-5 cm in diameter ..... **15. Albizia**
            - 14 Petioles lacking glands; leaves with 2 pinnae pairs, each pinna with <8 pinnule pairs; inflorescence 5-7 cm in diameter ..... **14. Calliandra**

- 13 Stamens free; inflorescence orange or yellowish-white, 1.0-2.2 cm in diameter.
  - 15 Inflorescence yellowish-white, 1.8-2.2 cm in diameter; stamens 10; [tribe *Mimoseae*] ..... **8. *Leucaena***
  - 15 Inflorescence orange, 1.0-1.3 cm in diameter; stamens many; [tribe *Acacieae*]..... **13. *Vachellia***
- 11 Leaves otherwise.
  - 15 Petals white, pink, or blue; stamens 10, monadelphous, diadelphous, or connate at the very base; [subfamily *Faboideae*].
  - 16 Leaves glandular-punctate; corolla of only 1 petal (the standard); inflorescence a spike; shrubs; stamens monadelphous; [tribe *Amorpheae*]..... **26. *Amorpha***
  - 16 Leaves not glandular-punctate; corolla of 5 petals; inflorescence a raceme or panicle; trees or shrubs; stamens diadelphous or connate at the very base.
    - 17 Leaflets alternate on the rachis; leaflets 4-15 (-20) cm long; stamens diadelphous or connate at the very base; [tribe *Sophoreae*] ..... **16. *Cladrastis***
    - 17 Leaflets opposite on the rachis, leaflets (1-) 2-5 (-6) cm long.
      - 18 Flowers in an upright, stiff raceme or panicle; flowers creamy white with some blue; stamens connate at the very base; [tribe *Sophoreae*]..... **18. *Maackia***
      - 18 Flowers in dangling racemes; flowers white or pink; stamens diadelphous or connate at the very base.
        - 19 Leaflets with persistent linear stipels; stamens diadelphous; [tribe *Robinieae*]..... **69. *Robinia***
        - 19 Leaflets lacking stipels; stamens connate at the very base; [tribe *Sophoreae*]..... **17. *Styphnolobium***
  - 15 Petals yellow or greenish; stamens 5-10, separate; [subfamily *Caesalpinioideae*].
    - 20 Leaves all 2-pinnate, or a mixture of 1-pinnate and 2-pinnate on the same plant; shrub or tree; [tribe *Caesalpineae*].
      - 21 Leaves a mixture of 1-pinnate and 2-pinnate on the same plant..... **5. *Gleditsia***
      - 21 Leaves all 2-pinnate.
        - 22 Leaves petiolate; leaflets 20-70 mm long ..... **4. *Gymnocladus***
        - 22 Leaves sessile (the pinnae simulating 1-pinnate leaves); leaflets 1-5 mm long ..... **6. *Parkinsonia***
    - 20 Leaves all 1-pinnate (or appearing so in *Parkinsonia*); herb, shrub or tree.
      - 23 Shrub with prominent glands on the leafstalk; [tribe *Cassieae*] ..... **3. *Senna***
      - 23 Tree or shrub (if a shrub, then lacking prominent glands on the leafstalk); [tribe *Caesalpineae*].
        - 24 Leaflets 13-45 mm long; tree; leaves 1-pinnate..... **5. *Gleditsia***
        - 24 Leaflets 1-5 mm long; shrub; leaves actually 2-pinnate, but sessile, the pinnae simulating 1-pinnate leaves ..... **6. *Parkinsonia***

**Key B – herbaceous legumes with palmate leaves with 4 or more leaflets [subfamily *Faboideae*]**

- 1 Leaflets 4; corolla yellow; [tribe *Dalbergieae*] ..... **28. *Zornia bracteata***
- 1 Leaflets 5 or more (at least on the largest and best developed leaves); corolla blue, pink, or violet (except yellow in *Lupinus luteus*).
  - 2 Leaflets and fruits not glandular-punctate; stamens monadelphous; [tribe *Genisteae*] ..... **22. *Lupinus***
  - 2 Leaflets and fruits glandular-punctate; stamens diadelphous; [tribe *Psoraleeae*].
    - 3 Leaflets linear to very narrowly oblanceolate, 0.5-2.0 (-3.5) mm wide, > 10× as long as wide; [Coastal Plain]..... **60. *Orbexilum lupinellum***
    - 3 Leaflets broader, >5 mm wide, 2-4.5× as long as wide; [collectively more widespread] ..... **61. *Pediomelum***

**Key C – herbaceous legumes with bipinnate leaves [subfamily *Mimosoideae*]**

- 1 Stamens > 10; [tribe *Acacieae*] ..... **12. *Acaciella***
- 1 Stamens 10 or fewer; [tribe *Mimoseae*].
  - 2 Petiole with 1-several glands; stems ascending to erect; flowers greenish-white ..... **9. *Desmanthus***
  - 2 Petiole without glands; stems prostrate to weakly arching; flowers pink-purple, yellow, or greenish-yellow.
    - 3 Flowers pink-purple; legume ribbed, the ribs with prickles ..... **11. *Mimosa***
    - 3 Flowers yellow to greenish-yellow; legume not ribbed or prickly ..... **7. *Neptunia***

**Key D – herbaceous legumes with once-pinnately compound leaves with 4 or more leaflets [subfamilies *Faboideae* and *Caesalpinioideae*]**

- 1 Leaves even-pinnate (lacking a terminal leaflet, this sometimes replaced by a tendril).
  - 2 Flowers nearly regular; stamens 5-10, separate; [subfamily *Caesalpinioideae*]
    - 3 Leaflets 5-25 pairs, each leaflet 0.5-1.5 cm long; stipules persistent, striate; herbs ..... **2. *Chamaecrista***
    - 3 Leaflets (2-) 3-12 pairs, each leaflet 1.5-12 cm long; stipules caduceous, small, not striate; herbs and shrubs ..... **3. *Senna***
  - 2 Flowers papilionoid; stamens diadelphous or monadelphous; [subfamily *Faboideae*]
    - 4 Tendrils lacking on all leaves; stamens monadelphous or diadelphous.
      - 5 Leaflets 20-60 per leaf; strong herbs (or woody) 1-4 m tall, simultaneously erect, > 1 m tall, and with stems usually > 5 mm in diameter; stamens diadelphous ..... **63. *Sesbania***
      - 5 Leaflets 4-16 per leaf; weak or sprawling herbs to 1.5 m long, with weak stems usually < 5 mm in diameter (or if thicker, then < 1 m long; stamens monadelphous or diadelphous.
        - 6 Leaflets 4 per leaf; stamens monadelphous ..... **31. *Arachis***
        - 6 Leaflets 4-16 per leaf; stamens diadelphous ..... **77. *Vicia***
    - 4 Tendrils present in the terminal position on some or all leaves; stamens diadelphous; [tribe *Fabeae*].
      - 7 Stipules foliaceous, typically larger than the leaflets ..... **80. *Pisum***
      - 7 Stipules smaller, typically much smaller than the leaflets.
        - 8 ..... **78. *Lens***



- 8 .
- 9 .....79. *Lathyrus*
- 9 .....77. *Vicia*
- 1 Leaves odd-pinnate (with a terminal leaflet).
- 32. *Aeschynomene*
- 43. *Apios*
- 71. *Astragalus*
- 29. *Chapmannia*
- 72. *Cicer*
- 41. *Clitoria*
- 27. *Dalea*
- 39. *Galactia*
- 70. *Glycyrrhiza*
- 68. *Lotus*
- 65. *Securigera*
- 35. *Tephrosia*

**Key E – herbaceous legumes with all leaves unifoliolate or leaflets absent [subfamily *Faboideae*]**

- 1Leaves 0-foliolate
- 1

59. *Alysicarpus*, 20. *Baptisia*, 21. *Crotalaria*, 22. *Lupinus*, 60. *Orbexilum*, 61. *Pediomelum*, 45. *Rhynchosia*, 64. *Scorpiurus*, 79. *Lathyrus*

**Key F – herbaceous legumes with palmately trifoliolate leaves [subfamily *Faboideae*]**

- 1Leaflets generally < 3 cm long; stems <5 (-8) dm tall.
- 55. *Kummerowia*,
- 76. *Medicago*, 73. *Trifolium*, 74. *Ononis*
- 67. *Acmispon*,
- 1Leaflets (at least the larger) > 3 cm long; stems >5 dm tall.
- 19. *Thermopsis*, 20. *Baptisia*,
- 21. *Crotalaria*,
- 60. *Orbexilum*, 61. *Pediomelum*,

**Key G – herbaceous legumes with pinnately trifoliolate leaves [subfamily *Faboideae*]**

67. *Acmispon*, 48. *Amphicarpaea*, 38. *Canavalia*, 42. *Centrosema*, 41. *Clitoria*, 62. *Cullen*, 27. *Dalea*, 57. *Desmodium*, 46. *Erythrina*, 39. *Galactia*, 49. *Glycine*, 58. *Hylodesmum*, 33. *Indigofera*, 50. *Lablab*, 56. *Lespedeza*, 68. *Lotus*, 54. *Macroptilium*, 76. *Medicago*, 75. *Melilotus*, 44. *Mucuna*, 60. *Orbexilum*, 61. *Pediomelum*, 52. *Phaseolus*, 45. *Rhynchosia*, 30. *Stylosanthes*, 53. *Strophostyles*, 73. *Trifolium*, 51. *Vigna*

**1. *Cercis* Linnaeus 1753 (Redbud)**

A genus of about 6-10 species, trees of north temperate areas. Apparently the basalmost (evolutionarily the earliest diverging) extant genus in the Fabaceae (Lewis et al. 2005). References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Isely (1998)=I.

- 1 Flowering pedicels 10-20 mm long; flowers (11-) 12-14 mm long.....[*C. chinensis*]
- 1 Flowering pedicels 6-8 mm long; flowers 8-13 mm long.
- 2 Leaves this, dull above (sun leaves slightly coriaceous, slightly glossy above); legumes 9-14 (-18) mm wide; flowers 8-11 mm long.....*C. canadensis* var. *canadensis*
- 2 Leaves coriaceous, glossy above; legumes (11-) 13-17 (-20) mm wide; flowers (9-) 10-13 mm long.....[*C. canadensis* var. *texensis*]

***Cercis canadensis* Linnaeus var. *canadensis***, Eastern Redbud. Moist to dry forests and woodlands, especially over calcareous or mafic rocks, also commonly planted as an ornamental. March-May; June-November. MA, WI, and NE south to c. peninsular FL and e. TX. This spectacular small tree is showy in bud or flower. The smooth, medium gray bark is distinctive in winter. Other varieties occur in TX and Mexico. [= C, G, I, K, SE, Y, Z; < *C. canadensis* – RAB, F, Pa, S, W, WH]

\* *Cercis canadensis* Linnaeus var. *texensis* (S. Watson) M. Hopkins, Texas Redbud. Native of OK and TX, sometimes cultivated. [= I, K2] {keyed; not mapped; rejected as a currently naturalized component of the flora}

\* *Cercis chinensis* Bunge, Chinese Redbud. Native to China, sometimes cultivated. [= I] {keyed; not mapped; rejected as a currently naturalized component of the flora}

**2. *Chamaecrista* Moench 1794 (Partridge-pea)**

A genus of about 250-350 species, shrubs and herbs, of primarily tropical and subtropical areas, extending into temperate areas in North America, South America, and e. Asia. References: Isely (1975)=Z; Irwin & Barneby (1982)=Y; Robertson & Lee (1976)=X; Isely (1998)=I.

- 1 Corolla 0.8-1.0 cm in diameter, the larger petals 4-7 (-8) mm long; functional stamens 5-8.
  - 2 Petiole pilose with hairs 1-2 (-3) mm long; petiolar gland cylindrical or clavate; functional stamens 5-8; leaflets 5-6× as long as wide..... *C. nictitans* var. *aspera*
  - 2 Petiole incurved-puberulent with hairs 0-0.8 mm long; petiolar gland stalked-cupuliform or stalked-discoid; functional stamens 5; leaflets 3-5× as long as wide..... *C. nictitans* var. *nictitans*
- 1 Corolla 2.5-3.5 cm in diameter, the larger petals 15-20 mm long; functional stamens 10.
  - 3 Perennial from a horizontal woody root or crown; stems clustered..... *C. deeringiana*
  - 3 Annual from a taproot; stems solitary.
    - 4 Pods 6.5-10 mm wide; seeds 4.7-6.3 mm across; [of tidal marshes in e. VA]..... *C. fasciculata* var. *macrosperma*
    - 4 Pods 3-5 (-6.5) mm wide; seeds (2.8-) 3.2-4.8 mm across; [widespread geographically and ecologically].
      - 5 Surface of leaflets pubescent; [from w. Panhandle FL and s. AL westward]..... *C. fasciculata* var. *1*
      - 5 Surface of leaflets glabrous; [collectively widespread in our area].
        - 6 Petiolar gland depressed, 1.5-2.5 mm wide, raised at both ends; pods 6-10 cm long; plant usually glabrous or glabrescent, to 24 dm tall..... *C. fasciculata* var. *brachiata*
        - 6 Petiolar gland not depressed, <1.5 mm wide; pods 4-6 cm long; plant usually pubescent, to 10 dm tall..... *C. fasciculata* var. *fasciculata*

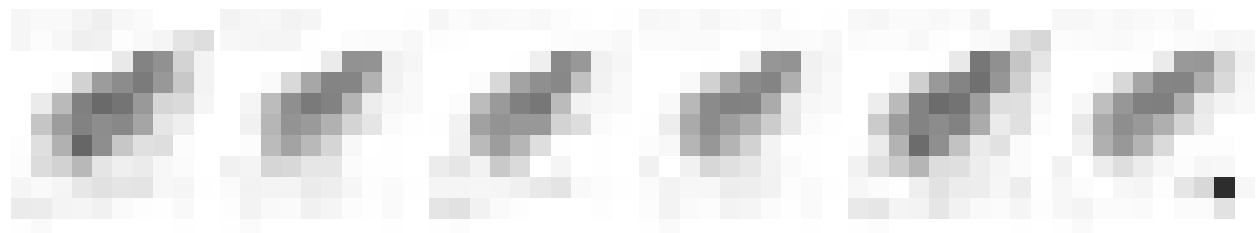
*Chamaecrista deeringiana* Small & Pennell, Florida Senna. Sandhills, dry longleaf pine woodlands, disturbed sandy areas. June-July. Sw. and wc. GA (Jones & Coile 1988) south to Panhandle FL and west to s. MS (Sorrie & Leonard 1999); disjunct in s. FL. [= I, K, S, SE, Y, Z; < *C. fasciculata* (Michaux) Greene – WH]

*Chamaecrista fasciculata* (Michaux) Greene var. *1*. Dunes, sandy disturbed areas. S. AL west to e. and s. TX. [= I; < *Chamaecrista fasciculata* var. *fasciculata* – K; > *Chamaecrista littoralis* Pollard – S; > *Chamaecrista mississippiensis* (Pollard) Pollard ex Heller – S; < *Chamaecrista fasciculata* – Y; = *Cassia fasciculata* Michaux var. *puberula* (Greene) J.F. Macbride (variants 1, 2, and 3) – SE, Z; > *Chamaecrista puberula* Greene] {synonymy incomplete}

*Chamaecrista fasciculata* (Michaux) Greene var. *brachiata* (Pollard) Isely. Fields, disturbed areas. E. GA south to s. FL, west to w. Panhandle FL. [= I, SE; < *Chamaecrista fasciculata* var. *fasciculata* – K; = *Cassia fasciculata* var. *brachiata* (Pollard) Pullen ex Isely – X, Z; = *Chamaecrista brachiata* Pollard – S; < *Chamaecrista fasciculata* – WH, Y]

*Chamaecrista fasciculata* (Michaux) Greene var. *fasciculata*, Common Partridge-pea. Fields, disturbed areas, fencerows, and a wide range of other habitats. June-September; July-November. MA west to MN, south to s. FL and Mexico. See discussion of the *Chamaecrista fasciculata* complex under var. *macrosperma*. [< *Cassia fasciculata* Michaux – RAB, W; < *Chamaecrista fasciculata* – C, Pa, WH, Y; > *Cassia fasciculata* var. *fasciculata* – F, G, X; > *Cassia fasciculata* var. *robusta* (Pollard) J.F. Macbride – F, G, X; > *Chamaecrista fasciculata* – S; > *Chamaecrista robusta* Pollard – S; = *Chamaecrista fasciculata* var. *fasciculata* (variant 1, variant 2, and typical variant) – Z; < *Chamaecrista fasciculata* var. *fasciculata* – I, SE (also see var. *macrosperma*); < *Chamaecrista fasciculata* var. *fasciculata* – K (also see var. *brachiata*); > *Cassia fasciculata* var. *littoralis* (Pollard) J.F. MacBride – X]

*Chamaecrista fasciculata* (Michaux) Greene var. *macrosperma* (Fernald) C.F. Reed, Tidal-marsh Partridge-pea. Freshwater tidal marshes. Endemic to e. VA (Rappahannock, Mattaponi, Pamunkey, Chickahominy, James, and Appomattox Rivers and their major estuarine tributaries) and MD. Isely (1975) did not recognize this taxon formally, but treated it informally as "variant 1," commenting (incorrectly) that it is "apparently a local, saline-adapted ecotype." Irwin & Barneby (1982) treated *C. fasciculata* as a very polymorphic species in which it was impractical to recognize infraspecific taxa, concluding "a student of tropical *Chamaecrista* has the choice of accepting as a fact of life that sort of infraspecific variability that inspired the dissection of *C. fasciculata* or of retreating to the position of Britton & Urban who, driven by logic rather than sense, found a species in every particular combination of gland and hairiness that fell in their way. But in passing over the observed variation as taxonomically insignificant, it is well to bear in mind that its cause and its biological significance remain a mystery." Botanists familiar with var. *macrosperma* in the field contend that it shows a cohesion in morphologic characters, ecology, and distribution that is biologically and taxonomically significant; it warrants varietal status. [= K; < *Chamaecrista fasciculata* – C, S, Y; = *Cassia fasciculata* var. *macrosperma* Fernald – F, G; < *Chamaecrista fasciculata* var. *fasciculata* – I, SE; = *Cassia fasciculata* var. *fasciculata* "variant 1" – Z]



*Chamaecrista nictitans* (Linnaeus) Moench var. *aspera* (Muhlenberg ex Elliott) Irwin & Barneby, Southern Sensitive-plant. Savannas, pinelands, disturbed sandy soils. June-October; July-November. Var. *aspera* ranges from se. SC south to s. FL. [= I, WH; = *Cassia aspera* Muhlenberg ex Elliott – RAB, X, Z; = *Chamaecrista nictitans* ssp. *nictitans* var. *aspera* (Muhlenberg ex Elliott) Irwin & Barneby – K, SE, Y; = *Chamaecrista aspera* (Muhlenberg ex Elliott) Greene – S]

**Chamaecrista nictitans** (Linnaeus) Moench var. **nictitans**, Common Sensitive-plant. Forests, woodlands, disturbed areas, pine savannas, and a wide variety of other habitats. June-October; July-November. *C. nictitans* is widely distributed in e. North America, and (depending on the scope of what is included in it) south into South America. Var. *nictitans* ranges throughout se. United States, north to MA, NY, OH, and KA. [= I, WH; < *Cassia nictitans* Linnaeus – RAB, W, X, Z; < *Chamaecrista nictitans* – C, Pa; > *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]

3. **Senna** P. Miller 1754 (Senna, Sicklepod, Wild Coffee)

A genus of about 295-350 species, trees, shrubs, and herbs, of tropical and warm temperate areas. References: Isely (1975)=Z; Irwin & Barneby (1982)=Y; Robertson & Lee (1976)=X; Isely (1998)=I; Marazzi et al. (2006).

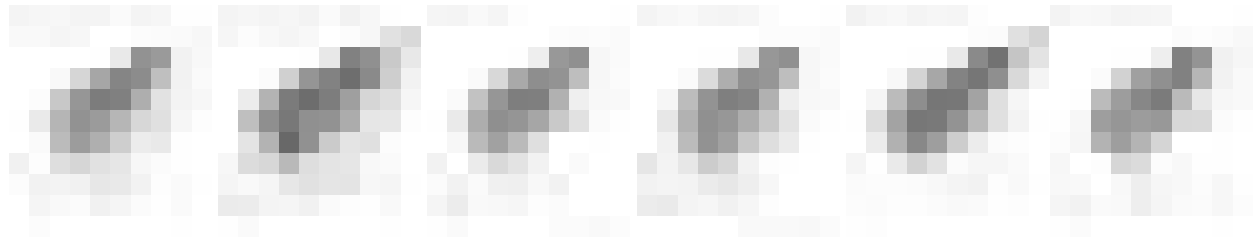
- 1 Racemes spike-like, 3-6 (-10) dm long; legume winged; [section *Senna*, series *Pictae*].....**S. alata**
- 1 Racemes not spike-like, <3 dm long; legume not winged; [section *Chamaefistula*].
  - 2 Plant a shrub, 1-3 m tall; gland between the lowest pair of the acute or acuminate leaflets; [plants aliens, barely established in the vicinity of cultivation]; [section *Chamaefistula*, series *Coluteoideae*].
    - 3 Gland between the lowest pair of leaflets only; leaflets 3-5× as long as wide.....**S. corymbosa**
    - 3 Glands between each pair of leaflets; leaflets 2-3× as long as wide, acuminate..... **S. septentrionalis**
  - 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 *Temperateae*].
        - 6 Legume 5.5-8 mm wide, with broad, nearly square segments, usually pilose initially, the hairs up to 0.8-2 mm long (sometimes glabrate); ovary lanate with hairs to 1 mm long; ovules 10-15 (-18); petiolar gland broadest above the middle..... **S. hebecarpa**
        - 6 Legume 8-11 mm wide, with narrow segments (much shorter than broad), glabrous (or with a few hairs, these < 0.6 mm long); ovary strigulose with hairs to 0.5 mm long; ovules 20-25 (-30); petiolar gland usually broadest at or below the middle .....**S. marilandica**

\* **Senna alata** (Linnaeus) Roxburgh, Emperor's Candlesticks, Candlestick Plant. Disturbed areas; native of tropical America. September-November. Planted and slightly naturalized from s. AL and FL west to OK and TX. [= I, K, SE, WH, Y; = *Cassia alata* Linnaeus – Z]

\* **Senna corymbosa** (Lamarck) Irwin & Barneby. Cultivated as an ornamental, rarely persistent or spreading to disturbed areas; native of South America. August-September. reported for AL (Diamond & Woods 2009). [= I, K, SE, WH, Y; = *Adipera corymbosa* (Lamarck) Britton & Rose – S; = *Cassia corymbosa* – X, Z]

**Senna hebecarpa** (Fernald) Irwin & Barneby, Northern Wild Senna. Open wet habitats, moist forests. July-August; August-November. MA and s. NH west to s. WI, south to sc. NC, e. TN, s. IN, and c. IL. [= C, I, K, Pa, SE, Y; = *Cassia hebecarpa* Fernald – RAB, G, W, X, Z; > *C. hebecarpa* var. *hebecarpa* – F, WV; > *C. hebecarpa* var. *longipila* E.L. Braun – F, WV; = *Ditremexa marilandica* (Linnaeus) Britton & Rose – S, misapplied]

**Senna ligustrina** (Linnaeus) Irwin & Barneby, Privet Wild Senna. Hardwood hammocks, wet disturbed habitats. N. peninsular FL south to s. FL; Central America; West Indies. [= I, K2, SE, WH; = *Cassia ligustrina* Linnaeus; ? *Peiransia bahamensis* (P. Miller) Britton & Rose - S] {not yet keyed; add X, Y, Z synonymy}



**Senna marilandica** (Linnaeus) Link, Maryland Wild Senna. Dry to moist forests, especially on greenstone and diabase barrens and rocky woodlands, thickets, woodland borders, sometimes somewhat weedy. July-August; August-November. S. MA and s. NY west to e. NE, south to c. peninsular FL and c. TX. [= C, I, K, Pa, SE, WH, Y; = *Cassia marilandica* Linnaeus – RAB, F, G, W, WV, X, Z; = *Ditremexa medsgeri* (Shafer) Britton & Rose – S]

\* **Senna obtusifolia** (Linnaeus) Irwin & Barneby, Sicklepod, Coffeeweed. Fields (especially soybean fields), disturbed areas; probably native of the New World Tropics. July-September; August-November. The species is now pantropical. [= C, I, K, Pa, SE, WH, X, Y; = *Cassia obtusifolia* Linnaeus – RAB, W, Z; < *Cassia tora* Linnaeus – F, G, misapplied; < *Emelista tora* (Linnaeus) Britton & Rose – S, misapplied]

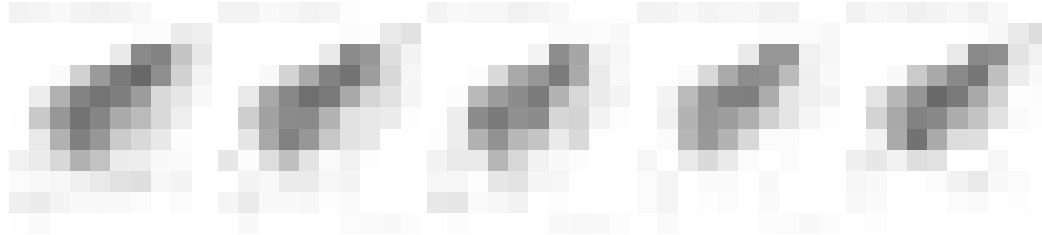
\* **Senna occidentalis** (Linnaeus) Link, Coffee Senna. Disturbed places; native of the Old World Tropics. July-August; August-November. The species is now pantropical. [= C, I, K, SE, WH, Y; = *Cassia occidentalis* Linnaeus – RAB, F, G, X, Z; = *Ditremexa occidentalis* (Linnaeus) Britton & Rose ex Britton & Wilson – S]

\* *Senna septentrionalis* (Viviani) Irwin & Barneby. Disturbed areas; native of the tropics, probably originally from tropical America, perhaps not truly established, though Isely (1990) states that "the weedy nature of this species suggests that it is almost certainly somewhat established." [= I, K, SE, Y; = *Cassia laevigata* Willdenow – Z]

**4. *Gymnocladus* Lamarck 1785 (Kentucky Coffee-tree)**

A genus of 6 species, all trees, ours in e. North America and 5 species in e. Asia, related to *Gleditsia*. References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Lee (1976)=X; Isely (1998)=I.

*Gymnocladus dioicus* (Linnaeus) K. Koch, Kentucky Coffee-tree, Kentucky Mahogany. Native in rich bottomland and slope forests, also in disturbed areas, persistent and weakly spreading from horticultural plantings. April-June; August-November (and persistent). The original native range has been obscured, perhaps PA west to se. SD, south to w. VA, TN, n. AL, and OK. [= RAB, C, F, G, I, K, Pa, S, SE, WV, X, Y, Z]



**5. *Gleditsia* Linnaeus 1753 (Honey Locust, Water Locust)**

A genus of 13-16 species, trees (and a shrub), scattered relictually in the Old and New Worlds, related to *Gymnocladus*. References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Isely (1998)=I; Schnabel & Wendel (1998).

**Identification notes:** The hybrid *Gleditsia ×texana* Sargent (pro sp.) [*G. aquatica* × *triacanthos*] occurs occasionally in the area of range overlap of its parents. It is intermediate between its parents.

- 1 Legume ovate, 3-5 (-8) cm long and 1-3-seeded; foliage glabrous (or slightly puberulent when young); [trees of frequently flooded swamps, often with *Taxodium*, rarely planted and escaped]..... *G. aquatica*
- 1 Legume elongate, 20-40 cm long and multi-seeded; foliage puberulent (even in age); [trees of moist to dry forests, frequently planted and escaped in disturbed areas] ..... *G. triacanthos*

*Gleditsia aquatica* Marshall, Water Locust. Swamp forests. April-May; July-November. E. SC south to c. peninsular FL, west to TX, and north in the interior to IN, IL, and MO; occasionally cultivated north of its native range. [= RAB, C, F, G, GW, I, K, S, SE, WH, Y, Z]

*Gleditsia triacanthos* Linnaeus, Honey Locust. Woodlands, forests (generally bottomland), fencerows, often planted as a street tree. April-early June; July-November. Native distribution is believed to be from w. NY west to se. SD, south to Panhandle FL and TX (west of the Blue Ridge); its occurrence over much of our region appears to be as an adventive. The trunks are normally beset with lengthy, branched thorns, but thornless trees are encountered (and are usually favored for horticultural planting). [= RAB, C, G, GW, I, K, Pa, S, SE, W, WV, Y, Z]

**6. *Parkinsonia* Linnaeus 1753 (Jerusalem Thorn)**

A genus of about 10-30 species (if circumscribed to include *Cercidium*), shrubs and trees of sw. North America, Central America, and Africa. References: Isely (1975)=Z; Robertson & Lee (1976)=Y; Isely (1998)=I.

\* *Parkinsonia aculeata* Linnaeus, Jerusalem Thorn, Retama, Horse-bean, Mexican Palo Verde. Disturbed areas; native of sw. North America. May. Rarely established or spread from cultivation in our area, more commonly so in much of FL. [= I, K, S, SE, Y, WH, Z]

**7. *Neptunia* Loureiro 1790 (Neptunia)**

A genus of about 12 species, herbs, of the tropics and subtropics of America and Eurasia. References: Isely (1998)=I; Windler (1966)=Z.

- 1 Leaflets 9-15 pairs per pinna; stipules 2-4 mm long; all flowers perfect, with functional stamens; stipe of fruit 4-14 mm long..... *N. lutea*
- 1 Leaflets (12-) 15-25 pairs per pinna; stipules 4-10 mm long; flowers in the lower part of the inflorescence with flattened staminalodes; stipe of fruit 2-5 mm long..... *N. pubescens* var. *pubescens*

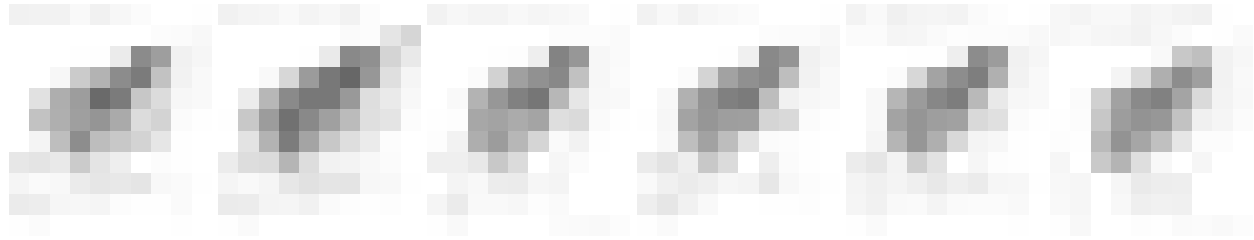
*Neptunia lutea* (Leavenworth) Bentham, Yellow Neptunia. Savannas, prairies, roadsides. AL west to OK and TX. [= I, K, S, SE, Z]

*Neptunia pubescens* Bentham var. *pubescens*, Tropical Neptunia. Savannas, sandhills, scrub, prairies, roadsides. AL and FL west to TX and south to Argentina. [= I, K, SE, Z; > *N. floridana* Small – S; < *N. pubescens* – WH; > *Neptunia pubescens* var. *floridana* (Small) B.L.Turner]

**8. *Leucaena* Bentham 1842 (Leadtree, Leucaena)**

A genus of about 22 species, of tropical and warm temperate America. References: Hughes (1998)=Z; Isely (1998)=I; Govindarajulu et al. (2011a, 2011b).

\* *Leucaena leucocephala* (Lamarck) de Wit ssp. *leucocephala*, Leadtree, Leucaena, Jumbie-bean. Disturbed areas; native of the New World tropics. E. GA (Kartesz 1999, voucher at UGA), south into FL and the New World tropics. An allotetraploid species derived from *L. cruziana* × *pulverulenta* (Govindarajulu et al. 2011b). [= Z; < *L. leucocephala* – I, K, SE, WH; < *L. glauca* (Linnaeus) Bentham – S, misapplied]



**9. *Desmanthus* Willdenow 1806 (Bundelflower)**

A genus of about 25 species, herbs and shrubs, of warm temperate and subtropical America. References: Isely (1973)=Z; Isely (1998)=I.

*Desmanthus illinoensis* (Michaux) MacMillan ex B.L. Robinson & Fernald, Bundelflower, Prairie Mimosa. Prairies, marsh edges, disturbed areas. June-July; August-November. OH, MN, and ND south to Panhandle FL, TX, and NM; with scattered adventive occurrences east and west of the native distribution. [= C, F, G, I, K1, K2, RAB, SE, W, WH3, Z; = *Acuan illinoense* (Michaux) Kuntze – S; = *Mimosa illinoensis* Michaux]

*Desmanthus virgatus* (Linnaeus) Willdenow var. *depressus* (Humboldt & Bonpland ex Willdenow), Wild Tantan. FL peninsula (north to Levy County, FL, just south of our area); West Indies; nw. LA and c. Texas south through Mexico and Central America to South America. [= I, SE; = *Acuan depressum* (Humboldt & Bonpland ex Willdenow) Kuntze – S; < *D. virgatus* – K2, WH3] {not keyed; not considered part of the flora of our area}

**10. *Dichrostachys* (de Candolle) Wight & Arnott (Sickle Bush)**

A genus of about 6 species, shrubs and trees, of Africa and tropical Asia. References: Isely (1998)=I.

\* *Dichrostachys cinerea* (Linnaeus) Wight & Arnott ssp. *africana* Brenan, African Sickle Bush, Kalahari Christmas Tree. Disturbed areas; native of Africa. [= K2; < *D. cinerea* – I, SE]

**11. *Mimosa* Linnaeus 1753 (Mimosa)**

A genus of about 500 species, herbs, shrubs, trees, and vines, of tropical, subtropical, and warm temperate areas, especially America. Barneby (1991) and Beard (1963) argue that there are no characters which serve to separate *Schrankia* from *Mimosa*. References: Barneby (1991)=Y; Isely (1973)=Z; Isely (1998)=I.

**Identification notes:** Unmistakable in our flora for its bipinnate leaves, with tiny (2-4 mm long) leaflets, responding to touch by closing.

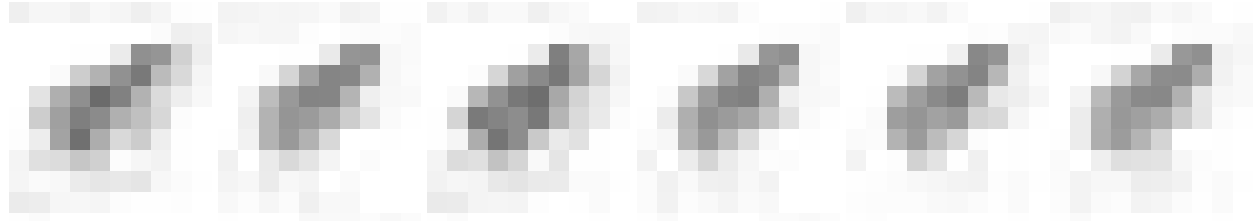
- 1 Plant unarmed.....*M. strigillosa*
- 1 Plant armed.
  - 2 Pinnae (1-) 2 pairs per leaf .....*M. pudica*
  - 2 Pinnae 6-16 (-22) pairs per leaf.
  - 3 Woody shrubs, to 4 m tall .....*M. pellita*
  - 3 Sprawling vines.
    - 4 Leaflets without apparent secondary veins; pinnae 4-8 (-11) pairs per leaf ..... *M. microphylla*
    - 4 Leaflets with evident (sometimes weakly so) secondary veins; pinnae 3-5 (-6) pairs per leaf .....*M. quadrivalvis* var. *floridana*

**Mimosa microphylla** Dryander, Eastern Sensitive-briar. Dry woodlands and forests, especially sandhills, disturbed areas. June-September; August-November. DE, WV, and MO south to FL and e. TX. A form with smaller fruits (3-5 cm long vs. 5-12 cm long) has been variously treated as a species [*Leptoglottis chapmanii* – S, *Schrankia chapmanii*] or a "recurrent fruit-form genotype" [phase *brachycarpa* of Isely (1973)]. [= K; = *Mimosa quadrivalvis* Linnaeus var. *angustata* (Torrey & A. Gray) Barneby – C, I, WH, Y; = *Schrankia microphylla* (Dryander) J.F. Macbride – RAB, F, G, W; = *Schrankia microphylla* (Dryander) J.F. Macbride var. *microphylla* – SE; > *Leptoglottis 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 pelliia** Humboldt & Bonpland. Disturbed areas; native of New World tropics (s. FL, West Indies, Central America, South America). [= I, K2; ? *M. pigra* Linnaeus var. *pigra* – SE, misapplied]

\* **Mimosa pudica** Linnaeus, Sensitive Plant, Shameplant. Disturbed areas; perhaps only a waif in our area. [= I, K, S, SE, WH]

**Mimosa quadrivalvis** Linnaeus var. **floridana** (Chapman) Barneby, Florida Sensitive-briar. Xeric sandhills and other dry, sandy habitats. A Southeastern Coastal Plain endemic: GA south into FL. This taxon is distinct at the specific level from *M. quadrivalvis* and nomenclatural adjustments are forthcoming (Flores-Cruz et al. 2004). [= I, K, WH, Y; = *Leptoglottis floridana* (Chapman) Small ex Britton & Rose – S; = *Schrankia microphylla* (Dryander) J.F. MacBride var. *floridana* (Chapman) Isely – SE]



**Mimosa strigillosa** Torrey & A. Gray, Powderpuff Mimosa. Floodplain forests, open wet areas. A Southeastern Coastal Plain endemic: e. GA south to FL, west to TX. It might be expected in se. SC (see SE, Y, Z). [= I, K, S, SE, WH, Y, Z]

### 12. *Acaciella* Britton & Rose 1928 (Acacia)

A genus of about 15 species, herbs, of sc. and se. United States south to Argentina. References: Isely (1998)=I.

**Acaciella hirta** Britton & Rose, Prairie Acacia. Sandhills, disturbed sandy areas. W. LA, AR, and MO west to KS, OK, and TX; disjunct in e. Panhandle FL and n. peninsular FL. [= S; = *Acacia angustissima* (P. Miller) Kuntze var. *hirta* (Nuttall) B.L. Robinson – I, K, SE, WH; = *Acacia hirta* Nuttall]

### 13. *Vachellia* Wight & Arnott 1834 (Acacia)

A genus of about 163 species, trees and shrubs, of tropical and subtropical America, Africa, Asia, and Australia. Formerly considered part of *Acacia*. References: Isely (1998)=I; Isely (1969)=Z; Ebinger, Seigler, & Clarke (2002)=Y; Seigler & Ebinger (2005)=X; Maslin, Miller, & Seigler (2003).

- 1 Leaves with 2-4 (-6) pairs of pinnae; each pinna with 10-20 pairs of leaflets ..... *V. farnesiana* var. *farnesiana*
- 1 Leaves with 10-15 (-20) pairs of pinnae; each pinna with 20-30 pairs of leaflets ..... *V. macracantha*

**Vachellia farnesiana** (Linnaeus) Wight & Arnott var. **farnesiana**, Sweet Acacia, Huisache. Sandy flats on barrier islands, maritime scrub, shell middens. E. GA, along the coast, south to s. FL, west to TX and Tamaulipas, across the sw. United States and south into Mexico. The GA occurrence appears native; see Duncan (1985). [= X; < *Acacia farnesiana* (Linnaeus) Willdenow – I, K, SE, WH, Z; > *Vachellia farnesiana* (Linnaeus) Wight & Arnott – S; = *Acacia farnesiana* ssp. *farnesiana* – Y; > *Acacia smallii* Isely – I, SE, Z; > *Vachellia densiflora* Alexander ex Small – S]

\* **Vachellia macracantha** (Humboldt & Bonpland ex Willdenow) Seigler & Ebinger, Apopanax, Longspine Acacia. Planted as an ornamental and rarely naturalized; native of farther south in FL. [= X; = *Acacia macracantha* Humboldt & Bonpland ex Willdenow – I, K, SE, WH, Z]

### 14. *Calliandra* Benthham 1840

A genus of about 135 species, trees and shrubs, of the New World tropics and subtropics. References: Isely (1998)=I.

\* **Calliandra haematocephala** Hasskarl, Powderpuff Tree. Disturbed areas; native of South America, cultivated in the southern part of our area and allegedly persistent or spreading. [= I, WH3]



15. *Albizia* Durazzini 1772 (Silktree)

A genus of about 100-120 species, trees, shrubs, and vines, of tropical, subtropical, and warm temperate Asia, Africa, and America. References: Isely (1973)=Z; Isely (1998)=I.

- 1 Leaflets 7-15 mm long; bark of mature trees smoothish, with small wart-like bumps ..... *A. julibrissin*  
 1 Leaflets 15-30 mm long; bark of mature trees rough, with plates ..... *A. kalkora*

\* *Albizia julibrissin* Durazzini, Mimosa, Silktree. Disturbed areas, suburban woodlots, escaped and persistent in forests and woodlands; native of tropical Asia. May-August; July-November. Becoming a serious weed; "literally almost everywhere in the 'Dixie' south" (Isely 1973). [= RAB, C, I, K, Pa, SE, W, WH, Z; = *Albizzia julibrissin* – F, G, S, orthographic variant]

\* *Albizia kalkora* (Roxburgh) Prain, Kalkora Mimosa. Naturalizing in suburban areas; native of e. Asia (Japan, Korea, Taiwan). Documented by herbarium specimens at DUKE and NCU. Apparently hybridizing with *A. julibrissin* (W. Cook, pers. comm.).

16. *Cladrastis* Rafinesque 1824 (Yellow-wood)

A genus of about 6 species, trees, of the se. United States and montane regions of Japan and China. *Cladrastis* is the only native member of the tribe Sophoreae in our area, with the exception of the cultivated (and weakly, if at all, established) *Styphnolobium* and *Maackia*; additionally the native *Sophora tomentosa* Linnaeus var. *truncata* Torrey & A. Gray closely approaches our area in n. peninsular FL. References: Duley & Vincent (2003)=X; Isely (1981)=Z; Isely (1998)=I; Rudd (1972)=Y.

*Cladrastis kentukea* (Dumont de Courset) Rudd, Yellow-wood. Mountain forests, Piedmont bluffs, especially on calcareous or mafic rocks (introduced only in the Piedmont of NC). April-May; July-August. This small to large tree has a native range primarily in the Southern Appalachians (mostly on the west side), the Ozarks, and limestone regions in-between (such as c. TN), ranging from s. OH, s. IN, and s. MO south to sw. NC, sc. SC, n. GA, AL, c. AR, and e. OK, but is cultivated more widely. As discussed by Wyatt (1985), the SC occurrence on Fall Line bluffs of the Savannah River is an interesting disjunction, apparently relictual. Yellow-wood is a distinctive tree, distinguished by its smooth silvery-gray bark, peculiar leaves with alternate leaflets, and pendent panicles of white flowers. The genus *Cladrastis* has 4 other species, all of temperate e. Asia. Increasingly planted as an ornamental, and likely to start escaping more widely, as reported for Fairfax County, VA (Steury 2011). [= K, W, X, Y; = *C. lutea* (Michaux f.) K. Koch – RAB, C, F, G, I, S, SE, Z]

17. *Styphnolobium* Schott 1830 (Pagoda Tree)

A genus of about 9 species, trees, shrubs, of central and South America and e. Asia. References: Isely (1998)=I; Isely (1981)=Z; Sousa S. & Rudd (1993)=Y; Palomino et al. (1993).

- 1 Flowers in terminal panicles; leaflets 13-17 per leaf ..... *S. affine*  
 1 Flowers in axillary racemes; leaflets 9-15 per leaf ..... *S. japonicum*

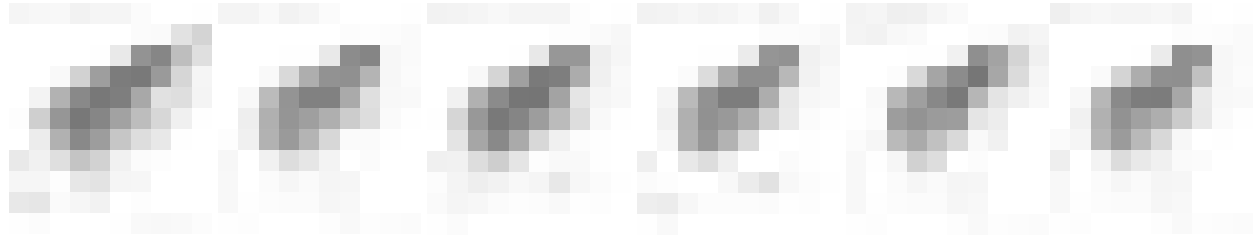
*Styphnolobium affine* (Torrey & A. Gray) Walpers, Eve's Necklace. Woodlands, disturbed areas. April-June. Sw, AR and OK south to sw. LA and c. TX; disjunct eastward in se. LA. [= K2; = *Sophora affinis* Torrey & A. Gray]

\* *Styphnolobium japonicum* (Linnaeus) Schott, Pagoda Tree. Cultivated ornamental, rarely persistent; native of China. Reported as "slightly escaped" in the United States by Isely (1981); most specimens in herbaria are from cultivated plants. Steury (2011) and Zell (2012) report it as well-established and invasive in Arlington County, VA. Also reported for MD, PA, and OH (Kartesz 1999). [= Y; = *Sophora japonica* Linnaeus – I, K, Pa, Z]

18. *Maackia* Ruprecht & Maximowicz 1856 (Maackia)

A genus of about 8 species, trees and shrubs, of e. Asia.

\* *Maackia amurensis* Ruprecht, Amur Maackia, Chinese Yellow-wood. Sparingly naturalizing in suburban woodlands; native of China and Siberia. Reported as sparingly naturalizing on Duke University campus, Durham County, NC (W. Cook, pers. comm., 2007).



**19. *Thermopsis*** R. Brown ex Aiton & Aiton f. 1811 (Golden-banner)

A genus of ca. 23 species, perennial herbs, of temperate e. North America, w. North America, and e. Asia. References: Chen, Mendenhall, & Turner in FNA (in prep.); Larisey (1940b); Chen, Mendenhall, & Turner (1994)=Y; Isely (1981)=Z; Isely (1998)=I.

- 1 Legumes erect or strongly ascending, densely villous; stipules clasping, those of the principal leaves (20-) 35-65 mm long, 10-30 mm wide; pedicels 2-3 mm long; plants mostly 6-20 dm tall, strict or few-branched..... *T. villosa*
- 1 Legumes spreading to ascending, glabrate or pubescent; stipules not clasping, those of the principal leaves 12-25 (-32) mm long, 1-5 mm wide; pedicels 4-20 mm long; plants mostly 3-10 dm tall, branched.
  - 2 Plants from a single woody rootstock, mostly 5-10 dm tall; calyx glabrous or very sparsely pubescent, often also glaucous, the lobes often only 1-1.5 mm long; pedicels glabrate, (4-) 7-20 mm long (as long as or longer than the bracts); racemes terminal or lateral; plants flowering (late May-) early June-July; [plants of moderate to high elevations, (300-) 700-2000 m]..... *T. fraxinifolia*
  - 2 Plants from extensive rhizomes, mostly 3-6 dm tall; calyx pubescent, the lobes 2-2.5 mm long; pedicels villosulous, 2-6 (-10) mm long (shorter than the bracts); racemes terminal; plants flowering late April-early May (-June); [plants of low to moderate elevations, 200-800 m]..... *T. mollis*

*Thermopsis fraxinifolia* (Nuttall) M.A. Curtis, Ash-leaf Golden-banner. Dry slopes and ridges. Late May-July; July-October. A Southern Appalachian endemic: w. NC and e. TN south to nw. SC and n. GA. In addition to the key characters above, *T. fraxinifolia* tends to have thinner stems than *T. mollis*, to average taller, and to have the inflorescence generally arching to reclining (vs. erect to sometimes arching). The phenologic separation (peak flowering times separated by about 6-7 weeks, generally with a 2 week period between the last flowering of *T. mollis* and the first flowering of *T. fraxinifolia*) provides strong support to the recognition of *T. fraxinifolia* and *T. mollis* at the species level. [= FNA, K, RAB, S, W, Y; = *T. mollis* var. *fraxinifolia* (Nuttall) Isely – I, SE, Z]

*Thermopsis mollis* (Michaux) M.A. Curtis, Appalachian Golden-banner. Dry slopes and ridges. April-May; June-August. Centered in the Southern Appalachians, but mostly in the Piedmont and lower elevation periphery of the mountains, ranging from sc. VA south through w. and c. NC and e. TN to nw. SC, n. GA, and ne. AL. See comments under *T. fraxinifolia*. [= C, F, FNA, G, K, RAB, W, Y; = *T. mollis* var. *mollis* – I, SE, Z; > *T. hugeri* Small – S; > *T. mollis* – S]

*Thermopsis villosa* (Walter) Fernald & Schubert, Aaron's-rod, Blue Ridge Golden-banner. Floodplains, mesic disturbed areas, woodland edges, roadbanks. May-June; July-September. A Southern Blue Ridge endemic: w. NC and e. TN to n. GA, and escaped from cultivation more widely, as in w. VA, s. MD, c. TN, and WV probably representing escapes from cultivation. *T. villosa* is a more erect and unbranched plant than our other 2 species. It is generally found in disturbed sites, its natural habitat somewhat of a mystery. [= C, FNA, I, K, RAB, SE, W, Y, Z; = *T. caroliniana* M.A. Curtis – S]



**20. *Baptisia*** Ventenat 1808 (Wild Indigo)

A genus of about 20 species, perennial herbs, of temperate e. and c. North America. References: Isely (1981)=Y; Larisey (1940a)=Z; Mendenhall (1994a, 1994b)=X; Turner (2006)=Q; Isely (1998)=I.

**Identification notes:** Many of our species hybridize when they grow in proximity. They are generally recognizable (especially in context with their parents) by their intermediate morphology. Additional hybrids have been created by plant breeders and may be found in cultivation.



- 1 Leaves 1-foliolate, sessile or perfoliate.
  - 2 Leaves perfoliate; plant glabrous or nearly so; [widespread, from s. SC southward] ..... *B. perfoliata*
  - 2 Leaves sessile; plant glabrous or densely cobwebby pubescent; [narrow endemics of GA and FL].
    - 3 Plant cobwebby-pubescent; leaves ca. 1× as long as wide, cordate at base; corolla 9-11 mm long, yellow; [of e. GA (Brantley and Wayne counties)] ..... *B. arachnifera*
    - 3 Plant glabrous; leaves 1.3-1.6× as long as wide, rounded to broadly cuneate at base; corolla 12-15 mm long, pale yellow to greenish; [of the FL Panhandle (Franklin, Gadsden, Leon, Liberty, and Wakulla counties)] ..... *B. simplicifolia*
- 1 Leaves 3-foliolate, petiolate or sessile.
  - 4 Flowering or fruiting pedicels bracteolate; corolla 11-14 mm long
    - 5 Calyx lobes about as long as the calyx tube ..... *B. lecontei*
    - 5 Calyx lobes much > the calyx tube.
      - 6 Plant glabrous; [of ne. FL (Clay and St. Johns counties)] ..... *B. calycosa*
      - 6 Plant tomentose to hirsute; [of FL Panhandle (Escambia, Holmes, Okaloosa, Santa Rosa, and Walton counties)] ..... *B. hirsuta*
  - 4 Flowering or fruiting pedicels lacking bracteoles; corolla larger (except *B. tinctoria*).
    - 7 Plants in flower ..... **Key A**
    - 7 Plants in fruit ..... **Key B**

**Key A – flowering *Baptisia***

- 1 Flowers lavender or blue.
    - 2 Leaflets 2-4 (-5) cm long, mostly < 10 mm wide (if wider, then < 4 cm long); leaflets mostly oriented in a vertical plane; fertile stems usually 0.4-1.0 m tall, the leafy branches horizontally spreading; racemes 1-2.5 (-4) dm long, rather densely flowered; petioles 0-4 (-12) mm long; [of diabase and limestone glades, barrens, and woodlands] ..... *B. australis* var. *aberrans*
    - 2 Leaflets 4-6 (-9) cm long, mostly > 12 mm wide; leaflets not oriented in a vertical plane; fertile stems usually 1-1.5 m tall, the leafy branches ascending; racemes 2-4 (-5) dm long, rather sparsely flowered; petioles 5-20 (-40) mm long; [of flood-scoured riverside cobblebars and rock outcrops, also frequently cultivated and sometimes persistent or escaped] ..... *B. australis* var. *australis*
  - 1 Flowers yellow, cream-white, or white.
    - 3 Flowers white or cream-white.
      - 4 Flowering pedicels 10-18 (-30) mm long, subtended by persistent bracts 10-25 mm long and 7-10 mm wide; flowers cream-white (to pale-yellow).
        - 5 Petioles of median leaves 4-10 mm long ..... *B. bracteata*
        - 5 Petioles of median leaves 2-4 mm long
          - 6 Leaves and stems glabrous; leaflets 1.5-2.5× as long as wide ..... *B. leucophaea* var. *laevicaulis*
          - 6 Leaves and stems pubescent; leaflets (1.5-) 2.5-5× as long as wide ..... *B. leucophaea* var. *leucophaea*
      - 4 Flowering pedicels 3-10 mm long, subtended by caducous bracts 4-7 mm long and 1-2 mm wide; flowers white.
        - 7 Calyx 4.5-6.5 mm long; corolla 13-16 (-18) mm long; petioles 5-10 (-20) mm long ..... *B. albescens*
        - 7 Calyx 7-8 mm long; corolla 20-25 mm long; petioles (of the lower leaves at least) 10-20 mm long.
          - 8 Legume usually 15-20 (-30) mm in diameter, thin-walled and brittle; [of NC south through GA to FL and AL] ..... *B. alba*
          - 8 Legume usually 10-12 (-15) mm in diameter, rigid and tough; [of c. TN, c. KY, and MS westward] ..... *B. leucantha*
    - 3 Flowers yellow.
      - 9 Flowering pedicels 14-18 (-30) mm long, subtended by persistent bracts 10-25 mm long and 7-10 mm wide; flowers pale-yellow (to cream-white).
        - 10 Petioles of median leaves 4-10 mm long ..... *B. bracteata*
        - 10 Petioles of median leaves 2-4 mm long.
          - 11 Leaves and stems glabrous; leaflets 1.5-2.5× as long as wide ..... *B. leucophaea* var. *laevicaulis*
          - 11 Leaves and stems pubescent; leaflets (1.5-) 2.5-5× as long as wide ..... *B. leucophaea* var. *leucophaea*
      - 9 Flowering pedicels 2-10 mm long, subtended by caducous bracts 2-10 mm long and 1-2 mm wide; flowers bright yellow.
        - 12 Leaflets mostly 1-2.5 (-4) cm long, 1-2.5× as long as wide, the petiolules 0-1 mm long; corolla 12-16 mm long; racemes numerous, terminating most of the branches ..... *B. tinctoria*
        - 12 Leaflets mostly 4-9 cm long, 1.5-4× as long as wide, the petiolules 2-10 mm long; corolla 20-28 mm long; racemes solitary (-3) or numerous.
          - 13 Inflorescences of racemes of (3-) 5-25 (or more) flowers; stipules persistent or caducous.
            - 14 Plant persistently cinereous-pubescent; stipules (some of them at least) persistent; plants blackening on drying ..... *B. cinerea*
            - 14 Plant puberulent when young, soon glabrate to glabrous; stipules caducous; [of MS westward]; plants not blackening on drying ..... *B. sphaerocarpa*
    - 13 Inflorescence **either** of solitary axillary flowers **or** flowers in clusters of 2-4 in axils **or** in terminal racemes of 2-4 (-10) flowers; stipules caducous.
      - 15 Petiolules 2-3 mm long; leaflets 1-2.5× as long as wide; [of LA, AR, TX, and OK] ..... *B. nuttalliana*
      - 15 Petiolules 4-10 mm long; leaflets 1.7-5× as long as wide; [of SC, GA, FL, and AL].
        - 16 Leaflets 3-5× as long as wide, usually < 1.5 cm wide; flowers usually solitary or in clusters of 2-3; fruits broadly ellipsoid or subspheroidal, < 2× as long as wide; [se. SC south through GA Coastal Plain to ne. FL] ..... *B. lanceolata* var. *lanceolata*
        - 16 Leaflets 1.7-3.2 (-5)× as long as wide, the larger typically > 2 cm wide; flowers in racemes of (1-) 3-10 flowers; fruits usually ellipsoid, often > 2× as long as wide; [FL Panhandle, s. AL, and c. peninsular FL] ..... *B. lanceolata* var. *tomentosa*
- {add *B. megacarpa* and *B. riparia* 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 texture.....*B. albescens*
- 2 Legume globose or subspheroidal, 7-25 mm long, 5-11 mm in diameter, black, woody in texture.
- 3 Leaflets mostly 1-2.5 (-4) cm long.....*B. tinctoria*
- 3 Leaflets 3.5-10 cm long.
- 4 Leaflets 3-5× as long as wide, usually < 1.5 cm wide; infructescence nodes (fruits or aborted fruits) usually 1-3; fruits broadly ellipsoid or subspheroidal, <2× as long as wide; [se. SC south through GA Coastal Plain to ne. FL] .....*B. lanceolata* var. *lanceolata*
- 4 Leaflets 1.7-3.2 (-5)× as long as wide, the larger typically > 2 cm wide; infructescence nodes (1-) 3-10; fruits usually ellipsoid, often > 2× as long as wide; [FL Panhandle, s. AL, and c. peninsular FL] .....*B. lanceolata* var. *tomentosa*
- 1 Legume 8-25 mm in diameter.
- 5 Pod drying tan, thin-walled and brittle .....*B. megacarpa*
- 5 Pod drying black to blackish-brown, leathery or tough.
- 6 Stems puberulent (sometimes inconspicuously so) or villous.
- 7 Legume (20-) 30-40 (-50) mm long, 15-25 mm in diameter; pedicels 14-18 (-30) mm long, subtended by persistent bracts 10-25 mm long and 7-10 mm wide.....*B. bracteata*, *B. leucophaea* var. *leucophaea*
- 7 Legume 10-35 mm long, 8-15 mm in diameter; pedicels 2-10 mm long, subtended by caducous bracts 2-10 mm long and 1-2 mm wide.
- 8 Petiolules 2-5 mm long; stipules (some of them at least) persistent .....*B. cinerea*
- 8 Petiolules 4-10 mm long; stipules caducous.....*B. lanceolata* var. *lanceolata*
- 6 Stems glabrous and generally glaucous as well.....*B. alba*, *B. leucantha*, *B. leucophaea* var. *laevicaulis*, *B. australis* var. *aberrans*, *B. australis* var. *australis* {add *B. nuttalliana* and *B. riparia* to fruiting key}

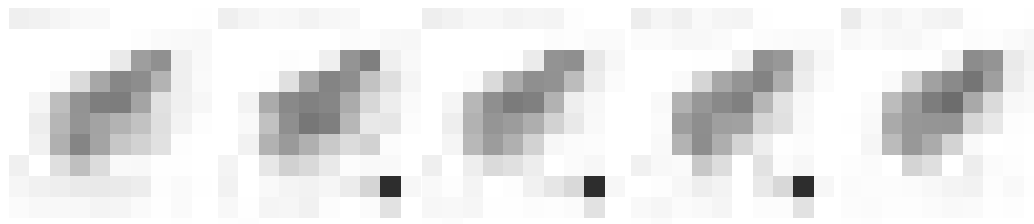
*Baptisia alba* (Linnaeus) Ventenat, Thick-pod White Wild Indigo. Dry woodlands, roadsides. May-July; June-October. NC south to n. peninsular FL, west to AL. *B. leucantha* (see below) is a western sibling, treated as either a species or a variety. In fruit, it is easily separated from *B. albescens* and most other *Baptisia* by its nearly spheroidal legume. *B. alba* and *B. albescens* have been nomenclaturally confused; Isely (1986a) corrects the application of the epithet "*alba*." [= S, WH; = *B. alba* var. *alba* - I, K, SE; = *B. pendula* Larisey - RAB; = *B. lactea* (Rafinesque) Thieret var. *obovata* (Larisey) Isely - C (by implication), X, Y; = *B. lactea* var. *pendula* (Larisey) B.L. Turner - Q; > *B. pendula* var. *pendula* - Z; > *B. pendula* var. *obovata* Larisey - Z]

*Baptisia albescens* Small, Narrow-pod White Wild Indigo, Spiked Wild Indigo. Dry woodlands, pine flatwoods, roadsides. May-July; June-October. Se. VA south through NC, SC, and GA to n. FL, e. AL and e. TN. The fruits are unlike any of our other species in being cylindric, about 3× as long as the diameter, and yellowish-brown (rather than black) when mature. [= I, K, S, SE, WH; = *B. alba* - RAB, C, F, G, Q, W, X, Y, misapplied; > *B. alba* - Z; > *B. albescens* - Z]

*Baptisia arachnifera* Duncan, Hairy Rattleweed, Hairy Wild Indigo. Sandhills. Endemic to GA (Wayne and Brantley counties). Unmistakable for its simple leaves and dense "cobwebby" pubescence. [= I, K, Q, SE, X, Y]

*Baptisia australis* (Linnaeus) R. Brown var. *aberrans* (Larisey) M. Mendenhall, Eastern Prairie Blue Wild Indigo, Glade Wild Indigo. Glades, barrens, and open woodlands over limestone (or other calcareous rocks) and diabase (or other mafic rocks), in areas that were formerly prairies, barrens, glades, or oak savannas. April-May; June-August. C. and se. TN, nw. GA, and c. NC (and possibly also s. KY and sc. VA). Blue-flowered *Baptisia* from mafic glades, barrens, and former prairies and oak savannas in NC has proven problematic to taxonomists. Larisey (1940a) treated *B. australis* and *B. minor* as separate species, and placed eastern plants resembling *B. minor* in *B. minor* var. *aberrans* Larisey, but without providing very satisfying characters for separating it from typical *B. minor* of mw. North America. RAB apparently (though tacitly) included *B. minor* within *B. australis*. Isely (1981, 1990) treated blue-flowered *Baptisia* as *B. australis* var. *australis* and var. *minor*, regarding var. *minor* as reaching its eastern limit in MO (the two varieties thus allopatric), and stating that "sporadic collections within the range of var. *australis* have the pods and some of the vegetative characters of var. *minor*... most of these collections are from dry or sterile habitats, e.g., cedar glades, that var. *australis* typically does not inhabit" (Isely 1990). His treatment of *australis* and *minor* at the varietal level seems largely based on the existence of *minor*-like plants within his concept of the range of *australis*. NC plants from glade-like sites are morphologically more similar to midwestern prairie *B. minor*, occur in similar habitats, and grow with a large number of other plants with midwestern phytogeographic affinities, such as *Eryngium yuccifolium* var. *yuccifolium*, *Echinacea laevigata* (an eastern sibling of *E. purpurea*), *Solidago ptarmicoides*, *Solidago rigida* ssp. *glabrata* (an eastern sibling of *S. rigida* ssp. *rigida*), *Silphium terebinthinaceum*, and others. The affinities of these plants seem to be with *B. minor*; "shoehorning" them into the more eastern *B. australis*, which they do not resemble in morphology, habitat, or (indeed) range is not a desirable disposition. Eastern plants referable to *B. minor* do, however, as noted by Larisey and Isely, differ from midwestern plants in leaflet size and shape, branching, and pod shape; they are best treated as an eastern, relictual variety in the complex, *B. australis* var. *aberrans* Larisey. Mendenhall (1994a, 1994b) found that the "*aberrans*" entity warranted taxonomic recognition, and indeed that it is less closely related to *B. australis* s.s. and *B. minor* than they are to one another; she chose to treat the three entities as varieties under *B. australis*. For now, the best treatment seems to be to follow Mendenhall, and acknowledge the existence of three varietal entities, with the phylogenetic affinities uncertain. The range of *B. australis* var. *minor* is thus largely midwestern, from se. NE, s. MO, and e. and c. KS south to w. AR, e. and c. OK, and ne. TX. [= K, X; = *Baptisia minor* Lehmann var. *aberrans* Larisey - Z; < *B. australis* (Linnaeus) R. Brown - RAB, S; < *B. australis* var. *australis* - I, Q, SE; < *B. australis* var. *minor* (Lehmann) Fernald - C, G; < *B. minor* - F]

*Baptisia australis* (Linnaeus) R. Brown var. *australis*, Tall Blue Wild Indigo, Streamside Blue Indigo. Riverbank scour areas, gravel bars, and disturbed areas (where persisting from cultivation). April-June; June-August. Native to w. and n. VA, w. MD, WV, w. PA, e. and c. KY, ne. TN, se. IN, and s. OH, and possibly native to other states, the original range somewhat obscured by its frequent cultivation. [= C, G, K, X; = *B. australis* - F, W, Z; < *B. australis* - RAB, Pa, S; < *B. australis* var. *australis* - I, Q, SE]



***Baptisia bracteata*** Elliott, Creamy Wild Indigo. Sandhills, other dry woodlands. March-April; May-June. Ne. AL northwest through n. GA and n. SC to w. NC. The more western *B. leucophaea* Nuttall is better treated as a species than as *B. bracteata* var. *leucophaea* (Nuttall) Kartesz & Gandhi (Mendenhall 1994b). [= RAB, Q, S, W, X, Z; = *B. bracteata* var. *bracteata* – C, I, K, SE]

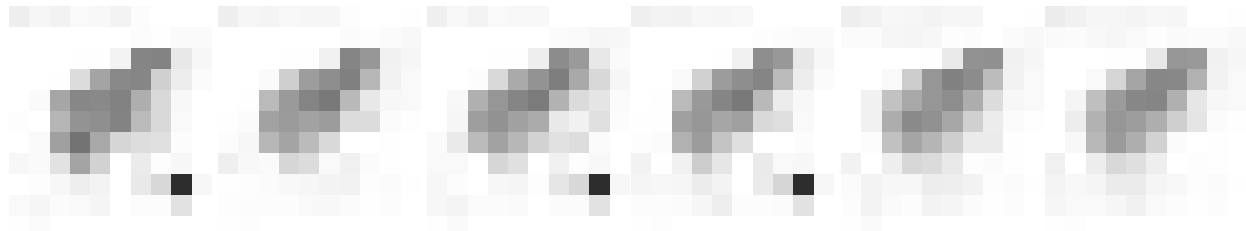
***Baptisia calycosa*** Canby, Florida Wild Indigo. Dry pinelands. Endemic to ne. FL (Clay and St. Johns counties) and also reported for Lowdes County, GA (Kartesz 2010) (this record needing confirmation). [= Q, S, Z; = *B. calycosa* var. *calycosa* – I, K, SE, WH, Y] {synonymy incomplete: X}

***Baptisia cinerea*** (Rafinesque) Fernald & Schubert, Carolina Wild Indigo. Sandhills, other dry sandy woods. Late April-June; June-July. Though common in the Coastal Plain of the Carolinas, *B. cinerea* is a narrow endemic, ranging only from s. VA south to s. SC. The large, yellow flowers are very showy. In fall, the leaves do not drop, but stay attached to the stems, the whole plant turning an ashy gray; these dried plants are conspicuous through the following winter. The report in Jones & Coile (1988) of *B. cinerea* in GA is in error; the specimen is of *B. lanceolata*. [= RAB, C, F, G, I, K, Q, SE, X; = *B. villosa* auct. non (Walter) Nuttall – S, Z]

***Baptisia hirsuta*** Small, Hairy Wild Indigo, Panhandle Wild Indigo. Dry pinelands. Endemic to FL Panhandle (Escambia, Holmes, Okaloosa, Santa Rosa, and Walton counties) and adjacent AL (Covington County). May; June-September. [= Q, S, Z; = *B. calycosa* Canby var. *villosa* Canby – I, K, SE, WH, Y] {synonymy incomplete: X}

***Baptisia lanceolata*** (Walter) Elliott var. *lanceolata*, Gopherweed. Sandhills. April-May; June-November. S. SC south to ne. FL and sw. GA, a Southeastern Coastal Plain endemic. Small (1933) alleges that *B. lanceolata* ranges north to NC, but no documentation is known. The plant is reminiscent of *B. cinerea*, but forms larger, bushier plants and is separable by characters in the key. [= I, K, Q, SE, X; < *B. lanceolata* – RAB, S, WH; = *B. lanceolata* – Z]

***Baptisia lanceolata*** (Walter) Elliott var. *tomentosa* (Larisey) Isely. Sandhills. Panhandle FL and adjacent s. AL; disjunct in c. peninsular FL. Two forms have been recognized, the "narrow-leaved form," endemic to the Apalachicola Lowlands portion of the FL Panhandle, and the "typical form", occupying the FL Panhandle, s. AL, and disjunct in c. peninsular FL (Isely 1981). Mendenhall (1994b) included broad-leaved and narrow-leaved forms of var. *tomentosa* in her study, which provided some support for the taxonomic recognition of these unnamed entities. [= I, K, SE, Y; = *B. lanceolata* var. *elliptica* (Small) B.L. Turner – Q; = *B. elliptica* Small – S; < *B. lanceolata* – WH; > *B. elliptica* var. *elliptica* – Z; > *B. elliptica* var. *tomentosa* Larisey – Z]



***Baptisia lecontei*** Torrey & A. Gray, Leconte's Wild Indigo. Sandhills. Sc. GA south to e. Panhandle FL and s. peninsular FL. [= I, K, Q, S, SE, WH, X, Y, Z]

***Baptisia leucantha*** Torrey & A. Gray. Woodlands, prairies, roadsides. W. MY, MI, WI, MN, and e. NE, south to AL, MS, LA, e. TX, and sw. OK; alleged by S to occur in NC, presumably based on misinterpreted material of *B. alba*. [= S, X; = *Baptisia alba* var. *macrophylla* (Larisey) Isely – I, K1, K2, SE; = *B. lactea* (Rafinesque) Thieret var. *lactea* – C, Q, Y; > *B. leucantha* var. *leucantha* – Z; > *B. pendula* Larisey var. *macrophylla* Larisey – Z]

***Baptisia leucophaea*** Nuttall var. *leucophaea*. Pinelands, woodlands. April-May. Nw. IN west to s. MN and e. NE, south to w. KY, c. MS, c. LA, se. LA (Turner 2006), and e. TX. [= *B. bracteata* var. *leucophaea* – I, K2, SE; < *B. leucophaea* var. *leucophaea* – F, G, Q; < *B. bracteata* Muhlenberg ex Elliott var. *leucophaea* (Nuttall) Kartesz & Gandhi – K1; < *B. bracteata* var. *glabrescens* (Larisey) Isely – C, Y; < *B. leucophaea* var. *glabrescens* Larisey – Z]

***Baptisia leucophaea*** Nuttall var. *laevicaulis* A. Gray ex Canby. Pinelands, coastal prairies. April-May. [< *B. bracteata* Muhlenberg ex Elliott var. *leucophaea* (Nuttall) Kartesz & Gandhi – K1; = *B. bracteata* var. *laevicaulis* (A. Gray ex Canby) Isely – I, K2, SE; < *B. bracteata* var. *glabrescens* (Larisey) Isely – Y; < *B. leucophaea* var. *glabrescens* Larisey – Z]

***Baptisia megacarpa*** Chapman ex Torrey & A. Gray, Apalachicola Wild Indigo, Bigpod Wild Indigo. Moist forests of floodplains and lower slopes. Late April-early June; June-July. E. Panhandle FL and sw. GA west to se. AL. [= Z; < *B. megacarpa* Chapman ex Torrey & A. Gray – I, K, Q, S, SE, WH, X, Y; > *B. megacarpa* – Z]

***Baptisia nuttalliana*** Small. Woodlands and prairies. S. AR and se. OK south to se. LA (Florida parishes) and se. TX. [= I, K1, K2, Q, S, SE, Y, Z] {synonymy incomplete}



**Baptisia perfoliata** (Linnaeus) R. Brown ex Aiton f., Catbells, Gopherweed. Sandhills. April-May; May-July. S. SC to e. GA; disjunct in c. peninsular FL (Orange and Osceola counties); disjunct in wc. AL (Sumter County) (Keener 2007), a Southeastern Coastal Plain endemic. [= RAB, I, K, Q, S, SE, X, Y, Z]

**Baptisia riparia** Larisey, Ochlockonee Wild Indigo. Moist forests of floodplains. Late April-early June; June-July. Endemic to e. Panhandle FL (all known collections from the Ochlockonee River). Provisionally accepted as a species, as seemingly very distinct from *B. megacarpa*, with which it has generally been lumped. [< *B. megacarpa* Chapman ex Torrey & A. Gray – I, K, Q, S, SE, WH, X, Y; > *B. riparia* var. *riparia* – Z; > *B. riparia* var. *minima* Larisey – Z] {not yet keyed}

**Baptisia simplicifolia** Croom. Pine flatwoods. Endemic to Panhandle FL (Franklin, Gadsden, Leon, Liberty, and Wakulla counties) (Wunderlin & Hansen 2004). [= I, K, Q, S, SE, WH, X, Y, Z]

**Baptisia sphaerocarpa** Nuttall. Woodlands and prairies. S. MS west to se. MO, e. OK, and e. TX. [= I, K, SE; > *B. sphaerocarpa* – Z; > *B. viridis* Larisey – Z] {synonymy incomplete}

**Baptisia tinctoria** (Linnaeus) Ventenat, Honesty-weed, Rattleweed. Sandhills, pine flatwoods, xeric woodlands, ridges, woodland edges, and roadbanks. April-August; July-November. Widespread in eastern United States, from NY and MN south to GA. The most widespread and common of our species of *Baptisia*, *B. tinctoria* is readily recognizable from its small, yellow flowers, small leaflets, and small fruits. The taxa synonymized need further investigation. [= RAB, C, I, K, Pa, 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]



**21 Crotalaria** Linnaeus 1753 (Rattlebox)

A genus of about 600 species, annual and perennial herbs, nearly cosmopolitan in tropical and temperate regions (especially diverse in Africa). References: Windler (1974)=Z; Isely (1986b)=Y; Ward (2009, 2010)=X; Isely (1998)=I. Key adapted in part from SE.

- 1 Leaves trifoliolate; erect annual herb, typically 1-2 m tall.
  - 2 Leaflets obovate to elliptic-oblong, 1.5-3.5× as long as wide; legume conspicuously curved (or straight in *C. incana*).
    - 3 Legume 10-15 mm in diameter, pilose; stem pubescence spreading .....*C. incana*
    - 3 Legume 5-6 mm in diameter, minutely puberulent; stem pubescence appressed .....*C. pallida* var. *obovata*
  - 2 Leaflets lanceolate, often narrowly so, 3-15× as long as wide; legume straight or nearly so (or upcurved at the tip).
    - 4 Corolla 8-10 mm long; legume 4-6 mm in diameter, upcurved at tip.....*C. lanceolata*
    - 4 Corolla 18-20 mm long; legume 15 mm in diameter, not upcurved.....*C. ochroleuca*
- 1 Leaves unifoliolate; plants of various habits, mostly either perennial, smaller, or both.
  - 5 Corolla 1.7-3.0 cm long; leaflets 4-15 cm long; stipules not decurrent on the stem and not conspicuously foliose; [exotic annual herbs, in disturbed habitats].
    - 6 Legume pubescent .....*C. juncea*
    - 6 Legume glabrous.
      - 7 Bracts of the inflorescence 2-3 mm long, caducous; leaflets 4-8 cm long .....*C. retusa*
      - 7 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. maritima* and *C. rotundifolia*); [native perennial or annual herbs, in natural or disturbed habitats].
    - 8 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*
    - 8 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].
      - 9 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*

- 9 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.
- 10 Stem pubescence appressed ..... *C. maritima*
- 10 Stem pubescence spreading ..... *C. rotundifolia*

\* *Crotalaria incana* Linnaeus, Shake-shake. Disturbed areas; native of Africa. Also in peninsular FL, from Alachua County southward. [= I, K, S, SE, WH3, X]

\* *Crotalaria juncea* Linnaeus, Sunn Hemp. Grown as a crop, and occurring as a waif in field edges (W. Barger, pers. comm., 2012). [= I, SE, WH3] {add to synonymy}

\* *Crotalaria lanceolata* E. Meyer, Lanceleaf Rattlebox. Sandy fields, roadsides, other disturbed areas; native of Africa. July-October; August-November. [= RAB, I, K, SE, WH3, X]

*Crotalaria maritima* Chapman, Low Rattlebox, Rabbitbells. Sandy forests and woodlands, roadsides. E. SC south to s. FL, and west to e. LA, endemic to the Southeastern Coastal Plain. [= S, X; = *Crotalaria rotundifolia* Walter ex J.F. Gmelin var. *rotundifolia* – Z; < *C. rotundifolia* – C, I, K, SE, WH3, Y; < *C. angulata* – RAB, F, G, apparently misapplied]

\* *Crotalaria ochroleuca* G. Don, Slenderleaf Rattlebox. Roadsides and sandy fields; native of Africa. July-August; August-October. All naturalized southeastern US material appears to be *C. ochroleuca*, not *C. brevidens* var. *intermedia* (M. Woods, pers. comm., 2011). [= I, K, SE, WH3, X; ? *C. intermedia* – RAB, misapplied; ? *C. brevidens* Bentham var. *intermedia* (Kotschy) Polhill, misapplied]

\* *Crotalaria pallida* Aiton var. *obovata* (G. Don) Polhill, Smooth Rattlebox. Roadsides and fields; native of Africa. July-September; August-October. [= I, K, SE, WH3, X; ? *C. mucronata* – RAB, misapplied; ? *C. striata* A.P. de Candolle – S, misapplied]

*Crotalaria purshii* A.P. de Candolle, Coastal Plain Rattlebox, Pursh's Rattlebox. Mesic to dry pinelands, sandy openings, roadsides. May-July; July-September. A Southeastern Coastal Plain endemic: se. VA south to n. FL, c. peninsular FL, and west to e. LA, with scattered locations inland. [= RAB, C, G, I, K, S, SE, W, WH3, X; > *C. purshii* var. *purshii* – F; > *C. purshii* var. *bracteolifera* Fernald – F]



\* *Crotalaria retusa* Linnaeus, Rattleweed. Disturbed areas; native of the Old World tropics. July-September; August-October. [= RAB, F, G, I, K, S, SE, WH3, X]

*Crotalaria rotundifolia* Walter ex J.F. Gmelin, Low Rattlebox, Rabbitbells. Sandy forests and woodlands, roadsides. Se. VA south to c. peninsular FL, west to se. LA; also widespread in Mexico. [= X; = *Crotalaria rotundifolia* Walter ex J.F. Gmelin var. *vulgaris* Windler – Z; < *C. rotundifolia* – C, I, K, SE, WH3, Y; < *C. angulata* – RAB, F, G, misapplied; = *C. rotundifolia* – S]

*Crotalaria sagittalis* Linnaeus, Common Rattlebox. Woodlands, woodland edges, openings, fields. June-August; July-September. MA and VT west to s. MI, s. WI, and c. MN, south to c. SC, s. AL, s. MS, TX, Mexico and Central America; West Indies. [= RAB, C, G, I, K, Pa, S, SE, W, WV; > *C. sagittalis* var. *sagittalis* – F; > *C. sagittalis* var. *oblonga* Michaux – F]

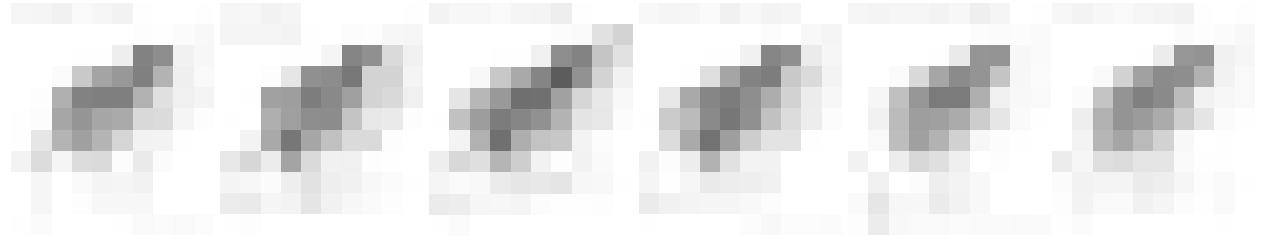
\* *Crotalaria spectabilis* Roth, Showy Rattlebox. Fields, roadsides, disturbed areas; native of s. Asia. July-September; August-October. [= RAB, C, F, G, I, K, SE, WH3, X; ? *C. retzii* A. Hitchcock – S]

22. *Lupinus* Linnaeus 1753 (Lupine)

A genus of about 200-250 species, annual herbs, perennial herbs, and shrubs, of temperate and tropical regions in North America, Mediterranean Europe, South America, and Africa (especially diverse in w. North America and South America). References: Isely (1998)=I.

- 1 Leaves unifoliolate; leaves and stems evergreen, overwintering (absent in midsummer); plant conspicuously pubescent.
- 2 Standard with a white to creamy eyespot; hairs of the legume 1.5-3 mm long, villous or sericeous.
- 3 Legumes 35-47 mm long, 6.3-7.6 mm wide; plants to 7 dm tall; living plants grey-green; [of se. NC south to s. FL, west to s. MS] .....  
..... *L. diffusus*
- 3 Legumes 27-42 mm long, 8.1-8.5 mm wide; plants to 19 dm tall; living plants silvery; [of FL] ..... *L. cumulicola*

- 2 Standard with a red or deep purple eyespot; hairs of the legume 3-5 mm long, villous.
  - 4 Hairs of the petioles 1.5-2.5 mm long; corolla pinkish to lavender; plants 2-6 dm tall; [of se. NC southward to n. FL, west to se. LA] ..... *L. villosus*
  - 4 Hairs of the petioles 0.5-1 (-1.5) mm long; corolla blue; plants 8-15 dm tall; [of FL Panhandle] ..... *L. westianus*
  - 1 Leaves palmately compound; leaves and stems deciduous, dying back in winter; plant inconspicuously pubescent.
  - 5 Corolla yellow; plant annual; [alien] ..... *L. luteus*
  - 5 Corolla blue; plant perennial or annual; [native or alien].
  - 6 Leaflets 5-9, linear, 5-9× as long as wide; plant annual; [alien] ..... *L. angustifolius*
  - 6 Leaflets 7-11, oblanceolate, 3-5× as long as wide; plant perennial; [native]
  - 7 Stem short; leaves clustered, nearly whorled; leaflets narrow; racemes long exserted; flowers small; [plants of e. GA southward and westward] ..... *L. perennis ssp. gracilis*
  - 7 Stem elongate; leaves alternate; leaflets broad; racemes only moderately exserted; flowers large; [plants of n. SC northward] ..... *L. perennis ssp. perennis*
- \* *Lupinus angustifolius* Linnaeus, Narrowleaf Lupine. Fields, disturbed areas; native of Mediterranean Europe. [= I, K, WH]  
*Lupinus cumulicola* Small. Sandhills and scrub. Peninsular FL, seemingly extending northward into GA, AL, and MS. [= K, S; < *L. diffusus* – I, SE, WH]



*Lupinus diffusus* Nuttall, Blue Sandhill Lupine. Sandhills, sandy roadsides. March-May; June-July. Se. NC south to s. FL, west to s. MS. I concur with Duncan & McCartney (1992) in recognizing *L. cumulicola* Small of peninsular FL as distinct from *L. diffusus*. [= RAB, K, S; < *L. diffusus* – I, SE, WH]

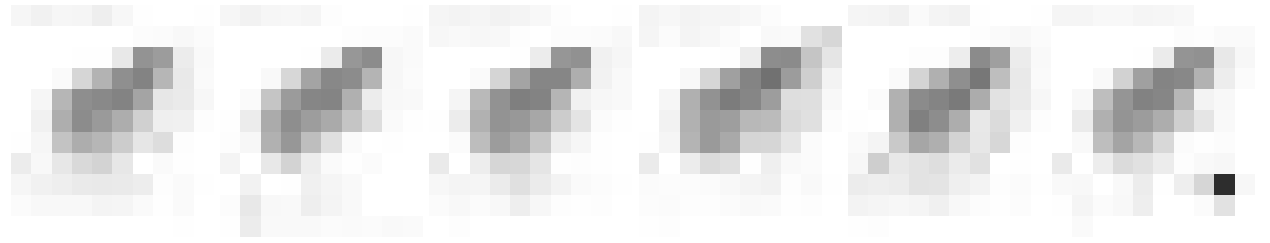
*Lupinus luteus* Linnaeus, Yellow Lupine. Disturbed areas; native of Mediterranean Europe. [= I, K, SE, WH]

*Lupinus perennis* Linnaeus *ssp. gracilis* (Nuttall) Dunn, Southern Sundial Lupine. Sandhills and sandy or dry rocky roadsides. E. GA (immediately across the Savannah River from SC), south to n. FL and west to s. AL. The validity of this taxon is uncertain; the differences may be only clinal. [= K, SE; < *L. perennis* – RAB, C, G, Pa, WH; = *L. perennis* var. *gracilis* (Nuttall) Chapman – I; = *L. nuttallii* S. Watson – S]

*Lupinus perennis* Linnaeus *ssp. perennis*, Northern Sundial Lupine. Sandhills, sandy roadsides, other dry habitats. April-May; June-July. ME west to MN, south to n. SC, w. VA, e. WV, IN, and IL. [= SE; < *L. perennis* – RAB, C, G, W; > *L. perennis* var. *perennis* – F, I, WV; > *L. perennis* var. *occidentalis* S. Watson – F, WV; > *L. perennis* *ssp. perennis* var. *perennis* – K; > *L. perennis* *ssp. perennis* var. *occidentalis* – K; = *L. perennis* – S]

*Lupinus villosus* Willdenow, Pink Sandhill Lupine. Sandhills, sandy roadsides. April-May; June-August. Se. NC south to n. FL, west to se. LA. [= RAB, I, K, S, SE, WH]

*Lupinus westianus* Small, Gulf Coast Lupine. Coastal dunes, sandhills. Endemic to Panhandle FL. The related *L. aridorum* McFarlane ex Beckner is endemic to sand pine scrub in the central FL peninsula. [= *L. westianus* var. *westianus* – I, K, WH; < *L. westianus* – S]



23. *Cytisus* Desfontaines 1798 (Broom)

A genus of about 65 species, shrubs and herbs, of Eurasia. References: Isely (1998)=I.

\* *Cytisus scoparius* (Linnaeus) Link, Broom, Scotch Broom, Besom, Ginster. Roadbanks, woodland borders, disturbed areas; native of Europe. April-June; May-July. [= RAB, C, F, G, I, Pa, S, SE, W, WV; > *C. scoparius* var. *scoparius* – K]

24. *Genista* Linnaeus 1753 (Dyer's Greenweed)

A genus of about 80-90 species, shrubs, herbs, and small trees, native to Eurasia. References: Isely (1998)=I.

\* *Genista tinctoria* Linnaeus, Dyer's Greenweed, Dyer's Broom. Disturbed areas; native of Europe. June-September. Not cited in Harvill et al. (1992), but described as naturalized in sterile soils south to VA in C, F, and G. [= C, F, G, I, K]

25. *Ulex* Linnaeus 1753 (Gorse)

A genus of 10-20 species, shrubs, of Europe and n. Africa. References: Isely (1998)=I.

\* *Ulex europaeus* Linnaeus, Gorse, Furze. Disturbed areas; native of Europe. June. Not cited in Harvill et al. (1992), but naturalized in sandy soils in York County, VA. Also reported from WV and PA. [= C, F, G, I, K, SE]

26. *Amorpha* Linnaeus 1753 (Indigo-bush, Leadplant)

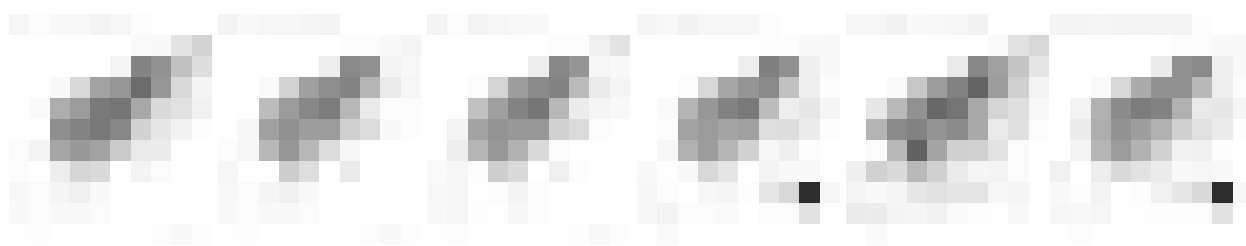
A genus of about 15 species, shrubs, of temperate North America. References: Straub, Sorrie, & Weakley (2009)=X; Wilbur (1964)=Z; Wilbur (1975)=Y; Isely (1998)=I.

- 1 Short shrubs, usually 0.3-1 (-1.5) m tall; petioles 1-15 (-20) mm long, usually shorter than the width of the contiguous leaflets (except in *A. confusa*); leaflets usually slightly or conspicuously revolute.
- 2 Leaflet mucros mostly swollen apically; plant usually evidently and rather densely pubescent or puberulent (except *A. herbacea* var. *floridana*, of s. GA and FL).
- 3 Upper portions of the plant (stems and leaves) glabrescent; calyx tube glabrous to sparsely or densely minutely strigillose; fruit glabrous; [of s. GA southward].....*A. herbacea* var. *floridana*
- 3 Upper portions of the plant (stems and leaves) conspicuously pubescent; calyx tube densely puberulent to short pilose; fruit densely to sparsely puberulent (rarely glabrate); [widespread in our area].....*A. herbacea* var. *herbacea*
- 2 Leaflet mucros mostly tapered apically; plant usually glabrous or sparsely pubescent.
- 4 Leaflets (10-) 15-25 (-35) mm long, (7-) 9-15 (-18) mm wide; standard intense (rarely light) bright blue; petiole (6-) 8-15 (-20) mm long; racemes mostly paniced, (1-) 3-5 (-8) per flowering branch, 10-20 (-45) cm long; flowering June-July.....*A. confusa*
- 4 Leaflets (3-) 6-10 (-15) mm long, (2-) 3-5 (-8) mm wide; standard reddish-purple; petiole 1-3 (-5) mm long; racemes solitary (less commonly paniced), 1 (-4) per flowering branch, (2-) 3-5 (-6) cm long; flowering April-May.....*A. georgiana*
- 1 Taller shrubs, usually 1-3 (-4) m tall, petioles 10-30 mm long, usually exceeding the width of the contiguous leaflets; leaflets not revolute, or slightly so.
- 5 Calyx lobes (1.2-) 2.0-3.5 mm long (thus approaching, equal to, or exceeding the length of the calyx tube); racemes 3-8 (-15) cm long.....*A. schwerinii*
- 5 Calyx lobes (0-) 0.2-1.2 mm long (thus distinctly shorter than the calyx tube); racemes 5-20 (-25) cm long.
- 6 Calyx lobes obsolete to very small, (0-) 0.2-0.6 (-0.8) mm long; plants glabrous to glabrate; leaflets usually not mucronate, the midrib commonly terminating in a sessile or shortly exserted (0.2-0.4 mm), slightly enlarged, glandular tip; leaflets relatively few, (9-) 11-15 (-19).....*A. glabra*
- 6 Calyx lobes small, 0.2-1.2 mm long (the lowermost lobe usually 0.8-1.2 mm long); plants pubescent or puberulent, usually conspicuously so; leaflets usually mucronate, the midrib usually slender, exserted, 0.5-1.5 mm long and tapering; leaflets relatively many, 9-23 (-31).
- 7 Foliage remaining green when dried; leaflets (7-) 9-23 (-31) per leaf, dull to somewhat shiny above; [widespread in our area].....*A. fruticosa*
- 7 Foliage blackening when dried; leaflets (7-) 9-15 (-19) per leaf, usually shiny above; [of s. SC and southward].....*A. nitens*

*Amorpha confusa* (Wilbur) S.C.K. Straub, Sorrie, & Weakley, Savanna Indigo-bush. Pine savannas. (May-) June-July; August-October. *A. confusa* is a narrow endemic of the se. Coastal Plain of NC (Brunswick, Columbus, and Bladen counties) and immediately adjacent SC (Horry County). It is restricted to moist loamy savannas, especially on the Foreston soil series, a habitat now largely destroyed by fire suppression, real estate development, and conversion of savannas to pine tree farms. [= X; = *Amorpha georgiana* Wilbur var. *confusa* Wilbur – I, K, SE, Y, Z; < *A. georgiana* – RAB, GW; ? *A. cyanostachya* auct. non M.A. Curtis – S, in part]

*Amorpha fruticosa* Linnaeus, Tall Indigo-bush. Riverbanks, forests, woodlands, marsh edges, sometimes in disturbed sites. April-June; June-October. [= RAB, C, G, GW, I, K, Pa, SE, W, WH, Y; > *A. fruticosa* var. *fruticosa* – F; > *A. fruticosa* var. *tennesseensis* (Shuttleworth) E.J. Palmer – F; > *A. curtissii* Rydberg – S; > *A. fruticosa* – S; > *A. tennesseensis* Shuttleworth – S; > *A. virgata* Small – S]

*Amorpha georgiana* Wilbur, Georgia Indigo-bush. Pine savannas, sandy river terraces. Late April-June; July-October. *A. georgiana* is endemic to the Coastal Plain of sc. NC, SC, and se. GA, primarily in the fall-line Sandhills region, but rarely found on younger terraces (as far east as Pender County, NC). Much of its habitat has been destroyed. [= X; = *Amorpha georgiana* Wilbur var. *georgiana* – I, K, SE, Y, Z; < *A. georgiana* – RAB, GW]



*Amorpha glabra* Desfontaines ex Poiret, Appalachian Indigo-bush, Mountain Indigo. Dry to dry-mesic ridgetop and slope forests, primarily in the Blue Ridge escarpment. May-July; July-October. Endemic to the Southern Appalachian mountains (and nearby provinces) of n. AL, ne. GA, w. NC, nw. SC, and e. and c. TN. [= RAB, I, K, S, SE, W, Y]

*Amorpha herbacea* Walter var. *floridana* (Rydberg) Wilbur, Florida Indigo-bush. Pine flatwoods and sandy river terraces. Se. GA (Echols County) south into FL (Sorrie 1998b). [= Y, Z; < *A. herbacea* var. *herbacea* – I, K, SE; = *A. floridana* Rydberg – S; < *A. herbacea* – WH]

*Amorpha herbacea* Walter var. *herbacea*, Dwarf Indigo-bush. Pine savannas, pine flatwoods, sandhills, other open forests and disturbed sites. May-July; July-October. Endemic to FL, GA, SC, and NC, mostly limited to the Coastal Plain. [= Y, Z; < *A. herbacea* – RAB, W, WH; = *A. herbacea* – S; < *A. herbacea* var. *herbacea* – I, K, SE]

*Amorpha nitens* Boynton, Dark Indigo-bush. Sandy woodlands, rocky slopes, bottomland forests. April-June. S. SC south to GA, west to LA, north in the interior to w. KY, s. IL, AR, and e. OK. First reported for SC by Nelson & Kelly (1997). [= I, K, S, SE, Y]

*Amorpha schwerinii* C. Schneider, Piedmont Indigo-bush. Forests and woodlands, primarily rather xeric and rocky (though not exclusively so). April-June; June-October. Endemic to the Piedmont (rarely adjacent provinces) of sc. NC, c. SC, nc. GA, e. AL, and ne. MS. [= RAB, I, K, S, SE, Y]



27. *Dalea* Lucanus 1758 (Prairie-clover)

A genus of about 165 species, herbs and shrubs, of temperate and tropical America, especially dry areas and most diverse in Mexico. References: Barneby (1977)=Z; Ward (2004c)=Y; Isely (1998)=I. Key adapted from SE.

- 1 Spikes corymbosely aggregated, capitate, surrounded by an involucre of 3-4 series of sterile bracts; [subgenus *Dalea*, section *Kuhnistera*].
  - 2 Leaflets 5-9 (-15); petals (other than the standard) mostly 3.7-4.5 mm long ..... *D. pinnata* var. *pinnata*
  - 2 Leaflets usually 3; petals (other than the standard) mostly 4.8-6.8 mm long ..... *D. pinnata* var. *trifoliata*
- 1 Spikes not corymbosely disposed, ovoid to cylindrical, with or without a few subtending, sterile bracts.
  - 3 Corolla subpapilionaceous, with apparent, differentiated wings and keel; stamens 9-10; annual herb; [alien, of disturbed habitats]; [subgenus *Dalea*, section *Dalea*] ..... *D. leporina*
  - 3 Corolla not papilionaceous, the wings and keel not differentiated; stamens 5; perennial herb; [native, primarily of calcareous glades and Coastal Plain pinelands]; [subgenus *Dalea*, section *Kuhnistera*].
  - 4 Leaflets 15-25; leaflets 2.5-3.5× as long as wide ..... *D. foliosa*
  - 4 Leaflets 3-9; leaflets 3-10 (or more)× as long as wide.
    - 5 Plants slightly to obviously pubescent (at least the spikes obviously pubescent); leaflets commonly involute or tubular, and > 10× as long as wide; corolla purple or pink.
      - 6 Leaflets 5-7 (-9); spikes lengthening and loosening in fruit, often becoming sinuous; plants decumbent to ascending, stems normally branching only below the middle ..... *D. gattingeri*
      - 6 Leaflets 3-5 (-7); spikes remaining compact; plants decumbent or ascending, stems normally branching only below the middle (*D. cahaba*), or ascending to erect, the stems branching above the middle (*D. purpurea* var. *purpurea*).
      - 7 Interfloral bracts with pubescence along the keel and margins; plants decumbent to ascending, stems normally branching only below the middle ..... *D. cahaba*
      - 7 Interfloral bracts with pubescence in a transverse band only; plants ascending to erect, the stems branching above the middle .... *D. purpurea* var. *purpurea*
- 5 Plants glabrous (except that the calyx lobes may be pubescent); leaflets broad and flat or narrow and involute; corolla pink-purple or white.
  - 8 Calyx tube not incised on the ventral (upper) side; blade of the standard cordate; corolla white; [of calcareous habitats of inland provinces of GA, AL, TN, WV and westward] ..... *D. candida*
  - 8 Calyx tube deeply incised on the ventral (upper) side; blade of the standard not cordate; corolla pink-purple or white; [of the Coastal Plain of GA southward and westward].



- 9 Leaflets linear, folded, or involute and terete-filiform; spikes globose ca. 6-12 mm long and in diameter; bracts much shorter than the calyx; corolla usually bright pink-purple (less commonly white or lavender) ..... *D. feayi*
- 9 Leaflets elliptic to oblanceolate, flat or folded; spikes ovoid to cylindric, 7-40 mm long; bracts as long as or longer than the calyx; corolla pink or white.
- 10 Plants spreading or decumbent; leaves widely spaced, generally lacking axillary fascicles; bract tips recurved in bud; calyx 2.7-3.3 mm long; flowers white; [of sc. and sw. GA west to se. LA] ..... *D. gracilis*
- 10 Plants erect-ascending to sprawling; leaves more densely spaced, generally with well-developed axillary fascicles; bract tips not recurved in bud; flowers pink or white; [of the GA Coastal Plain, se. AL, and south through e. FL Panhandle to the s. FL peninsula].
- 11 Leaflets of primary stem leaves mostly 5; corolla white ..... *D. albida*
- 11 Leaflets of primary stem leaves mostly 7-9; corolla pink (rarely white) ..... *D. carnea*

*Dalea albida* (Torrey & A. Gray) D.B. Ward, White-tassels. Pinelands. July-November. E. GA (near the SC border) west to se. AL, south to ne. FL, n. peninsular FL, and e. FL Panhandle. [= Y; = *Dalea carnea* (Michaux) Poir. var. *albida* (Torrey & A. Gray) Barneby - I, K, SE, WH, Z; = *Petalostemon albidus* (Torrey & A. Gray) Small - S]

*Dalea cahaba* J. Allison, Cahaba Prairie-clover. Dolomitic Ketona glades. May-June; June-September. Endemic to c. AL (Bibb County) (Allison & Stevens 2001). [= K2]

*Dalea candida* Michaux ex Willdenow, White Prairie-clover. Limestone glades and barrens. Late May-August. WV, KY, IN, WI, MN, and SK south to nw. GA, e. TN, w. AL, sc. MS, s. LA, and ne. TX. [= I, SE (excluding *D. occidentalis*); = *D. candida* var. *candida* - C, K, Z; = *Petalostemon candidum* (Michaux ex Willdenow) Michaux - F, G; = *Petalostemon candidus* (Michaux ex Willdenow) Michaux - S]

*Dalea carnea* (Michaux) Poir. Pink-tassels. Dry sandy pinelands. June-November. Se. GA south to s. peninsular FL. [= Y; = *Dalea carnea* (Michaux) Poir. var. *carnea* - I, K, SE, WH, Z; = *Petalostemon carneus* Michaux - S]

*Dalea feayi* (Chapman) Barneby, Feay's Prairie-clover. Sandhills. June-October. E. GA (vicinity of the Altamaha River); FL peninsula; Panhandle FL (vicinity of the Apalachicola River). [= I, K, SE, WH, Z; = *Petalostemon feayi* Chapman - S]

*Dalea foliosa* (A. Gray) Barneby, Cedar Glade Prairie-clover. Calcareous glades. Late June-September. C. TN, n. AL, IL, and OH (?). [= C, I, K, SE, Z; = *Petalostemon foliosum* A. Gray - F, G; = *Petalostemon foliosus* A. Gray - S]



*Dalea gattingeri* (A. Heller) Barneby, Gattinger's Prairie-clover. Limestone glades and barrens. May-August. C. TN, nw. GA, n. AL, s. MO, and n. AR (Sundell et al. 1999). [= I, K, SE; = *Petalostemon gattingeri* (A. Heller) A. Heller - S]

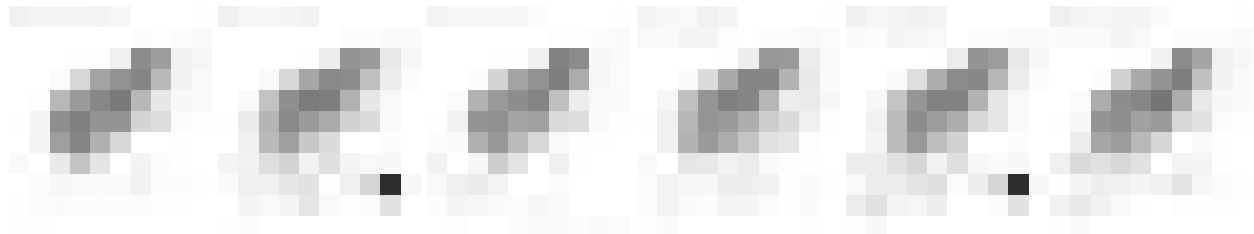
*Dalea gracilis* (Nuttall) D.B. Ward, Sprawling White-tassels. Wet pine savannas. August-September. Sc. and sw. GA west to se. LA. [= Y; = *Dalea carnea* (Michaux) Poir. var. *gracilis* (Nuttall) Barneby - I, K, SE, WH, Z; = *Petalostemon gracilis* Nuttall - S]

\* *Dalea leporina* (Aiton) Bullock, Hare's-foot Dalea. Habitat not known, presumably agricultural; native of w. North America. [= I, K, SE, Z; ? *Parosela alopecuroides* (Willdenow) Rydberg - S]

*Dalea pinnata* (J.F. Gmelin) Barneby var. *pinnata*, Summer Farewell, Eastern Prairie-clover. Sandhills and other dryish pinelands, especially in loamy sands. August-November. Sc. and se. NC south through SC and GA to c. peninsular FL and e. Panhandle FL. [= I, K, SE, WH, Z; < *Petalostemon pinnatum* (J.F. Gmelin) Blake - RAB; < *Kuhnistera pinnata* (J.F. Gmelin) Kuntze - S]

*Dalea pinnata* (J.F. Gmelin) Barneby var. *trifoliata* (Chapman) Barneby. Sandhills, dry to moist longleaf pine flatwoods. September-November. E. GA (near the Savannah River) south and west to w. Panhandle FL, s. AL, and s. MS. [= I, K, SE, WH, Z; < *Kuhnistera pinnata* (J.F. Gmelin) Kuntze - S; = *Petalostemon pinnatus* (J.F. Gmelin) Blake ssp. *trifoliatus* (Chapman) Wemple]

*Dalea purpurea* Ventenat var. *purpurea*, Purple Prairie-clover. Prairies, glades, and open woodlands. NY and ON west to BC, south to KY, TN, n. AL, c. MS, TX, and NM. [= C, I, K, SE, Z; < *Petalostemon purpureum* (Ventenat) Rydberg - F, G; < *Petalostemon purpureus* (Ventenat) Rydberg - S]



A genus of about 50-90 species, perennial herbs, of tropical and warm temperate regions. References: Isely (1998)=I.

**Identification notes:** The palmately 4-foliolate leaves are unique in the flora of our area.

*Zornia bracteata* Walter ex J.F. Gmelin, *Zornia*. Flatwoods, sandhills, sandy roadsides. June-August; July-October. Se. VA south to s. FL, west to TX and e. Mexico, endemic to the Southeastern Coastal Plain. [= RAB, C, F, G, K, S, SE, WH]

**29. *Chapmannia*** Torrey & A. Gray 1838 (Alicia)

A genus of about 7 species, perennial herbs, shrubs and trees, of tropical America and Africa, most closely related in the Southeastern flora to *Stylosanthes* and the introduced *Arachis* (Lewis et al. 2005). References: Isely (1998)=I.

*Chapmannia floridana* Torrey & A. Gray, Alicia. Longleaf pine sandhills, scrub. N. FL (Clay County) south to s. FL. [= I, K, S, WH]

**30. *Stylosanthes*** Swartz 1788 (Pencil-flower)

A genus of about 25-50 species, annual and perennial herbs, pantropical and less commonly temperate. References: Isely (1998)=I.

*Stylosanthes biflora* (Linnaeus) Britton, Sterns, & Poggenburg, Pencil-flower. Sandhills, dry to moist (but not wet) pine savannas and flatwoods, dry forests, woodlands, woodland borders, glades, barrens, rock outcrops. June-August; July-October. S. NY west to OH, s. IL, and KS, south to c. peninsular FL and e. TX. The large, adnate stipules are distinctive. Variation in this species (see synonymy) needs additional study. [= RAB, C, I, K, Pa, SE, W, WH, WV; > *S. biflora* var. *biflora* – F, G; > *S. biflora* var. *hispidissima* (Michaux) Pollard & Ball – F, G; > *S. riparia* Kearney – G, S; > *S. riparia* var. *riparia* – F; > *S. riparia* var. *setifera* Fernald – F; > *S. biflora* – S]

**31. *Arachis*** Linnaeus 1753 (Peanut)

A genus of about 60 species, annual and perennial herbs, native of South America (especially Brazil). References: Isely (1998)=I.

- 1 Petiole 2.5-3.5 cm long; corolla 1.8-2 cm long; perennial ..... *A. glabrata*
- 1 Petiole 5-10 cm long; corolla 1.1.5 cm long; annual..... *A. hypogaea*

\* *Arachis glabrata* Bentham, Grassnut. Disturbed areas; native of South America, planted on roadsides and spreading. July-October. Anderson (2007) states that this is “naturalized and spreading;” the species is also reported for Charlton County, GA (Carter, Baker, & Morris 2009) and Baldwin County, AL (Keener, 2012; W. Barger, pers. comm. 2011). [= I, SE; = *A. prostrata* Bentham – K1, WH, misapplied]

\* *Arachis hypogaea* Linnaeus, Peanut. Fields; commonly cultivated, rarely persistent; native of South America. July-October. This remarkable plant bears normal aerial flowers, but following pollination the pedicels elongate and arch downward, the legume soon buried and developing underground. [= RAB, C, F, I, K1, K2, S, SE, WH]



**32. *Aeschynomene*** Linnaeus 1753 (Joint-vetch)

A genus of about 175 species, herbs and shrubs, pantropical and warm temperate. References: Carulli, Tucker, & Dill (1988)=Z; Rudd (1955)=Y; Isely (1998)=I. Key adapted in part from SE.

- 1 Prostrate perennial; leaves with 3-18 leaflets [of dry, sandy or disturbed areas].
- 2 Leaves with 8-18 leaflets; leaflets 3-4 mm long; [rare alien, of disturbed areas]..... *A. hystrix* var. *incana*
- 2 Leaves with 3-7 (-9) leaflets; leaflets 4-12 mm long; relatively common native, of dry sandy pinelands] ..... *A. viscidula*
- 1 Erect or ascending annual; leaves with 20-50 or more leaflets; [of moist to wet habitats].
- 3 Leaflets with 2-4 longitudinal nerves; mature fruit stipe 1.5-3 mm long..... *A. americana* var. *americana*
- 3 Leaflets with 1 longitudinal nerve; mature fruit stipe 4-25 mm long.

- 4 Mature fruit stipe 12-25 mm long; corolla (10-) 12-15 mm long; fruit segments 5-7 mm long, 4.5-6.5 mm wide; paired bracts subtending each flower toothed (rarely entire); standard greenish-yellow with distinct dark-red veins; leaflets 6-25 mm long, 2-5 mm wide ..... *A. virginica*
- 4 Mature fruit stipe 4-8 (-10) mm long; corolla 7-13 (-15) mm long; fruit segments 4-6 mm long, 3.5-6 mm wide; paired bracts subtending each flower toothed or entire; standard pale orange or reddish-orange, the veins usually indistinct; leaflets 2.5-25 mm long, 1-4 mm wide.
  - 5 Paired bracts subtending each flower entire (rarely toothed); leaflets 2.5-13 mm long, 1-2.5 mm wide; fruit segments 4-5 mm wide, 3.5-5 mm wide ..... *A. indica*
  - 5 Paired bracts subtending each flower toothed (rarely entire); leaflets 6-25 mm long, 1.5-4 mm wide; fruit segments 5-6 mm wide, 5-6 mm wide..... *A. rudis*

*Aeschynomene americana* Linnaeus var. *americana*, Shyleaf. Moist, disturbed sites. S. GA (Jones & Coile 1988, SE), s. AL, s. LA south to Central America; West Indies; se. Asia. [= I, SE, Y; < *A. americana* – K, S, WH]

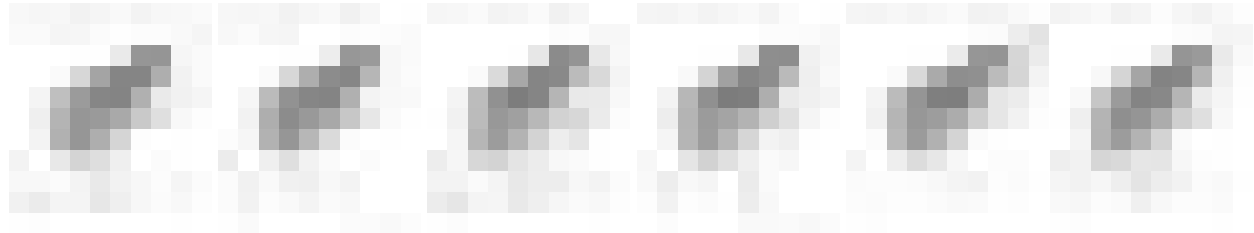
\* *Aeschynomene histrix* Poirer var. *incana* (Vogel) Bentham. Disturbed areas; native of tropical America. Probably introduced on ship's ballast at Pensacola in the 19<sup>th</sup> century, but seemingly established as it was recollected in Escambia County, FL, in 1985 (Isely 1990). [= K, WH; = *A. histrix* var. *incana* – SE, orthographic variant]

*Aeschynomene indica* Linnaeus, Southern Joint-vetch Marshes, ditches, disturbed wetlands. July-October. Apparently native to se. North America, from NC west to AR, south to s. FL and TX, now widespread in the tropics and subtropics of the Old World and New World. Perry, Ware, & McKenney-Mueller (1998) discuss the occurrence of this species in VA. [= GW, I, K, SE, WH, Y, Z; < *A. virginica* – S]

\* *Aeschynomene rudis* Bentham, Frisolillo. Roadside ditches, rice fields, disturbed wetlands; native of South America. July-October. Native to South America, introduced in se. United States, recently becoming a weed. [= I, K, SE, WH, Y, Z]

*Aeschynomene virginica* (Linnaeus) Britton, Sterns, & Poggenburg, Northern Joint-vetch, Sensitive Joint-vetch. Fresh to brackish tidal marshes and adjacent ditches, fields, and disturbed areas. July-October. NJ to ne. NC. Generally not weedy in most of its range, but in NC (now) found mostly in weedy situations, such as ditches or fields hydrologically connected to tidal waters. See Tyndall, Holt, & Lam (1996) and Belden & Van Alstine (2003) for additional information on habitat, population biology, and survey techniques. See Baskin et al. (1998) for additional information about seed germination and viability. [= RAB, C, F, G, I, K, Pa, SE, Y, Z; < *A. virginica* – S (also see *A. indica*)]

*Aeschynomene viscidula* Michaux, Sticky Joint-vetch. Dry sandy areas, such as sandhills, dry pinelands, and barrier islands. From s. GA (Jones & Coile 1988; Carter, Baker, & Morris 2009; SE), panhandle FL, s. AL, s. MS, and s. TX south to s. FL; tropical America. [= I, K, SE, WH, Y; = *Secula viscidula* (Michaux) Small – S]



### 33. *Indigofera* Linnaeus 1753 (Indigo)

A genus of about 700 species, annual herbs, perennial herbs, and shrubs, nearly cosmopolitan in tropical and warm temperate regions. References: Isely (1998)=I.

- 1 Leaflets borne alternately or irregularly on the rachis.
  - 2 Stipules subulate, < 1.5 mm wide; legumes divergent to deflexed, spaced on the rachis; flowers 6-10 per inflorescence..... *I. miniata* var. *leptosepala*
  - 2 Stipules deltate to lanceolate, 2-3 mm wide; legumes deflexed, crowded on the rachis; flowers many per inflorescence..... *I. spicata*
- 1 Leaflets borne opposite on the rachis.
  - 3 Stem pubescence hirsute or pilose with long brownish hairs..... *I. hirsuta*
  - 3 Stem pubescence strigose-appressed.
    - 4 Legume 7-9 mm long, ovoid, not falcate, indehiscent, with 2-3 seeds; corolla 6-9 mm long; [native species]..... *I. caroliniana*
    - 4 Legume 15-36 mm long, linear-cylindric, slightly to strongly falcate, dehiscent, with 3-12 or more seeds; corolla either 5-6 mm long or 15-18 mm long; [introduced species].
      - 5 Corolla 15-18 mm long; legume 30-40 mm long, straight; leaflets 2.5-4 cm long..... *I. decora*
      - 5 Corolla 5-6 mm long; legume 15-36 mm long, slightly to strongly falcate; leaflets (0.5-) 1-3 cm long.
        - 6 Legume 15-20 mm long, strongly falcate..... *I. suffruticosa*
        - 6 Legume 28-36 mm long, slightly falcate..... *I. tinctoria*

*Indigofera caroliniana* P. Miller, Wild Indigo, Carolina Indigo. Sandy forests and woodlands, including sandhills and sandy maritime forests. June-August; July-October. E. NC south to s. FL, west to se. LA, a Southeastern Coastal Plain endemic. [= RAB, I, K1, K2, S, SE, WH]

\* *Indigofera decora* Lindley, Chinese Indigo. Planted horticulturally and spreading to nearby roadbanks, potentially invasive; native of China. June-July (-September). In GA (Oglethorpe County). [= K2]

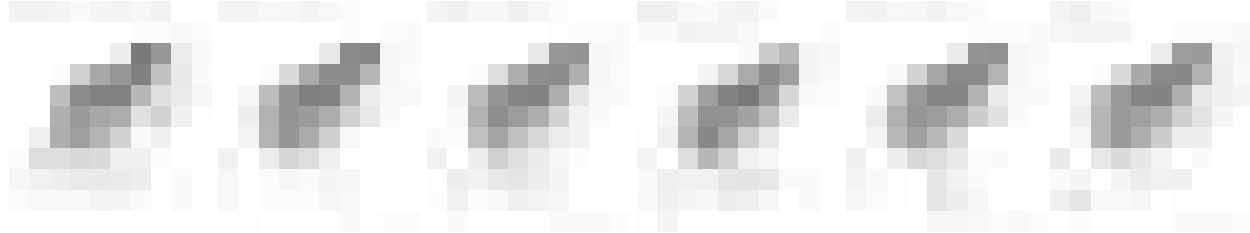
\* *Indigofera hirsuta* Linnaeus, Hairy Indigo. Sandy disturbed areas, such as wildlife "food fields"; native of the Old World tropics. First reported for SC by Nelson & Kelly (1997). Also known from other scattered locations in the Southeast, such as s. MS (Leonard, 2006, pers.comm.) and AL (Diamond & Woods 2009). [= I, K1, K2, SE, WH]

\* *Indigofera miniata* Ortega var. *leptosepala* (Nuttall ex Torrey & A. Gray) B.L. Turner. Dunes, dry disturbed areas. S. KS south to s. TX, disjunct eastward in FL and (?) GA (where reported by Chapman 1883). [= I, SE, WH; < *I. miniata* – K1, K2; = *I. leptosepala* Nuttall ex Torrey & A. Gray – S]

\* *Indigofera spicata* Forsskål, Trailing Indigo. Dry, disturbed areas, hammocks, dunes; native of Africa. Reported for Camden County, GA (Carter, Baker, & Morris 2009). [= I, K1, SE, WH; ? *I. hendecaphylla* Jacquin – K2]

\* *Indigofera suffruticosa* P. Miller, West Indian Indigo. Disturbed areas, dry sandy woodlands, formerly commonly cultivated, locally established as a weed at that time, perhaps no longer present in our area; native of the New World tropics, including s. FL. [= I, K1, K2, S, SE, WH; ? *I. anil* Linnaeus]

\* *Indigofera tinctoria* Linnaeus, African Indigo. Formerly commonly cultivated, locally established as a weed at that time, perhaps no longer present in our area; native of Africa. Both this species and *I. suffruticosa* were cultivated as an important export crop in the Coastal Plain of GA, SC, and (less so) NC in the seventeenth and eighteenth centuries. [= I, K1, K2, S, SE, WH]



34. *Wisteria* Nuttall 1818 (Wisteria)

A genus of about 6 species, woody vines, shrubs, and small trees, of temperate e. Asia and e. North America. Some research suggests that the Asian species should be placed in a separate genus (see Isely 1998 and Stritch 1984). References: Isely (1998)=I; Valder (1995)=Z; Stritch (1984)=Y.

**Identification notes:** Twining direction can be determined by looking at (or imagining) the vine twining around a branch or pole. Look at the pole or branch from the base (from the direction from which the vine is growing). If the vine is circling the branch or pole in a clockwise direction, that is dextrorse; if counterclockwise, that is sinistrorse. Identification of the two alien species and their hybrids is uncertain. Genetic sorting of morphological characters and horticultural selection mean that morphology is only poorly correlated with genetic origin. Trusty et al. (2007) found that 24 of 25 individuals tested from scattered sites around the Southeast showed genetic admixture (sometimes complicated) between *W. floribunda* and *W. sinensis*. Probably the great majority of material in the Southeast could be called *W. xformosa*; the below key may work poorly or not at all for some material encountered.

- 1 Legume and ovary glabrous; pedicels 5-10 (-15) mm long; standard reflexed near the middle; seeds reniform; leaflet margins plane; leaflet apices acute to slightly acuminate; [native species of swamps and bottomland forests and thickets] ..... *W. frutescens*
- 1 Legume and ovary velvety pubescent; pedicels 15-20 mm long; standard reflexed at the base; seeds lenticular; leaflet margins undulate; leaflet apices mainly strongly acuminate; [introduced species, naturalized in a wide variety of situations].
  - 2 Standard 20-23.5 mm long, 21-23 mm wide; leaflets (7-) 9-11 (-13) per leaf; raceme to 33 cm long, with 25-95 flowers opening nearly simultaneously; vine twining clockwise (dextrorse; from lower left ascending to upper right) ..... *W. sinensis*
  - 2 Standard 16-18 mm long, 16-18 mm wide; leaflets 7-17 (-19) per leaf; raceme to 132 cm long, with 25-170 flowers opening nearly simultaneously or sequentially; vine twining counter-clockwise (sinistrorse; from lower right ascending to upper left).
  - 3 Auricles of the standard's callosity 1.1-1.2 mm long; leaflets (11-) 13-17 (-19) per leaf; raceme to 132 cm long, with the 50-170 flowers opening successively from base to the tip of the inflorescence, those at the base withering before those at the tip have opened ..... *W. floribunda*
  - 3 Auricles of the standard's callosity 0.7-0.8 mm long; leaflets 7-17 per leaf; racemes to 36 cm long ..... *W. xformosa*

\* *Wisteria floribunda* (Willdenow) A.P. de Candolle, Japanese Wisteria. Commonly cultivated, escaped to urban, suburban, and rural forests and woodlands; native of Japan. April-July; July-November. [= RAB, C, F, G, I, K, Pa, SE, WH, Z; = *Kraunhia floribunda* (Willdenow) Taubert – S; = *Rehsonia floribunda* (Willdenow) Stritch – Y]

\* *Wisteria xformosa* Rehder [= *W. floribunda* x *sinensis*], Hybrid Asian Wisteria. Cultivated, escaped to urban, suburban, and rural forests and woodlands, commonly cultivated and escaped; a cross of species native to China and Japan. April-July; July-November. Trusty et al. (2007, 2008) reveal that much of the invasive *Wisteria* in southeastern United States involves complex hybrids and backcrosses involving *W. floribunda* and *W. sinensis*. [= WH; = *Rehsonia xformosa* (Rehder) Stritch – Y]

*Wisteria frutescens* (Linnaeus) Poiret, American Wisteria, Swamp Wisteria, Atlantic Wisteria. Swamp forests, wet thickets. April-May; June-September. E. VA south to n. peninsular FL, west to TX, north in the interior to AR, s. IN, and s. MO. The issue of the distinctiveness of *W. frutescens* and *W. macrostachya* needs further study. Harvill et al. (1992) reports *W. macrostachya* from Northumberland and Shenandoah counties, VA. [= RAB, GW, I, K, Pa, SE, W, WH, WV; > *W. frutescens* – C, F, G, Z; > *W. macrostachya* (Torrey & A. Gray) Nuttall ex B.L. Robinson & Fernald – C, F, G, Z; > *Kraunhia frutescens* (Linnaeus) Greene – S; > *Kraunhia macrostachya* (Torrey & A. Gray) Small – S]

\* *Wisteria sinensis* (Sims) A.P. de Candolle, Chinese Wisteria. Commonly cultivated, escaped to urban, suburban, and rural forests and woodlands; native of China. April-July; July-November. [= RAB, C, F, I, K, Pa, SE, WH; = *Rehsonia sinensis* (Sims) Stritch - Y]



**35. *Tephrosia* Persoon 1807 (Goat's-rue)**

A genus of about 350-400 species, perennial herbs, of tropical and warm temperate regions of the Old World and New World. References: Isely (1998)=I; Ward (2004c)=Z; Wood (1949)=Y. Key adapted from SE.

- 1 Corolla bicolored, the standard yellow and the wings pink; racemes terminal; stems erect; stamens monadelphous; leaves with (9-) 13-23 (-37) leaflets.
- 2 Inflorescence reduced, foliose, flowers solitary or in small clusters overtopped by leaves; plants < 25 cm tall; leaflets generally < 10 mm long and < 5 mm wide; [restricted to the West Gulf Coastal Plain of sw. GA, adjacent FL and westward] ..... *T. mohrii*
- 2 Inflorescence terminal, not foliose and overtopped by leaves; plants > 25 cm tall; leaflets generally > 10 mm long and > 5 mm wide; [widespread in our area] ..... *T. virginiana*
- 1 Corolla unicolored, initially white or pink, darkening in age to a dark maroon or purple; racemes opposite the leaves (the uppermost appearing terminal); stems decumbent or ascending; stamens diadelphous; leaves with (3-) 5-23 (-27) leaflets.
- 3 Upper stamen fused with the staminal sheath for part or most of its length (submonadelphous); leaves with (9-) 13-23 (-27) leaflets; [plants from s. AL westward] ..... *T. onobrychoides*
- 3 Upper stamen completely separate from the staminal sheath (diadelphous); leaves with (3-) 5-17 (-19) leaflets; [plants collectively widespread in our area].
- 4 Inflorescences with 1-several reduced leaves, mainly borne terminally on the principal axis or branches; bracts generally deciduous ..... *T. rugelii*
- 4 Inflorescences lacking leaves (sometimes with 1 reduced leaf), mainly borne leaf-opposed; bracts persistent.
- 5 Petiole 1-4x as long as the lowest leaflets of the leaf; peduncle and rachis of inflorescence strongly flattened (2-angled, or rarely, 3-angled) in cross-section; leaflets averaging 25 mm long and 12 mm wide ..... *T. florida*
- 5 Petiole 1/3-1x as long as the lowest leaflets of the leaf; peduncle and rachis of inflorescence terete or inconspicuously 2-4-angled in cross-section; leaflets averaging smaller.
- 6 Leaves with (3-) 5-7 leaflets; petiole 0-5 mm long; stem and fruit hairs < 0.5 mm long ..... *T. chrysophylla*
- 6 Leaves with (7-) 9-17 (-19) leaflets; petiole 2-15 mm long; some stem and fruit hairs > 0.5 mm long.
- 7 Inflorescence with 1-3 (-5) nodes; plants inconspicuously pubescent with gray hairs (the hairs appressed or spreading, short to fairly long); leaflets (3-) avg. 5-6 (-7) mm wide, mostly acute; [plants of the Coastal Plain of NC and SC] ..... *T. hispidula*
- 7 Inflorescence with 2-20 nodes; plants conspicuously tawny long-pilose with rusty brown hairs; leaflets (6-) avg. 8 (-12) mm wide, mostly obtuse; [plants widespread in our area] ..... *T. spicata*

*Tephrosia chrysophylla* Pursh, Sprawling Goat's-rue. Sandhills. E. GA s. to s. FL, and west to s. MS. Rather frequent hybrids between *T. chrysophylla* and *T. florida* are intermediate in morphology and have been found in AL, FL, GA, and MS; they have been given a hybrid binomial, *T. ×intermedia* (Small) G.L. Nesom & Zarucchi, replacing the later name *T. ×floridana* (Vail) Isely, which has been in regular use in the southeastern United States (Nesom & Zarucchi 2009). [= I, K, SE, WH, Y; = *Cracca chrysophylla* (Pursh) Kuntze - S]

*Tephrosia cinerea* (Linnaeus) Persoon, Ashen Hoary-pea. Disturbed areas; native of South America. Reported from an 19<sup>th</sup> century ballast collection from Mobile, AL. [= I, K2, SE] {not keyed; rejected as a component of our flora}

*Tephrosia florida* (F.G. Dietrich) C.E. Wood, Florida Goat's-rue. Pine savannas and other pinelands. May-July; June-September. E. NC south to s. FL, west to se. LA, a Southeastern Coastal Plain endemic. See *T. chrysophylla* for discussion of hybrids between *T. chrysophylla* and *T. florida*. [= RAB, I, K, SE, WH, Y; = *Cracca ambigua* (M.A. Curtis) Kuntze - S]

*Tephrosia hispidula* (Michaux) Persoon. Pine savannas and other pinelands. May-August; July-October. E. NC (se. VA?) south to c. peninsular FL, west to se. LA, a Southeastern Coastal Plain endemic. Fernald (1950) reports this species from se. VA. [= RAB, F, I, K, SE, WH, Y; = *Cracca hispidula* (Michaux) Kuntze - S]

*Tephrosia mohrii* (Rydberg) Godfrey, Dwarf Goat's-rue. Sandhills, dry savannas. GA and westward in the East Gulf Coastal Plain. Perhaps not distinct from *T. virginiana*, but not easily dismissed as "little more than a freak" (Wood 1949); see Godfrey & Kral (1958). [= K; < *T. virginiana* - I, SE, WH, Y; = *Cracca mohrii* Rydberg - S; = *T. virginiana* var. *mohrii* (Rydberg) D.B. Ward - Z]

*Tephrosia onobrychoides* Nuttall. Dry pinelands. S. AL, n. AR, e. OK, south to s. LA, and sc. TX. [= I, K, SE, Y; = *Cracca onobrychoides* (Nuttall) Kuntze - S]

*Tephrosia rugelii* Shuttleworth ex B.L. Robinson. Sandhills. Ne. and Panhandle FL (Jefferson County) south to s. FL. [= I, K, SE, WH; = *Cracca rugelii* (Shuttleworth ex B.L. Robinson) A.A. Heller - S]



***Tephrosia spicata*** (Walter) Torrey & A. Gray. Woodlands. June-August; July-October. S. DE south to s. FL, west to w. LA, north in the interior to se., sc., and sw. TN and se. KY. [= RAB, C, G, K, SE, W, WH, Y; > *T. spicata* var. *semitonsa* Fernald – F; > *T. spicata* var. *spicata* – F; = *Cracca spicata* (Walter) Kuntze – S]

***Tephrosia virginiana*** (Linnaeus) Persoon, Virginia Goat's-rue. Sandhills, other pinelands, xeric and/or rocky woodlands and forests, outcrops, shale barrens and other barrens, dry roadbanks. May-June; July-October. S. NH west to WI, se. MN, and c. KS, south to c. peninsular FL, c. TX, and nw. TX. [= RAB, C, I, K, Pa, SE, W, WV; > *T. virginiana* var. *glabra* Nuttall – F, G; > *T. virginiana* var. *virginiana* – F, G; < *T. virginiana* – I, SE, WH, Y (also see *T. mohrii*); = *Cracca virginiana* Linnaeus – S; = *T. virginiana* var. *virginiana* – Z]

**36. *Abrus* Adanson 1763 (Precatory Bean)**

A genus of about 17 species, woody vines and shrubs, of the Old World tropics, now pantropical. References: Isely (1998)=I.

\* *Abrus precatorius* Linnaeus, Precatory Bean, Rosary Pea, Crab's Eye, Jequirity. Native of the Paleotropics, and apparently reported for GA, AL, and AR by Isely (1998) and Kartesz (1999), but this is actually based on mislabeling in Map 64 in Isely (1998). The species does occur in peninsular FL, south of our area. The beautiful black-and-red beans have been traditionally used for jewelry and rosaries; they are extremely poisonous, though, and should be used with caution. [= I, K, WH; = *Abrus abrus* (Linnaeus) L.F. Wight – S] {not keyed; not mapped; rejected as a component of our flora}

**38. *Canavalia* deCandolle 1825**

A genus of about 50 species, perennial or annual herbs or vines, pantropical. References: Isely (1998)=I.

***Canavalia rosea*** (Swartz) deCandolle, Baybean. Ocean beaches. Pantropical, north to Dixie County on the west coast and Volusia County on the east coast of FL. [= I, K, SE, WH; ? *Canavali lineata* (Thunberg) deCandolle – S, misapplied]

**39. *Galactia* P. Browne 1756 (Milkpea)**

A genus of about 50-60 species, perennial herbs, of tropical and warm temperate regions, primarily American. References: Duncan (1979)=Z; Isely (1998)=I; Ward & Hall (2004)=Y.

**Identification notes:** Definite identification of the taxa from key lead 4 on is problematic. Note also that the traditional application of *G. regularis* and *G. volubilis* is reversed.

- 1 Leaves with (5-) 7 (-9) leaflets; flowers white.....*G. elliotii*
- 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 elliotii* Nuttall, Elliott's Milkpea. Moist forests. July-September; August-October. S. SC south to s. FL. [= RAB, I, K, S, SE, WH, Y, Z]

*Galactia erecta* (Walter) Vail, Erect Milkpea. Sandhills. May-July; July-September. Se. NC south to Panhandle FL, west to e. TX. [= RAB, I, K, S, SE, WH, Y, Z]

*Galactia floridana* Torrey & A. Gray, Florida Milkpea. Sandhills and other xeric sands. S. GA south to s. FL, west to s. MS. [= Y; < *G. floridana* – I, K, SE, Z (also see *G. volubilis* var. *fasciculata*); = *G. floridana* var. *floridana* – S; < *G. volubilis* – WH]



*Galactia minor* W.H. Duncan, Little Milkpea. Sandhills. June-August; July-October. Sc. NC south to Panhandle FL, west to s. MS. [= Y, Z; < *G. regularis* (Linnaeus) Britton, Sterns, & Poggenburg – RAB (misapplied); = *G. microphylla* (Chapman) H.J. Rogers ex Isely – I, K, SE; = *G. floridana* Torrey & A. Gray var. *microphylla* Chapman – S; < *G. volubilis* – WH]

*Galactia mollis* Michaux. Sandhills. May-July; July- September. Se. NC south to c. peninsular FL, west to Panhandle FL and se. AL. [= RAB, I, K, S, SE, WH, Y, Z]

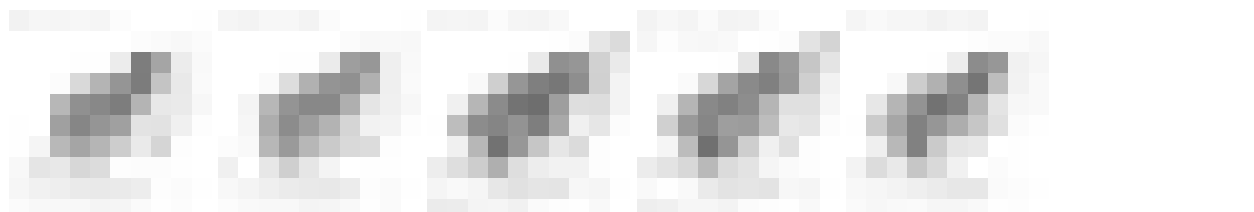
*Galactia regularis* (Linnaeus) Britton, Sterns, & Poggenburg. Dry forests and woodlands. July-September; August-October. Se. PA west to MO and OK, south to s. FL and se. TX. [= Y, Z; > *G. volubilis* (Linnaeus) Britton – RAB, C, F, G, Pa, WV (misapplied); > *G. macreei* M.A. Curtis – RAB, C, F, G; = *G. volubilis* – I, K, S, SE, misapplied; < *G. volubilis* – WH]

*Galactia volubilis* (Linnaeus) Britton var. *volubilis*. Sandhills, other dry forests and openings. June-August; July-October. NJ and s. PA west to c. AR, south to s. FL and LA. Var. *baltzelliana* D.B. Ward & D.W. Hall and var. *fasciculata* (Vail) D.B. Ward & D.W. Hall are localized endemics of the FL Peninsula. Duncan (1979) describes additional forms of this taxon (which he treated under the name *G. glabella*) that he considered to potentially warrant description as varieties or species; they need further study. [= Y; < *G. regularis* (Linnaeus) Britton, Sterns, & Poggenburg – RAB, C, F, G, I, K, Pa, SE, WH (misapplied); > *G. regularis* – S, misapplied; > *G. brevipes* Small – S; > *G. brachypoda* Torrey & A. Gray – S; < *G. glabella* Michaux – Z]

**40. Lackeya** Fortunato, L.P. Queiroz, & G.P. Lewis 1996

A monotypic genus, a perennial woody or semi-woody vine, of the Southeastern United States. References: Fortunato, de Queiroz, & Lewis (1996)=Z; Isely (1998)=I.

*Lackeya multiflora* (Torrey & A. Gray) Fortunato, L.P. Queiroz, & G.P. Lewis. Alluvial forests, prairies. S. GA and FL Panhandle west to e. TX, north in the interior to w. TN and w. KY. [= Z; = *Dioclea multiflora* (Torrey & A. Gray) C. Mohr – C, G, I, K, S, SE; = *Galactia mohlbrockii* R.H. Maxwell – WH]



**41. Clitoria** Linnaeus 1753 (Butterfly Pea, Pigeonwings)

A genus of about 60 species, of tropical and warm temperate regions of the New and Old World. References: Isely (1998)=I; Fantz (2000, 2002b)=Z.

**Identification notes:** *Centrosema* and *Clitoria* are unique among our legumes in having resupinate flowers, the pedicel twisted 180 degrees so that the large “standard” is lowermost. They are often confused; see key under *Centrosema*.

- 1 Leaves 3-foliolate; standard 4.5-5.5 cm long ..... *C. mariana* var. *mariana*
- 1 Leaves 5-7-foliolate; standard 3.5-4 cm long ..... *C. ternatea* var. *ternatea*

***Clitoria mariana*** Linnaeus var. *mariana*, Butterfly Pea, She-pea. Dry woodlands and openings, roadsides. June-August; July-October. NY (Long Island), NJ west to s. OH, s. IL, MO, and OK, south to c. peninsular FL, TX, and South America; disjunct in s. AZ. Var. *pubescentia* Fantz is endemic in c. and s. peninsular FL. Var. *orientalis* Fantz is endemic in se. Asia. [= Z; < *C. mariana* – RAB, C, F, G, I, K, Pa, SE, W, WH; < *Martusia mariana* (Linnaeus) Small – S]

\* ***Clitoria ternatea*** Linnaeus var. *ternatea*, Blue-pea. Disturbed areas; native of the Paleotropics. Weakly naturalized in s. GA (Isely 1998) and southward. [= Z; < *C. ternatea* – I, K, S, SE]

**42. *Centrosema*** (A.P. de Candolle) Bentham 1837 (Spurred Butterfly Pea)

A genus of about 40 species, perennial vining herbs, of tropical and warm temperate regions of the Western Hemisphere. References: Isely (1998)=I; Fantz (2002a).

**Identification notes:** *Centrosema* and *Clitoria* are unique among our legumes in having resupinate flowers, the pedicel twisted 180 degrees so that the large “standard” is lowermost. They are often confused; the following key includes both genera for easy differentiation.

- 1 Leaflets 5-7-foliolate; [rare alien] ..... *Clitoria ternatea* var. *ternatea*
- 1 Leaflets 3-foliolate.
  - 2 Calyx tube 10-13 mm long, much longer than the lobes; bracteoles 3-7 mm long, not enclosing the calyx tube; legume 3-5 cm long, 5-7 mm broad; standard 4-6 cm long, not spurred ..... *Clitoria mariana* var. *mariana*
  - 2 Calyx tube 4-5 mm long, shorter than or about as long as the lobes; bracteoles 5-12 mm long, partly enclosing the calyx tube; legume 6-12.5 cm long, 3-6 mm broad; standard 2.5-3.5 cm long, spurred near the base.
  - 3 Lower calyx lobe 5-8 mm long, subulate to lanceolate; upper (bifurcate) calyx lobe 3-4 mm long; bracteoles 5-7 mm long; stems to 3 m long; [of n. FL southward] ..... *Centrosema arenicola*
  - 3 Lower calyx lobe 8-11 mm long, subulate; upper (bifurcate) calyx lobe 7-8 mm long; bracteoles 8-12 mm long; stems to 1.5 m long; [widespread in our area] ..... *Centrosema virginianum*

***Centrosema arenicola*** (Small) F.J. Hermann, Sand Butterfly-pea. Longleaf pine sandhills. N. FL (Columbia, Dixie, and Duval counties) south to s. FL. [= K, WH; > *Bradburya arenicola* Small – S; > *Bradburya floridana* Britton – S; = *C. arenicolum* – I, orthographic variant]

***Centrosema virginianum*** (Linnaeus) Bentham, Spurred Butterfly Pea. Dry woodlands and openings. June-August; July-October. S. NJ south to s. FL, west to KY, AR, and TX. [= RAB, C, G, K, SE, W, WH; > *C. virginianum* var. *virginianum* – F; > *C. virginianum* var. *ellipticum* Fernald – F; = *Bradburya virginiana* (Linnaeus) Kuntze – S]

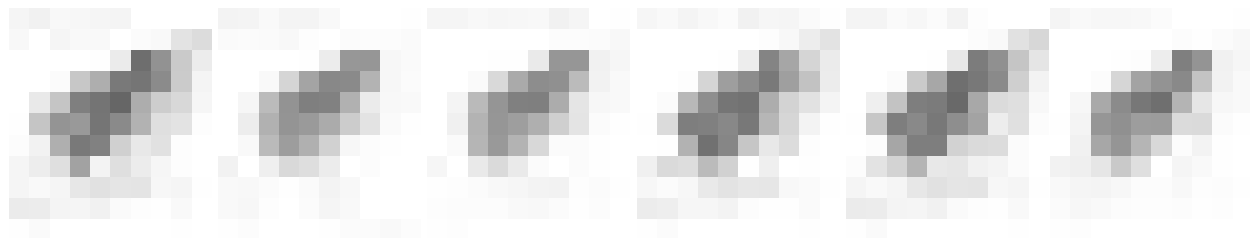
**43. *Apios*** Fabricius 1759 (Groundnut)

A genus of about 7-10 species, perennial vines, of temperate e. Asia and e. North America. References: Woods (2005)=Z; Isely (1998)=I. Key based on Z.

- 1 Petiole 20-58 mm long; flower deep maroon to pale maroon and white; style glabrous; legume 6-10 (-12) cm long; seed 5-6 mm long; tubers several in a chain, each 2-10 cm in diameter ..... *A. americana*
- 1 Petiole 70-75 mm long; flower pale green and rose-purple; style bearded; legume 12-15 (-18) cm long; seed 7.2-11.0 mm long; tuber 1, 15-20 cm in diameter ..... *A. priceana*

***Apios americana*** Medikus, Common Groundnut. Marshes, wet thickets, streambanks, bottomland forests. June-August; July-September. NS, NB, and QC west to MN and SD, south to s. FL and TX. [= RAB, C, GW, I, K, Pa, SE, W, WH, Z; > *A. americana* var. *americana* – F, G; > *A. americana* var. *turrigera* Fernald – F, G; = *Glycine apios* Linnaeus – S]

***Apios priceana*** B.L. Robinson, Kentucky Groundnut, Price’s Potato-bean. Mixed oak woods, especially over limestone. Sw. KY, c. TN, ne. MS, and n. and c. AL. [= C, F, G, I, K, SE, Z; = *Glycine priceana* (B.L. Robinson) Britton – S]



**44. *Mucuna*** Adanson 1763 (Velvetbean)



A genus of about 100 species, perennial herbs, annual herbs, and woody vines, of tropical regions of Old World and New World. References: Isely (1998)=I.

\* *Mucuna pruriens* (Linnaeus) A.P. de Candolle. Velvetbean, Bengal Bean, Florida Bean. Disturbed areas, fields, cultivated and sporadically established in disturbed areas; native of se. Asia. [= I, SE; > *M. pruriens* var. *pruriens* – K; > *Stizolobium deeringianum* Bort – S; > *M. deeringiana* (Bort) Merrill]

**45. *Rhynchosia* Loureiro 1790 (Snoutbean)**

A genus of about 200-230 species, perennial herbs, of tropical and warm temperate regions, nearly cosmopolitan. References: Woods & Key (2009)=Y; Grear (1978)=Z; Isely (1998)=I.

- 1 Leaves unifoliolate (rarely with a few upper leaves trifoliolate).
  - 2 Plant prostrate, trailing, usually with many leaves; stipels absent; [plant very rare in our area, probably introduced] ..... *R. michauxii*
  - 2 Plants erect or ascending, usually with fewer than 6 leaves; stipels present; [plant common in the Coastal Plain in our area].....  
..... *R. reniformis*
- 1 Leaves trifoliolate (rarely with a few lowermost leaves unifoliolate, these generally withering before flowering and fruiting).
  - 3 Plant trailing or twining; pubescence of the lower leaf surface mostly restricted to the veins.
    - 4 Calyx 2.5-3 (-4) mm long, clearly shorter than the corolla; [plants of e. GA southward]..... *R. minima*
    - 4 Calyx 8-14 mm long, about as long as the corolla; [plants collectively widespread in our area].
      - 5 Calyx 10-14 mm long; inflorescence (including peduncle) 5-25 cm at anthesis, elongating further in fruit, with flowers scattered; [MS and w, TN westward] ..... *R. latifolia*
      - 5 Calyx 8-10 (-12) mm long; inflorescence (including peduncle) 1-2 cm long at anthesis, elongating to 4 (-8) cm, the flowers tightly packed; [collectively widespread in our area].
        - 6 Pubescence of petiole of mostly incurved hairs 0.2-0.4 mm long; terminal leaflet 1-3 (-3.5) cm long; plants generally trailing; [of ne. FL southward] ..... *R. cinerea*
        - 6 Pubescence of petiole of mostly spreading hairs 0.5-0.6 mm long; terminal leaflet (2-) 2.5-5 cm long; plants generally twining; [widespread in our area]..... *R. difformis*
    - 3 Plant erect; pubescence of the lower leaf surface not restricted to the veins (except in the rare upright forms of *R. difformis* keyed below).
      - 7 Terminal leaflet suborbicular, 1.0-1.3× as long as wide; plants ascending to erect ..... *R. difformis*
      - 7 Terminal leaflet elliptic 1.6-2.5× as long as wide; plants erect.
        - 8 Plant lavishly branched, bushy (with something of the aspect of a *Baptisia*); terminal leaflets 0.5-2.0 cm long; pubescence of the lower leaf surface sparse, not velvety to the touch; flowers solitary (-3) in leaf axils..... *R. cytisoides*
        - 8 Plant unbranches or with few well-developed branches in its upper portion; terminal leaflets (2.0-) 2.5-5 cm long; pubescence of the lower leaf surface grayish tomentose and velvety to the touch; flowers many, in racemes.
          - 9 Inflorescence a single exserted terminal raceme, 5-20 cm long; stipules caducous; [plants of s. SC southward] ..... *R. mollissima*
          - 9 Inflorescences several and axillary, each 1-3 cm long (or with a short terminal inflorescence also); stipules persistent; [plants widespread in our area]..... *R. tomentosa*

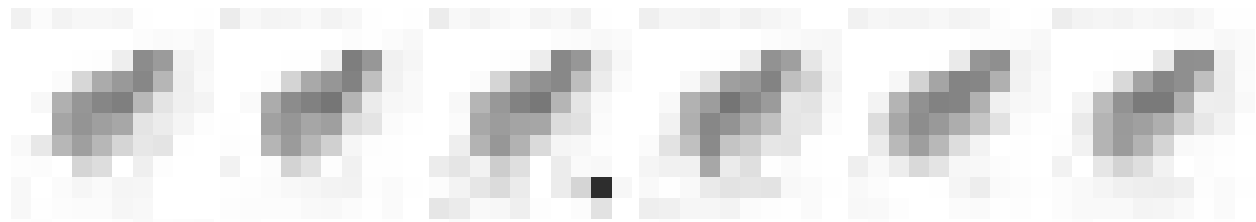
*Rhynchosia cinerea* Nash, Sandhill Snoutbean. Sandhills, scrub. Ne. FL (Columbia County) south to s. FL. [= I, K, S, SE, WH, Y]

*Rhynchosia cytisoides* (Bertoloni) Wilbur, Broom Snoutbean. Sandhills. May-June. Panhandle FL and s. AL west to MS. [= I, K, SE, WH, Y; = *Pitcheira galactioides* Nuttall – S]

*Rhynchosia difformis* (Elliott) A.P. de Candolle. Sandhills. June-August; July-October. Se. VA south to c. peninsular FL, west to e. TX. [= RAB, C, F, G, I, K, SE, WH, Y; = *R. tomentosa* – S, misapplied]

*Rhynchosia latifolia* Nuttall. Pinelands and woodlands, roadsides. May-July. W. TN s. MO, and OK south to c. MS, s. LA, and se. TX. [= I, K2, SE]

*Rhynchosia michauxii* Vail. Sandhills, dry hammocks, disturbed areas. June-August; August-October. Se. NC (one 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, Y; = *R. americana* (Houston ex P. Miller) M.C. Metz – RAB (the identification as *R. americana* based on misidentification of the specimen)]



*Rhynchosia minima* (Linnaeus) A.P. de Candolle. Hammocks, dry pine flatwoods, coastal sands. E. GA, south to s. FL, west to s. TX. The species also occurs in the Old World, and the New World distribution is sometimes considered a result of introduction. [= I, K, SE, WH, Y; = *Dolicholus minimus* (Linnaeus) Medikus – S]

*Rhynchosia mollissima* (Elliott) S. Watson. Sandhills, scrub. June-August; August-October. Se. SC (Beaufort County, documented by an old specimen [GH] by Mellichamp from the vicinity of Bluffton, where it was probably native) and e. GA south to c. peninsular FL. [= S; = *Rhynchosia tomentosa* (Linnaeus) Hooker & Arnott var. *mollissima* (Elliott) Torrey & A. Gray – I, K, SE, WH, Y; = *R. mollissima* (Elliott) S. Watson – S]

**Rhynchosia reniformis** A.P. de Candolle, Dollarweed. Sandhills. June-September; August-October. Se. NC south to s. FL, west to e. TX; disjunct (introduced?) in e. TN (Chester, Wofford, & Kral 1997). [= RAB, K, SE, WH, Y; = *R. simplicifolia* (Walter) Wood – S]

**Rhynchosia tomentosa** (Linnaeus) Hooker & Arnott. Xeric woodlands and forests, sandhills, edges, open areas. June-August; August-October. DE south to n. peninsular FL, west to LA, and north in the interior to e. and c. TN. [= *Rhynchosia tomentosa* (Linnaeus) Hooker & Arnott var. *tomentosa* – C, I, K, SE, WH, Y; < *R. tomentosa* – RAB, F, G, W; > *R. erecta* (Walter) A.P. de Candolle – S; > *R. intermedia* (Torrey & Gray) Small – S]

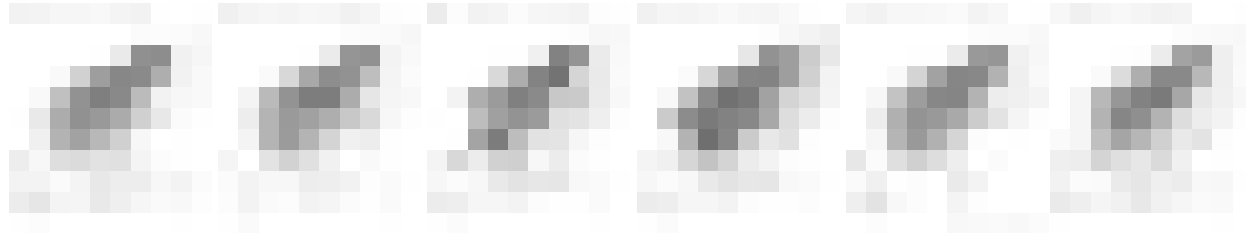
**46. Erythrina** Linnaeus 1753 (Coral Bean)

A genus of about 120 species, trees, shrubs, and perennial herbs, of tropical and subtropical regions of the Old and New World. References: Isely (1998)=I.

- 1 Leaflets not lobed; [cultivated tree, persistent] ..... *E. crista-galli*
- 1 Leaflets hastately lobed; [native herb or shrub] ..... *E. herbacea*

\* **Erythrina crista-galli** Linnaeus, Coraltree. Cultivated, disturbed areas, roadside ditches; native of South America. [= I, K, SE; = *Micropteryx crista-galli* (Linnaeus) Walpers – S]

**Erythrina herbacea** Linnaeus, Coral Bean, Cardinal-spear. Maritime forests, dry sandy woodlands, sandhills in the outer Coastal Plain. May-July; July-September. Se. NC south to FL, west to se. TX, and south to e. Mexico (Tamaulipas and e. San Luis Potosi). [= RAB, I, K, SE, WH; > *E. herbacea* – S; > *E. arborea* (Chapman) Small – S]



**47. Pueraria** A.P. de Candolle 1825 (Kudzu)

A genus of about 15 species, perennial vining herbs and shrubs, of tropical and subtropical Asia. References: Isely (1998)=I; Ward (1998)=Z.

\* **Pueraria montana** (Loureiro) Merrill var. *lobata* (Willdenow) van der Maesen & S. Almeida, Kudzu. Roadsides, waste areas; native of e. Asia. July-October. Kudzu was strongly promoted in the 1920's and 1930's in the Southeastern United States as a stabilizer of eroded areas. Hundreds of Kudzu Clubs formed, and Kudzu Songbooks were published. It is now notorious as a weed and symbol of the South. Despite its notoriety in the popular press, kudzu is an ecologically relatively trivial (though conspicuous) weed, since it rarely produces viable seeds in our area, and generally does not invade high quality natural areas. The thickened rhizome can weigh as much as 100 kg, and is the source of a high quality cooking starch prized in the Orient. The purple flowers smell like artificial grape flavoring. The leaves are very frost-sensitive. [= I, K, WH, Z; = *P. lobata* (Willdenow) Ohwi – RAB, C, F, G, Pa, SE, W, WV; = *P. thunbergiana* (Siebold & Zuccarini) Bentham – S]

**48. Amphicarpaea** Elliott ex Nuttall 1818 (Hog-peanut)

A genus of 5-6 species, of e. and se. Asia, North America, and montane Africa. It now appears that 2-3 semi-cryptic taxa should be recognized in what has traditionally been considered a single species of *Amphicarpaea* (Callahan 1997, Parker 1996). The genus name has been corrected to *Amphicarpaea* from the frequently used *Amphicarpa*. References: Callahan (1997)=Y; Parker (1996)=Z; Isely (1998)=I.

**Identification notes:** Producing inflorescences of two types, one with chasmogamous flowers and aerial legumes, the other with cleistogamous flowers and subterranean legumes.

- 1 Petiole 3.5-5.3 cm long; petiolule of the terminal leaflet (not including the rachis extending from the point of connection of the lateral leaflets to the joint marking the beginning of the petiolule of the terminal leaflet) 1.0-1.4 mm long; terminal leaflet 4.2-5.2 cm long ..... *A. bracteata* var. *bracteata*
- 1 Petiole 6.0-6.8 cm long; petiolule of the terminal leaflet 1.7-1.9 mm long; terminal leaflet 5.5-6.1 cm long ..... *A. bracteata* var. *comosa*

**Amphicarpaea bracteata** (Linnaeus) Fernald var. *bracteata*, Hog-peanut. {Mt, Pd, Cp (DE, GA, NC, SC, VA, WV) {FL}: dry to moist forests, thickets; common (rare in FL?). July-September; August-October. {The distributions and habitats of the two varieties in our area require herbarium and field investigation}. [= K; = *Amphicarpa bracteata* var. *bracteata* – F, G, orthographic

variant; < *Amphicarpaea bracteata* – C, I, SE, WH; < *Amphicarpa bracteata* – Pa, RAB, orthographic variant; < *Falcata comosa* (Linnaeus) Kuntze – S]

***Amphicarpaea bracteata*** (Linnaeus) Fernald var. ***comosa*** Fassett, Hog-peanut. {Mt, Pd, Cp (DE, GA, NC, SC, VA, WV): dry to moist forests, thickets; common. July-September; August-October. {The distributions and habitats of the two varieties in our area require herbarium and field investigation}. [= K; = *Amphicarpa bracteata* var. *comosa* – F, G, orthographic variant; < *Amphicarpaea bracteata* – C, I, SE, WH; < *Amphicarpa bracteata* – Pa, RAB, orthographic variant; < *Falcata comosa* (Linnaeus) Kuntze – S]

**49. *Glycine*** Willdenow 1802 (Soybean, Soya)

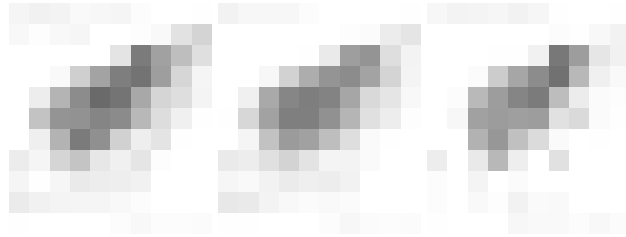
A genus of about 10-20 species, annual and perennial herbs, of Asia and Australia. References: Isely (1998)=I.

\* ***Glycine max*** (Linnaeus) Merrill, Soybean. Abundantly cultivated, rarely persisting as a waif; native of e. Asia. July-October. One of the most important legume crops in the world. [= RAB, F, I, K, SE]

**50. *Lablab*** Adanson 1763 (Hyacinth-bean)

A genus of a single species, an annual to perennial herb, native of the Old World tropics. References: Isely (1998)=I.

\* ***Lablab purpureus*** (Linnaeus) Sweet, Hyacinth-bean. Disturbed areas; native of Africa. Cultivated and rarely may escape or persist as a waif in disturbed areas; it is reported from se. PA (Rhoads & Klein 1993). [= I, K, SE; = *Dolichos lablab* Linnaeus]



**51. *Vigna*** Savi 1824 (Cow Pea)

A genus of about 100-150 species, annual and perennial herbs, pantropical, rarely extending into warm temperate regions. References: Isely (1998)=I; Maréchal, Mascherpa, & Stainier (1978)=Z.

- 1 Corolla yellow, 1.5-1.7 cm long; leaves somewhat fleshy-thickened; [plant native or introduced in maritime situations]; [section *Vigna*] ..... *V. luteola*
- 1 Corolla pink to purple, 1.5-2.5 cm long; leaves herbaceous; [plant a cultivated introduction]; [section *Catiang*] ..... *V. unguiculata*

***Vigna luteola*** (Jacquin) Bentham, Wild Cow Pea. Edges of freshwater tidal marshes, beaches, hammocks, disturbed areas, railroad embankments, low fields, in the outer Coastal Plain. July-September; August-October. Se. NC south to s. FL, west to se. TX, and in the New World tropics. Often weedy in appearance, and its nativity at a particular location difficult to judge. [= RAB, GW, I, K, Z; ? *V. repens* (Linnaeus) Kuntze – S; = *V. marina* (Burmam) Merrill (the correct name according to some authors, based on uncertain typification)]

\* ***Vigna unguiculata*** (Linnaeus) Walpers, Black-eyed Pea, Field Pea, Cow Pea. Cultivated in commercial and home gardens, rarely persistent or occurring as a waif in disturbed areas; native of tropical Africa or Asia. June-August; July-September. [= RAB, I, K; ? *V. sinensis* (Linnaeus) Savi – F, S; > *V. unguiculata* var. *unguiculata* – Z]

**52. *Phaseolus*** Linnaeus 1753 (Bean)

A genus of about 50-65 species, annual and perennial herbs, of tropical and warm temperate America (now widely distributed worldwide in cultivation). References: Isely (1998)=I; Maréchal, Mascherpa, & Stainier (1978)=Z; Freytag & Debouck (2002)=Y. Key based on SE.

- 1 Raceme axes slender, flexuous; [plants native perennials]; [section *Paniculati*; subsection *Volubili*].
  - 2 Stems trailing; leaflets 1-4 cm long, strongly 3-lobed, suborbicular; leaflet surfaces strongly reticulate-veined; [plants of sandhill habitats] ..... *P. sinuatus*
  - 2 Stems climbing and twining on other vegetation (or trailing); leaflets 3-10 cm long, lobed or not, ovate; leaflet surfaces only slightly reticulate; [plants of various habitats]
    - 3 Leaflets unlobed; vines climbing; [widespread] ..... *P. polystachios*
    - 3 Leaflets lobed; vines trailing or climbing; [restricted to n, FL southward] ..... *P. smilacifolius*
- 1 Raceme axes stout, stiff; [plants alien annuals, only weakly naturalized].
  - 4 Corolla 1.5-2 cm long, scarlet red or bright lavender; racemes exserted; plants twining; [section *Coccinei*] ..... *P. coccineus* ssp. *coccineus*

- 4 Corolla ca. 1 cm long, pink-purple, greenish white, or bicolored pink and white; racemes short or exserted; plants bushy-erect (rarely twining).
- 5 Legumes distinctly flattened at maturity, 15-20 mm wide; corolla usually greenish white; [section *Paniculati*; subsection *Volubili*].....*P. lunatus*
- 5 Legumes nearly terete at maturity, about 8 mm in diameter; corolla usually pink-purple, at least in part; [section *Phaseoli*] .....*P. vulgaris*

\* *Phaseolus coccineus* Linnaeus ssp. *coccineus*, Scarlet Runner Bean. Infrequently cultivated, mostly as an ornamental in home gardens, rarely found as a waif; native of tropical America. [= Z; < *P. coccineus* – C, F, G, I, K, SE; > *P. coccineus* ssp. *coccineus* var. *coccineus* – Y] [not mapped]

\* *Phaseolus lunatus* Linnaeus, Lima Bean. Frequently cultivated (both commercially and in home gardens), rarely found as a waif; native of tropical America. [= I, K, S, SE, WH3, Y, Z; > *P. limensis* Macfadyen – F]

*Phaseolus polystachios* (Linnaeus) Britton, Sterns, & Poggenburg, Wild Bean, Wild Kidney Bean. Thickets, woodlands. July-September; August-October. S. ME west to OH, IL, and MO, south to s. FL and TX. [= RAB, C, G, I, Pa, SE, W, WV; > *P. polystachios* var. *polystachios* – F; > *P. polystachios* var. *aquilonius* Fernald – F; = *P. polystachios* var. *polystachios* – K, WH3; = *P. polystachios* – S, orthographic variant; = *P. polystachyus* ssp. *polystachyus* – Y; = *P. polystachyus* var. *polystachyus* – Z]

*Phaseolus sinuatus* (Nuttall) Torrey & A. Gray, Sandhills Bean. Sandhills. July-September; August-October. Sc. NC south to s. FL, west to s. MS, a Southeastern Coastal Plain endemic. Freytag & DeBouck (2002) describe *P. sinuatus* and *P. polystachios* as being "very distinct and there seems to be no intergradation," yet treat them as only subspecifically distinct; I choose to recognize them as species. Not easy to distinguish in sterile condition from *Strophostyles*. [= RAB, I, S, SE, W; = *P. polystachios* (Linnaeus) Britton, Sterns, & Poggenburg var. *sinuatus* (Nuttall) R. Marechal, J.M. Mascherpa, & F. Stainier – K, WH3; = *P. polystachyus* ssp. *sinuatus* (Nuttall) Freytag – Y; = *P. polystachyus* var. *sinuatus* (Nuttall) R. Marechal, J.M. Mascherpa, & F. Stainier – Z]

*Phaseolus smilacifolius* Pollard. Ne. FL south to c. peninsular FL. This taxon needs additional study; it is sometimes regarded as a hybrid of *P. polystachios* × *P. sinuatus*. Abbott & Judd () regarded the 100% germination rate of its seeds as evidence supporting specific status. [= S; = *P. polystachyus* (Linnaeus) Britton, Sterns, & Poggenburg ssp. *smilacifolius* (Pollard) Freytag – Y; = *P. ×smilacifolius* Pollard (pro sp.) – WH3] {add Z synonymy}

\* *Phaseolus vulgaris* Linnaeus, Garden Bean, Green Bean, Snap Bean, String Bean, Kidney Bean, Pole Bean, Bush Bean. Frequently cultivated (both commercially and in home gardens), rarely found as a waif; native of tropical America. [= C, F, G, I, K, S, SE, WH3; > *P. vulgaris* var. *vulgaris* – F; > *P. vulgaris* var. *humilis* Alefeld – F; < *P. vulgaris* var. *vulgaris* – Z]



53. *Strophostyles* Elliott 1823 (Sand Bean, Woolly Bean, Wild Bean)

A genus of 3 species, annual and perennial herbs, of North America. References: Pelotto & Martínez (1998)=Z; Isely (1998)=I. Key adapted from SE.

- 1 Legumes 2-4 cm long, permanently pubescent; corolla 5-8 mm long; leaves permanently pubescent on the upper surface; seeds glabrous.....*S. leiosperma*
- 1 Legumes 3-8 cm long, glabrate at maturity; corolla 8-15 mm long; leaves usually glabrate on the upper surface; seeds pubescent.
- 2 Bracteoles (immediately subtending the calyx) 2-3 mm long, equaling or exceeding the calyx tube; leaflets usually prominently 3-lobed; terminal leaflet 2.5-3.5 cm wide; plant an annual.....*S. helvola*
- 2 Bracteoles (immediately subtending the calyx) 0.5-1.0 (-1.5) mm long, shorter than the calyx tube; leaflets not lobed; terminal leaflet 0.3-2.0 cm wide; plant a perennial.....*S. umbellata*

*Strophostyles helvola* (Linnaeus) Elliott, Annual Sand Bean. Coastal dunes, beaches, dry sandy woodlands, disturbed areas. June-September; August-October. QC west to MN and SD, south to n. peninsular FL and e. TX. See Isely (1986b) for a discussion of the orthography of the epithet. [= RAB, C, G, Pa, S, WH, WV; = *S. helvola* (Linnaeus) Elliott – K, SE, W, Z, orthographic variant; > *S. helvola* var. *helvola* – F; > *S. helvola* var. *missouriensis* (S. Watson) Britton – F]

*Strophostyles leiosperma* (Torrey & A. Gray) Piper, Small-flowered Sand Bean. Prairies, glades, barrens, sand bars, disturbed areas. June-September; August-October. IN, WI, MN, and ND, south to FL Panhandle, AL, MS, LA, TX, NM, and AZ; also scattered eastward presumably as introductions. This species is native east to KY and TN; it should be sought inland in prairies, glades, and barrens with midwestern affinities. [= C, F, G, K, Pa, SE, WH, Z; = *S. pauciflora* (Benth) S. Watson – S]

*Strophostyles umbellata* (Muhlenberg ex Willdenow) Britton, Perennial Sand Bean. Dry sandy or rocky woodlands, disturbed areas. June-September; August-October. S. NY west to s. IN, s. MO, and KS, south to c. peninsular FL and s. TX. [= RAB, C, F, G, K, Pa, S, SE, W, WH, Z; > *S. umbellata* var. *umbellata* – F; > *S. umbellata* var. *paludigena* Fernald – F]

54. *Macroptilium* (Benth) Urban 1928

A genus of about 20 species, annual and perennial herbs, of tropical and subtropical America. References: Isely (1998)=I.

\* *Macroptilium lathyroides* (Linnaeus) Urban. Disturbed areas; native of tropical America. [= I, K, SE, WH; = *Phaseolus lathyroides* Linnaeus]

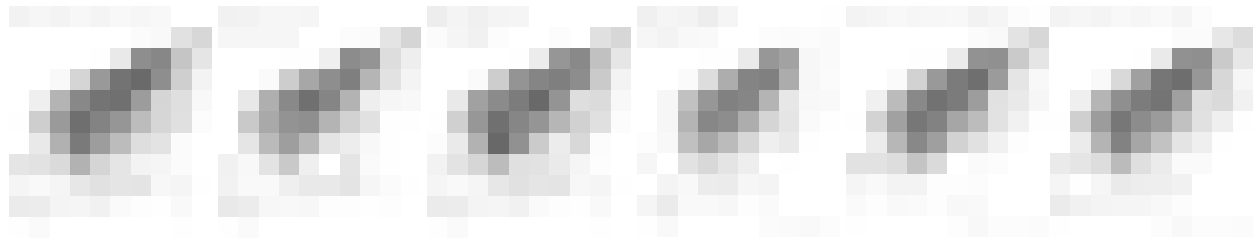
55. *Kummerowia* Schindler 1912 (Korean-clover, Japanese-clover)

A genus of 2 species, annual herbs, native to temperate e. Asia. *Kummerowia* differs from *Lespedeza* in its annual habit (vs. perennial), conspicuous stipules (vs. not conspicuous), inflorescence branching pattern (see Akiyama & Ohba 1985), and leaflets with striate, parallel, lateral veins (vs. with reticulate lateral veins). It is now generally regarded as distinct from *Lespedeza* at the generic level, though they are closely related. References: Akiyama & Ohba (1985)=Z; Isely (1998)=I. Key based closely on SE.

- 1 Mid-stem leaves with petioles 4-10 mm long; leaflets emarginate at the apex; leaflets conspicuously spreading-ciliate; stems antrorsely appressed-strigose; calyx covering 1/3-1/2 of the legume ..... *K. stipulacea*
- 1 Mid-stem leaves with petioles 1-2 (-4) mm long; leaflets not emarginate at the apex; leaflets inconspicuously appressed-ciliate; stems retrorsely appressed-strigose; calyx covering 1/2-4/5 of the legume..... *K. striata*

\* *Kummerowia stipulacea* (Maximowicz) Makino, Korean Lespedeza, Korean-clover. Fields, roadsides, disturbed areas; native of e. Asia. July-September; August-November. [= I, K, Pa, SE, Z; = *Lespedeza stipulacea* Maximowicz – RAB, C, F, G, W, WV]

\* *Kummerowia striata* (Thunberg) Schindler, Japanese-clover, Common Lespedeza. Fields, roadsides, disturbed areas; native of e. Asia. July-September; August-November. [= I, K, Pa, SE, WH, Z; = *Lespedeza striata* (Thunberg) Hooker & Arnott – RAB, C, F, S, G, W, WV]



56. *Lespedeza* Michaux 1803 (Lespedeza)

A genus of about 40 species, perennial herbs and shrubs, of temperate regions of e. Asia and e. North America. References: Clewell (1966a)=Z; Clewell (1966b)=Y; Isely (1986b)=X; Akiyama (1988)=Q; Clewell & Stickel (1990); Isely (1998)=I. Key based primarily on Z and SE. [also see *Kummerowia*]

**Identification notes:** Many species of *Lespedeza* hybridize, and most combinations may occur in our area. Some of the hybrids have been named in the past as varieties or species. Hybrids generally occur in mixed populations with both parents and can usually be identified by their intermediate morphology (identification much easier in the field where context is apparent than in the herbarium). See Isely (1990) and Clewell (1966a) for additional hints about identification of hybrids.

- 1 Plants annual; stipules ovate to ovate-lanceolate, conspicuous; leaflets with striate, parallel, lateral veins .....[*Kummerowia*]
- 1 Plants perennial, stipules subulate, setaceous, or lanceolate, not conspicuous; leaflets with reticulate lateral veins, joining before reaching the margin.
- 2 Leaflets distinctly widest toward the tip, 3-5× as long as wide, the base and apex very differently shaped (the base narrowly cuneate, the tip rounded, truncate or even retuse); racemes reduced, with 2-3 flowers, shorter than the subtending leaves; [plants alien] .....*L. cuneata*
- 2 Leaflets generally widest near the middle, 1-8 (-10)× as long as wide, the base and apex shaped similarly (i.e., both rounded, or both cuneate); racemes with 3-many flowers, shorter or longer than the subtending leaves; [plants native, except *L. virgata*].
- 3 Midrib of leaflets distinctly excurrent as a spinose bristle 0.5-1.5 mm long; [plant a rare introduction] .....*L. virgata*
- 3 Midrib of leaflets not excurrent, or only as an obscure mucro, not at all spinose; [plants native].
- 4 Plants trailing at maturity (young stems erect to arching-ascending up to 2 dm tall, then lopping over); stems slender, wiry; corolla pink to purple.

- 5 Pubescence of the stem spreading (pilose) ..... *L. procumbens*
- 5 Pubescence of the stem appressed (strigose).
- 6 Calyx of legumes produced from cleistogamous flowers 1/4-1/3 as long as the pod; stems usually lacking axillary leaves; keel subequal to the wings, or shorter; stipules 2-4 (-5) mm long ..... *L. repens*
- 6 Calyx of legumes produced from cleistogamous flowers ca. 1/5 as long as the pod; stems often with axillary leaves distinctly smaller than the primary leaves; keel usually longer than the wings; stipules 3-5 (-6) mm long ..... *L. frutescens*
- 4 Plants erect at maturity; stems generally stout, stiff; corolla pink, purple, white, cream, or mixed.
- 7 Plants in flower.
- 8 Corolla primarily white or cream (often with a purplish throat).
- 9 Raceme peduncles short (shorter than the subtending leaf), the inflorescence itself barely if at all exceeding the subtending leaf; calyx lobes 6-10 mm long; leaflets (2-) 2.5-5 (-8)× as long as wide ..... *L. capitata*
- 9 Raceme peduncles elongate (often longer than the subtending leaf), the inflorescence itself well-exserted beyond the subtending leaf; calyx lobes 3-7 mm long; leaflets either narrower or wider (see below).
- 10 Leaflets 4-8 (-10)× as long as wide ..... *L. angustifolia*
- 10 Leaflets 1.3-1.8× as long as wide.
- 11 Leaves closely strigose on both surfaces with hairs 0.2-0.5 mm long, silvery when fresh; leaflets 1-2 cm long; petiole of midstem leaves not generally > 1 cm long, about the same length as the rachis; [plants of the Coastal Plain and, in NC and SC, the lower Piedmont] ..... *L. hirta* var. *curtissii*
- 11 Leaves glabrate, or strigose above only, at least some of the hairs (especially those on the veins below) > 0.5 mm long, green or grey (to somewhat silvery) when fresh; leaflets 1.5-4 (-5) cm long; petiole of midstem leaves 1-1.5 (-2) cm long, much exceeding the rachis; [plants widespread in our area] ..... *L. hirta* var. *hirta*
- 8 Corolla primarily pink or purple.
- 12 Peduncles of the racemes of chasmogamous (petaliferous) flowers longer than the subtending leaves; keel > 1 mm longer than the wings.
- 13 Stems to 7 dm long, not bushy-branched; petioles of medial leaves 0.5-2 cm long; chasmogamous panicles with 4-7 flowers; corolla 6-8 mm long; chasmogamous legumes glabrate or inconspicuously strigulose, 5-7 mm long; [native] ..... *L. frutescens*
- 13 Stems 10-30 dm long, bushy-branched; petioles of medial leaves 2-4 cm long; chasmogamous panicles with 5-15 flowers; corolla 8-15 mm long; chasmogamous legumes strigose, 7-8 mm long; [plants alien, planted in "wildlife food plots" and persisting or spreading]; [section *Macrolopedeza*].
- 14 Calyx lobes equal to or shorter than the calyx tube; corolla 8-11 mm long; leaflets 1.5-2 × as long as wide; racemes erect or strongly ascending; stems 1-several per crown, brown when young ..... *L. bicolor*
- 14 Calyx lobes longer than the calyx tube (at least the lowest lobe); corolla (10-) 12-15 mm long; leaflets 2-3 × as long as wide; racemes lax and drooping; stems many per crown, purplish when young ..... *L. thunbergii*
- 12 Peduncles of the racemes of chasmogamous (petaliferous) flowers shorter than the subtending leaves; keel about as long as or shorter than the wings; [native].
- 15 Upper surface of the leaflets glabrous (sometimes strigose along the midrib only); pubescence of the stem appressed; leaflets 1.5-3× as long as wide ..... *L. violacea*
- 15 Upper surface of the leaflets pubescent; pubescence of the stem appressed or spreading; leaflets 1.3-7× as long as wide.
- 16 Leaflets 1.3-3 (-3.5)× as long as wide ..... *L. stuevei*
- 16 Leaflets (4-) 5-7× as long as wide ..... *L. virginica*
- 7 Plants not in flower.
- 17 Leaflets of average, mid-stem leaves > 4× as long as wide (*L. capitata* keyed here and below).
- 18 Petioles of mid-stem leaves ca. 10 mm long ..... *L. virginica*
- 18 Petioles of mid-stem leaves 1-3 mm long.
- 19 Leaflets 4-8(-10)× as long as wide; pubescence of the stems and leaves usually not silvery-cinereous ..... *L. angustifolia*
- 19 Leaflets (2-) 2.5-5 (-8)× as long as wide; pubescence of stems and leaves usually silvery-cinereous ..... *L. capitata*
- 17 Leaflets of average, mid-stem leaves < 3.5× as long as wide (*L. capitata* keyed here and above).
- 20 Leaflets (2-) 2.5-5 (-8)× as long as wide; leaf rachis (the apparent petiolule of the terminal leaflet) longer than the petiole..... *L. capitata*
- 20 Leaflets 1.3-3 (-3.5)× as long as wide; leaf rachis shorter than the petiole (or about equal in *L. hirta* var. *curtissii*).
- 21 Central axis not strongly dominant, branches divaricate, irregular; stems slender, wiry ..... *L. frutescens*
- 21 Central axis strongly dominant, branches ascending, mostly on the upper stem; stems stout, stiff.
- 22 Stems 10-30 dm tall, 1-many from the base; medial leaf petiole 2-4 cm long; [plants alien, planted in "wildlife food plots" and persisting or spreading]; [section *Macrolopedeza*].
- 23 Calyx lobes equal to or shorter than the calyx tube; leaflets 1.5-2 × as long as wide; racemes erect or strongly ascending; stems 1-several per crown, brown when young ..... *L. bicolor*
- 23 Calyx lobes longer than the calyx tube (at least the lowest lobe); leaflets 2-3 × as long as wide; racemes lax and drooping; stems many per crown, purplish when young ..... *L. thunbergii*
- 22 Stems 3-15 (-20) dm tall, 1-few from the base; medial leaf petiole 0.7-2.5 cm long; [native].
- 24 Leaflets (1.3-) 1.8-3 (-3.5)× as long as wide.
- 25 Upper surface of the leaflets pubescent; pubescence of the stem appressed or spreading ..... *L. stuevei*
- 25 Upper surface of the leaflets glabrous (sometimes strigose along the midrib only); pubescence of the stem appressed ..... *L. violacea*
- 24 Leaflets 1.3-1.8× as long as wide.
- 26 Leaves closely strigose, the hairs 0.2-0.5 mm long, silvery when fresh; leaflets 1-2 cm long; [plants of the Coastal Plain and, in NC and SC, the lower Piedmont] ..... *L. hirta* var. *curtissii*
- 26 Leaves glabrate, or strigose above only, at least some of the hairs > 0.5 mm long, green or grey when fresh; leaflets 1.5-4 (-5) cm long; [plants widespread in our area] ..... *L. hirta* var. *hirta*

*Lespedeza angustifolia* (Pursh) Elliott, Narrow-leaved Lespedeza. Sandhill-pocosin ecotones and dry to moist savannas, mountain bogs. August-October; September-November. MA south to c. peninsular FL, west to s. MS, essentially a Southeastern Coastal Plain endemic, rarely disjunct inland to w. NC, c. GA, and ec. TN (Chester, Wofford, & Kral 1997). [= RAB, C, G, I, K, Pa, S, SE, W, WH, Y, Z; > *L. angustifolia* – F; > *L. hirta* var. *intercurva* Fernald – F]

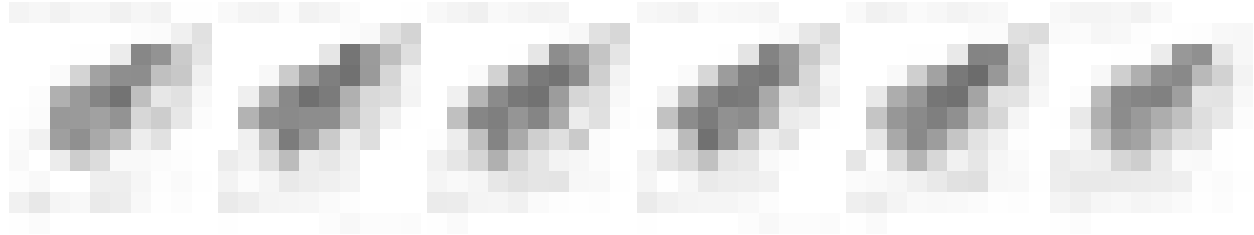
\* *Lespedeza bicolor* Turczaninow, Bicolor Lespedeza. "Wildlife food plots," roadsides, forests; native of e. Asia. June-September; August-November. [= RAB, C, I, K, Pa, Q, S, SE, W, WH, WV]

*Lespedeza capitata* Michaux, Bush-clover. Woodlands and woodland borders. August-October; September-November. ME and s. ON west to MN, SD, and NE, south to FL Panhandle and TX. [= RAB, C, I, K, Pa, S, SE, W, Y, Z; > *L. capitata* var. *capitata* – F, G, WV; > *L. capitata* var. *stenophylla* Bissell & Fernald – F, G, WV; > *L. capitata* var. *velutina* (Bicknell) Fernald – F, G; > *L. capitata* var. *vulgaris* Torrey & A. Gray – F, WV]

\* *Lespedeza cuneata* (Dumont-Cours.) G. Don, Sericea Lespedeza, Chinese Lespedeza. Roadbanks, "wildlife food plots", disturbed areas, floodplains, creekbanks; native of e. Asia. July-September; October-November. [= RAB, C, F, G, I, K, Pa, SE, W, WV]

*Lespedeza frutescens* (Linnaeus) Elliott, Violet Lespedeza. Woodlands and woodland borders. July-September; October-November. MA and NY west to MI, WI, IA, and KS, south to ne. FL, FL Panhandle, AL, MS, AR, and TX. [= K, S; = *L. violacea* (Linnaeus) Persoon – RAB, C, F, G, I, Pa, SE, W, WV, Y, Z, misapplied]

*Lespedeza hirta* (Linnaeus) Hornemann var. *curtissii* (Clewell) Isely, Silvery Lespedeza. Sandhills and dry to moist savannas. August-October; September-November. Se. VA south to s. FL, west to Panhandle FL and se. AL, barely extending onto the Piedmont in NC, SC, and GA. Clewell (1966a) discusses apparent intergrades between the two varieties in s. NJ. [= C, I, SE, X; < *L. hirta* – RAB, G, S, WH; = *L. hirta* var. *appressipilis* Blake – F (as to intent, but not the type); = *L. hirta* ssp. *curtissii* Clewell – K, Y, Z]



*Lespedeza hirta* (Linnaeus) Hornemann var. *hirta*, Hairy Lespedeza. Woodlands and woodland borders. August-October; September-November. S. ME and s. ON west to MI, n. IL, c. MO, and OK, south to c. peninsular FL and TX. [= C, I, SE, X; < *L. hirta* – RAB, G, Pa, S, W, WH, WV; > *L. hirta* var. *hirta* – F; > *L. capitata* var. *calycina* (Schindler) Fernald – F; = *L. hirta* ssp. *hirta* – K, Y, Z]

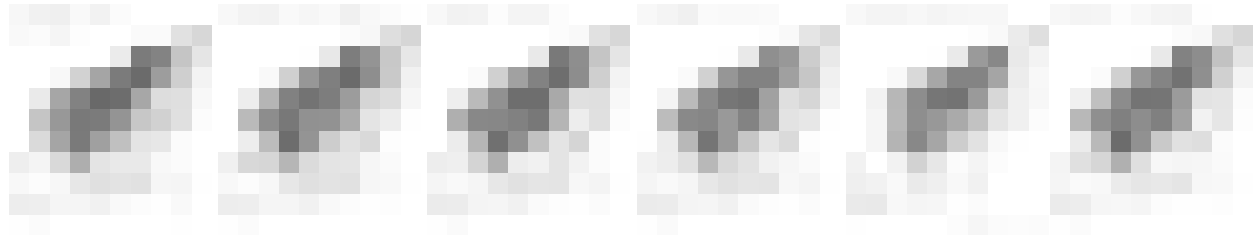
*Lespedeza procumbens* Michaux, Downy Trailing Lespedeza. Woodlands and woodland borders, hammocks. July-September; August-November. MA, NH, and NY west to IL, MO, and KS, south to Panhandle FL and TX. [= RAB, C, G, I, K, Pa, S, SE, W, WH, WV, Y, Z; > *L. procumbens* var. *procumbens* – F; > *L. procumbens* var. *elliptica* Blake – F]

*Lespedeza repens* (Linnaeus) W. Barton, Smooth Trailing Lespedeza. Woodlands and woodland borders. July-September; August-November. CT and NY west to n. OH, s. WI, MO, and KS, south to n. peninsular FL, Panhandle FL, and c. TX. [= RAB, C, F, G, I, K, Pa, S, SE, W, WH, WV, Y, Z]

*Lespedeza stuevei* Nuttall, Velvety Lespedeza. Woodlands and woodland borders. July-September; August-November. MA south to n. peninsular FL, west to c. and n. TX, north in the interior to NC, TN, s. IN, s. IL, c. MO, and nc. KS. [= RAB, C, F, G, I, K, Pa, SE, W, WH, WV, Y, Z; = *L. stuevei* – S, orthographic variant]

\* *Lespedeza thunbergii* (A.P. de Candolle) Nakai. "Wildlife food plots," roadbanks; native of e. Asia. Reported for Macon County, NC by Pittillo & Brown (1988). [= C, F, G, I, K, Pa, Q, SE, WH]

*Lespedeza violacea* (Linnaeus) Persoon, Wand Lespedeza. Woodlands and woodland borders. July-September; August-November. S. ME and s. ON west to MI and se. MN, south to ne. FL, Panhandle FL, and e. TX. [= K, S, WH; = *L. intermedia* (S. Watson) Britton – RAB, C, F, G, I, Pa, SE, W, WV, Y, Z]



\* *Lespedeza virgata* (Thunberg) A.P. de Candolle. Roadbanks; native of e. Asia. Clewell & Stickel (1990) report the occurrence of this species in NC. [= I, K]

*Lespedeza virginica* (Linnaeus) Britton, Virginia Lespedeza. Sandhills, woodlands, and woodland borders. July-September; August-November. MA and NH west to MI, WI, IA, and KS, south to Panhandle FL and c. TX. [= RAB, C, F, G, I, K, Pa, S, SE, W, WH, WV, Y, Z]

57. *Desmodium* Desvauz 1813 (Tick-trefoil, Tick-clover, Beggar's-ticks, Stick-tights)

A genus of about 300 species, annual herbs, perennial herbs, and shrubs, nearly cosmopolitan (but lacking from Europe). In our area, *Desmodium* is a complex genus. Some of the species in our area are confusing and can be identified only with difficulty. References: Isely (1998)=I; Krings (2004). Key based on SE, C, RAB, F, and Krings (2004). Some parts adapted with little change from SE. Some parts, especially Key D, will likely be substantially revised, based on additional herbarium and field testing. [also see *Hylodesmum*]

- 1 Longest calyx lobes shorter than the calyx tube; stipe of the loment 4-20 mm long, about 3× or more as long as the calyx; mature leaves without stipels at the base of the petiolules of the leaflets; leaves subverticillate at the top of the stem (alternate in *D. pauciflorum*); stamens monadelphous; lower margin of the loment incised to the upper suture ..... [see *Hylodesmum*]
- 1 Longest calyx lobes longer than the calyx tube; stipe of the loment absent or nearly so, included within the calyx; mature leaves retaining stipels at the base of the petiolules of the leaflets; leaves alternate; stamens diadelphous; lower margin of the loment not incised to the upper suture.
  - 2 Leaflets narrow, the terminal leaflet < 10 mm wide, and also 4-12× as long as wide, typically thick and strongly reticulate; petioles of midstem leaves 1-10 (-15) mm long; [primarily of the Coastal Plain and lower Piedmont (rarely Mountains) in our area] ..... **Key A**
  - 2 Leaflets broader, the terminal leaflet > 15 mm wide, or < 4× as long as wide, typically thin and not reticulate; petioles of midstem leaves various, but > 15 mm long if leaflet proportions are narrow; [collectively widespread in our area].
    - 3 Stems trailing vinelike along the ground, and/or the plants stoloniferous-rhizomatous..... **Key B**
    - 3 Stems erect or ascending, not vinelike.
      - 4 Stipules persistent (most or all of the stipules persisting through the year), 4-20 mm long, ovate to amplexicaul-clasping (to lance-attenuate, and if so, generally longer than 8 mm long, except in *D. floridanum*); leaflets 1.5-3× as long as wide..... **Key C**
      - 4 Stipules caducous (most or all of the stipules falling soon after expansion of the leaves), 2-6 (-8) mm long, mostly linear-subulate or lance-attenuate (in some species narrowly ovate to triangular); leaflets 1-8 (-10)× as long as wide..... **Key D**

**Key A: *Desmodium* with very narrow leaflets**

- 1 Petioles (0-) 1-3 (-4) mm long, the leaves thus subsessile; leaflets 5-10 mm wide, strongly pubescent on the lower surface..... *D. sessilifolium*
- 1 Petioles 3-15 mm long, the leaves thus obviously petiolate; leaflets 2-5 (-8) mm wide, glabrate or inconspicuously puberulent on the lower surface.
  - 2 Loment segments flat to distinctly concave along the upper (suture) margin; [of dry to mesic habitats]..... *D. strictum*
  - 2 Loment segments slightly convex along the upper (suture) margin; [of boggy, wet, or mesic habitats]..... *D. tenuifolium*

**Key B: *Desmodium* with trailing stems or stoloniferous-rhizomatous habit**

- 1 Flowers in axillary clusters; leaflets broadly obovate, 0.5-1 cm long ..... *D. triflorum*
- 1 Flowers in axillary or terminal racemes; leaflets rotund, broadly ovate, broadly elliptic, or narrowly elliptic, the larger > 1 cm long.
  - 2 Flowers in simple terminal racemes; leaflets mostly > 2.5× as long as wide..... *D. incanum*
  - 2 Flowers either in axillary racemes or in terminal panicles; leaflets mostly 0.9-2.0× as long as wide.
    - 3 Stipules ovate, persistent, slightly to strongly clasping at the base, 6-12 mm long.
      - 4 Leaflets ovate, 1.2-1.9× as long as wide; flowers white to yellowish; loment uncinat-puberulent only along the sutures ..... *D. ochroleucum*
      - 4 Leaflets ovate, 0.8-1.1× as long as wide; flowers blue-purple; loment uncinat-puberulent over the surface..... *D. rotundifolium*
    - 3 Stipules lanceolate to linear (or deltate in *D. humifusum*), usually quickly deciduous, not clasping at the base, 2-8 mm long.
      - 5 Terminal leaflet 1.4-2.0× as long as wide, 3.0-7.0 cm long; loment segments 6-8 mm long; stipules 4-8 mm long, ovate to lance-acuminate ..... *D. humifusum*
      - 5 Terminal leaflet 0.9-1.2× as long as wide, 1.5-2.3 cm long; loment segments 4-5 mm long; stipules lanceolate, 1-5 mm long ..... *D. lineatum*

**Key C**

- 1 Loment segments nearly symmetrical along the axis of the loment (the isthmi more or less equal above and below, thus each segment diamond-shaped, rounded-diamond-shaped, or essentially elliptical), each segment 3-3.5 mm long; annual from a taproot; [of NC and southward] ..... *D. tortuosum*
- 1 Loment segments asymmetrical along the axis of the loment (the isthmi deeper below than above, thus each segment triangular, rounded-triangular, or semi-circular), each segment 5-11 mm long; perennial; [collectively widespread in our area].
  - 2 Corolla 6-7 mm long; loment with 2-4 segments, each 5-7 mm long; lower leaves often 1-foliolate; [of se. SC and southward] ..... *D. floridanum*
  - 2 Corolla 8-13 mm long; loment with 4-6 segments, each 6.5-11 mm long; lower leaves usually 3-foliolate; [collectively widespread in our area].
    - 3 Stem densely spreading pilose (at least the upper stem) and also uncinat-puberulent; loment segments 6.5-10 mm long..... *D. canescens*
    - 3 Stem glabrous or uncinat-puberulent; loment segments 9-11 mm long
      - 4 Leaves glabrous or nearly so ..... *D. cuspidatum* var. *cuspidatum*
      - 4 Leaves evidently pubescent..... *D. cuspidatum* var. *longifolium*



Key D

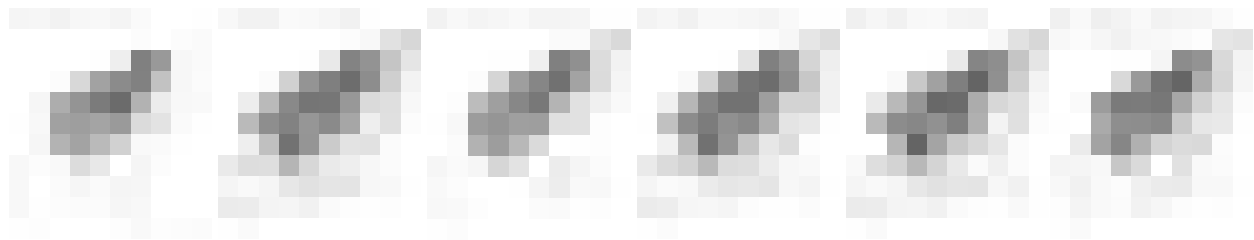
- 1 Corolla 8-11 mm long; petioles mostly 1-8 mm long; [plants of the Mountains of VA and possibly NC]..... *D. canadense*
- 1 Corolla 3-8 (-9) mm long (or 8-10 mm long in *D. laevigatum*); petioles mostly longer, mostly 10-60 mm long (except *D. ciliare* and *D. obtusum*); [plants collectively widespread in our area].
  - 2 Loment with 1-3 segments, rounded below.
    - 3 Leaflets cinereous on the lower surface; corolla 6-7 mm long; loment with 3 (-4) segments..... *D. nuttallii*
    - 3 Leaflets not cinereous on the lower surface; corolla 3.5-6 mm long; loment with 1-2 (-3) segments; ["*Desmodium ciliare* group"].
      - 4 Leaflets 3-5.5× as long as wide ..... *D. ciliare*
      - 4 Leaflets 1.2-3-5× as long as wide.
        - 5 Terminal leaflet usually distinctly longer and narrower than the lateral leaflets; stem (near the middle) sparsely to densely uncinat-pubescent..... *D. obtusum*
        - 5 Terminal leaflet similar to the lateral leaflets; stem (near the middle) glabrous to pilose, or also with some uncinat-pubescent.
          - 6 Petioles 1-3 (-5) mm long; pedicels 3-8 mm long; stem usually pilose; leaflets sub-appressed pubescent (to glabrate) ..... *D. ciliare*
          - 6 Petioles 10-25 mm long; pedicels 8-15 mm long; stem glabrous (to sparsely uncinat-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 uncinat or non-uncinat 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 uncinat 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 uncinat puberulence on the veins; stems and petioles glabrous or uncinat-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 uncinat-puberulent; stems and petioles glabrate to conspicuously pilose or uncinat-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 uncinat pubescence on either surface; mid-stems glabrous or glabrate, the pubescence usually uncinat puberulence.
              - 13 Loment segments rounded on the lower margin (thus semicircular to gibbous); leaves sessile 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 uncinat pubescence on the veins of the upper surface; mid-stems pubescent, either pilose or with uncinat pubescence (if not, evidently pubescent on the petioles).
      - 14 Stem and petiole pubescence sparsely to densely uncinat-puberulent; upper surface of leaflets commonly uncinat-puberulent on the veins..... *D. glabellum*
      - 14 Stem and petiole pubescence pilose; upper surface of leaflets occasionally uncinat-puberulent on the veins ..... *D. perplexum*

*Desmodium canadense* (Linnaeus) A.P. de Candolle, Showy Tick-trefoil, Canadian Tick-trefoil. Marl marshes, *Thuja* swamps, springs, seeps, hay meadows, streambanks. July-September; August-October. QC and NS west to AB, south to n. VA, sw. VA, NC (?), c. WV, MO, and OK. Small (1933) reports this species for NC; the documentation is not known. [= C, F, G, I, K, Pa, SE, W, WV; = *Meibomia canadensis* (Linnaeus) Kuntze – S]

*Desmodium canescens* (Linnaeus) A.P. de Candolle, Hoary Tick-trefoil. Fields, woodland borders, disturbed areas. June-October; August-November. MA west to WI and NE, south to n. peninsular FL and TX. [= RAB, C, F, G, I, K, Pa, SE, W, WH, WV; = *Meibomia canescens* (Linnaeus) Kuntze – S]

*Desmodium ciliare* (Muhlenberg ex Willdenow) A.P. de Candolle. Fields, woodland borders, disturbed areas. June-September; August-October. MA west to IN, MO, and se. KS, south to s. FL and TX; also in Cuba. [= RAB, C, G, I, Pa, SE, W, WH, WV; > *D. ciliare* var. *ciliare* – F, K; > *D. ciliare* var. *lancifolium* Fernald – F, K; = *Meibomia ciliaris* (Muhlenberg ex Willdenow) Blake – S]

*Desmodium cuspidatum* (Muhlenberg ex Willdenow) A.P. de Candolle ex Loudon var. *cuspidatum*, Toothed Tick-trefoil. Fields, woodland borders, disturbed areas. June-August; August-October. VT and MA west to MI and WI, south to FL Panhandle and OK. [= C, F, G, K, SE; < *D. cuspidatum* – RAB, I, Pa, W, WH, WV; = *Meibomia grandiflora* (A.P. de Candolle) Kuntze – S]



***Desmodium cuspidatum*** (Muhlenberg ex Willdenow) A.P. de Candolle ex Loudon var. ***longifolium*** (Torrey & A. Gray) Schubert. Forests and woodlands. OH west to MN and NE, south to GA and ne. TX. [= C, F, G, K, SE; < *D. cuspidatum* – RAB, I, Pa]

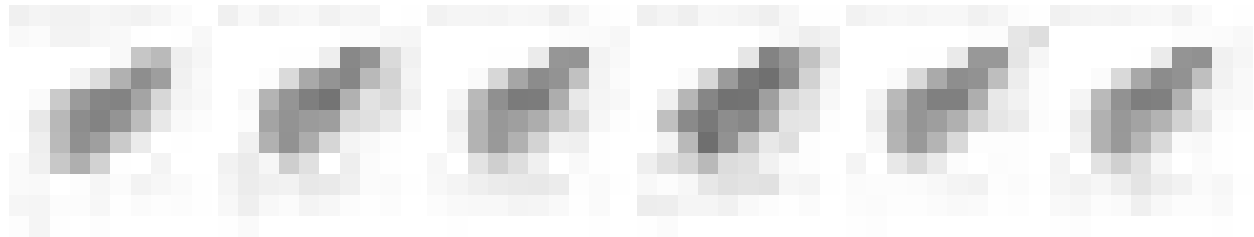
***Desmodium fernaldii*** Schubert, Fernald's Tick-trefoil. Sandhills, dry flatwoods, woodland borders. June-September; August-October. Se. VA south to s. SC (and maybe e. GA and n. FL); Isely (1998) states that reports from the Gulf Coast are based on "glabrate forms of *D. glabellum*," and also suggests that *D. fernaldii* is only weakly differentiated from *D. glabellum*. [= RAB, C, F, G, I, K, SE, W, WH; < *Meibomia rhombifolia* Vail – S (also see *D. floridanum*)]

***Desmodium floridanum*** Chapman, Florida Tick-trefoil. Sandhills, other dry sandy habitats. June-September; August-October. Se. SC south to s. FL. [= RAB, I, K, SE, WH; < *Meibomia rhombifolia* Vail – S (also see *D. fernaldii*)]

***Desmodium glabellum*** (Michaux) A.P. de Candolle. Fields, woodland borders, disturbed areas. June-September; August-October. ME west to WI and NE, south to n. peninsular FL and TX. [= RAB, F, I, K, Pa, SE, WH, WV; < *D. glabellum* – C (also see *D. perplexum*); ? *Meibomia paniculata* (Linnaeus) Kuntze – S, in part; ? *Meibomia pubens* (Torrey & A. Gray) Rydberg – S (also see *D. paniculatum* var. *paniculatum*); < *D. paniculatum* var. *dillenii* (Darlington) Isely – W]

***Desmodium humifusum*** (Muhlenberg ex Bigelow) Beck. Dry, sandy soils. MA (NS?) south to MD and DC (and possibly VA). Perhaps only a hybrid. [= C, F, I, K, Pa, SE; = *D. glabellum* – G, misapplied; = *Meibomia glabella* – S, misapplied]

***Desmodium incanum*** A.P. de Candolle. Lawns, disturbed areas; presumably introduced or adventive from tropical America. A pantropical weedy species. [= I, SE, WH; > *D. incanum* var. *incanum* – K; = *Meibomia cana* (J.F. Gmelin) Blake – S, illegitimate basionym; = *D. canum* (J.F. Gmelin) Schinz & Thellung, illegitimate basionym] {not yet keyed}



***Desmodium laevigatum*** (Nuttall) A.P. de Candolle. Dry oak and pine forests, fields, woodland borders, disturbed areas. June-September; August-October. S. NY west to IN and MO, south to n. FL, Panhandle FL, and TX. [= RAB, C, F, G, I, K, Pa, SE, W, WH, WV; = *Meibomia laevigata* (Nuttall) Kuntze – S]

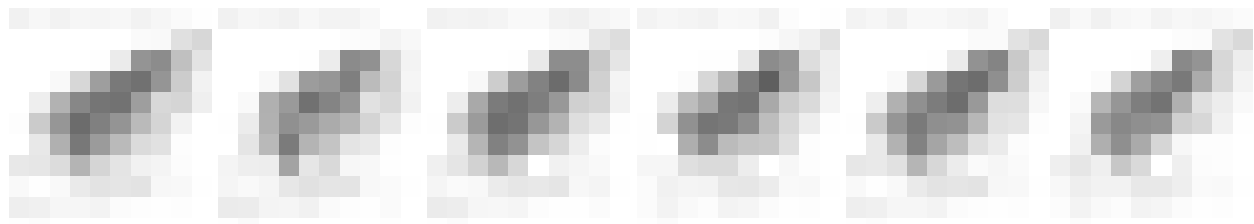
***Desmodium lineatum*** A.P. de Candolle, Matted Tick-trefoil. Sandhills and other dry forests and woodlands. June-September; August-October. Se. MD south to n. peninsular FL, west to TX, rarely inland. [= RAB, C, F, G, I, K, SE, W, WH, WV; > *Meibomia arenicola* Vail – S; > *Meibomia polymorpha* (A. Gray) Small – S]

***Desmodium marilandicum*** (Linnaeus) A.P. de Candolle. Fields, woodland borders, disturbed areas. June-September; August-October. MA west to MI and MO, south to n. peninsular FL and TX. [= RAB, C, F, G, I, K, Pa, SE, W, WH, WV; = *Meibomia marilandica* (Linnaeus) Kuntze – S]

***Desmodium nuttallii*** (Schindler) Schubert. Fields, woodland borders, disturbed areas. July-September; August-October. NY west to IN, south to n. peninsular FL, FL Panhandle, AL, and AR. [= RAB, F, I, K, Pa, SE, W, WH, WV; < *D. viridiflorum* – C, G; < *Meibomia viridiflora* (Linnaeus) Kuntze – S (also see *D. viridiflorum*)]

***Desmodium obtusum*** (Muhlenberg ex Willdenow) A.P. de Candolle. Dry pine woodlands, fields, woodland borders, disturbed areas. June-September; August-October. MA west to s. MI, south to Panhandle FL and TX. [= RAB, I, K, Pa, SE, W, WH; = *D. rigidum* (Elliott) A.P. de Candolle – C, F, G, WV; = *Meibomia rigida* (Elliott) Kuntze – S]

***Desmodium ochroleucum*** M.A. Curtis ex Canby, White Tick-trefoil, Creamflower Tick-trefoil. Dry woodlands, especially over calcareous soils. June-August; August-October. NJ (?), DE, and MD south to sc. and sw. NC, GA, TN, AL, Panhandle FL, MS, and MO. [= RAB, C, F, G, I, K, SE, W; = *Meibomia ochroleuca* (M.A. Curtis ex Canby) Kuntze – S]



***Desmodium paniculatum*** (Linnaeus) A.P. de Candolle var. ***epetiolum*** Schubert. Pine savannas and flatwoods, bogs. June-September; August-October. Var. *epetiolum* ranges from se. VA south to se. NC or e. SC. It may reflect hybridization between *D. paniculatum* var. *paniculatum* and another species. Further study is needed. [= F, I, K, SE; < *D. paniculatum* – RAB, C; < *D. paniculatum* var. *paniculatum* – W]

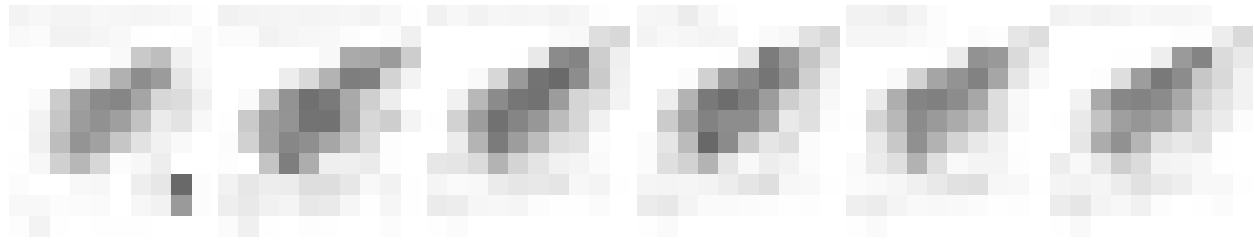
***Desmodium paniculatum*** (Linnaeus) A.P. de Candolle var. ***paniculatum***. Fields, woodland borders, disturbed areas. June-September; August-October. S. ME west to s. ON, MI, and NE, south to s. FL and TX. [= F, I, K, SE; < *D. paniculatum* – RAB, C, Pa, WH, WV; > *Meibomia chapmanii* (Britton) Small – S; = *D. paniculatum* var. *pubens* Torrey & A. Gray – G; > *Meibomia paniculata* (Linnaeus) Kuntze – S; >> *Meibomia pubens* (Torrey & A. Gray) Rydberg – S (also see *D. glabellum*); < *D. paniculatum* var. *paniculatum* – W]

***Desmodium perplexum*** Schubert. Fields, woodland borders, disturbed areas. July-September; August-October. [= RAB, F, I, K, Pa, SE, WH, WV; < *D. glabellum* – C; ? *Meibomia dillenii* (Darlington) Kuntze – S; < *D. paniculatum* var. *dillenii* (Darlington) Isely – W]

***Desmodium rotundifolium*** A.P. de Candolle, Roundleaf Tick-trefoil. Dry forests and woodlands. June-August; August-October. VT and MA west to s. MI, south to ne. FL, Panhandle FL, LA, and MO. [= RAB, C, F, G, I, K, Pa, SE, W, WH, WV; ? *Meibomia michauxii* Vail – S]

***Desmodium sessilifolium*** (Torrey) Torrey & A. Gray, Sessile-leaf Tick-trefoil. Dry woodlands. July-August; August-October. RI west to s. MI and KS, south to NC, Panhandle FL, MS, and TX. [= RAB, C, F, G, I, K, Pa, SE, W, WH; = *Meibomia sessilifolia* (Torrey) Kuntze – S]

***Desmodium strictum*** (Pursh) A.P. de Candolle, Pineland Tick-trefoil, Pinebarren Tick-trefoil. Sandhills, other dry woodlands. July-August; August-October. S. NJ south to s. FL, west to w. LA. [= RAB, C, F, G, I, K, SE, W, WH; = *Meibomia stricta* (Pursh) Kuntze – S]

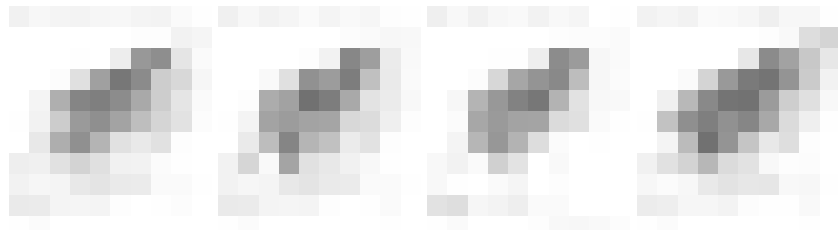


***Desmodium tenuifolium*** Torrey & A. Gray, Slimleaf Tick-trefoil. Savannas, wet pine flatwoods. July-August; August-October. Se. VA south to c. peninsular FL, west to w. LA. [= RAB, C, F, G, I, K, SE, WH; = *Meibomia tenuifolia* (Torrey & A. Gray) Kuntze – S]

\*? ***Desmodium tortuosum*** (Swartz) A.P. de Candolle. Fields, woodland borders, disturbed areas. July-August; August-October. E. NC south to s. FL, west to TX; perhaps only introduced in the southeastern United States. [= RAB, I, K, SE, WH; = *Meibomia purpurea* (P. Miller) Vail – S]

\* ***Desmodium triflorum*** (Linnaeus) deCandolle. Lawns, roadsides; native of the Old World tropics. Reported for Escambia County, FL Panhandle (Kunzer et al. 2009). [= I, K, SE, WH; = *Sagotia triflora* (Linnaeus) Duchassaing & Walpers – S] {add to synonymy}

***Desmodium viridiflorum*** (Linnaeus) A.P. de Candolle, Velvety Tick-trefoil. Fields, woodland borders, disturbed areas. June-September; August-October. DE south to c. peninsular FL, west to TX, and inland to w. VA, w. NC, n. TN, and AR. This species is one of several that is notably uncinatopuberulent on the upper leaf surfaces. [= RAB, F, I, K, Pa, SE, W, WH; < *D. viridiflorum* – C, G (also see *D. nuttallii*); < *Meibomia viridiflora* (Linnaeus) Kuntze – S (also see *D. nuttallii*)]



A genus of ca. 15 species, perennial herbs, mainly of e. Asia and e. North America. This group has often been included in *Desmodium* as a section or subgenus, but is now shown to be amply distinct in morphology and also to form a monophyletic group based on molecular analysis. References: Raveill (2006); Ohashi & Mill (2000)=Z.

- 1 Stems dimorphic, the flowering stem normally lacking leaves (rarely with leaves), the sterile stem with a subverticillate cluster of 3-7 leaves near the top; pedicels 10-20 mm long ..... *H. nudiflorum*
- 1 Stems monomorphic, bearing both leaves and flowers, the leaves either subverticillate or not; pedicels 2-10 mm long.
  - 2 Leaves subverticillate, clustered; leaflets conspicuously and strongly acuminate, 5-10 cm long; flowers usually distinctly pink or pink-purple; inflorescence 3-8 dm long, elongate, large, and conspicuous, much exceeding the leaves ..... *H. glutinosum*
  - 2 Leaves alternate, scattered; leaflets acute to slightly acuminate, 3-7 cm long; flowers white; inflorescence 1-2 dm long, small and inconspicuous, often partly obscured by the leaves ..... *H. pauciflorum*

*Hylodesmum glutinosum* (Muhlenberg ex Willdenow) H. Ohashi & R.R. Mill, Heartleaf Tick-trefoil, Clusterleaf Tick-trefoil. Moist forests, especially nutrient-rich. June-August; August-October. NS west to SK, south to Panhandle FL and Mexico. [= Z; = *Desmodium glutinosum* (Muhlenberg ex Willdenow) A. Wood – RAB, C, F, G, I, K, Pa, SE, W, WH, WV; = *Meibomia acuminata* (Michaux) Blake – S]

*Hylodesmum nudiflorum* (Linnaeus) H. Ohashi & R.R. Mill, Naked Tick-trefoil. Moist to dry forests. July-August; August-October. ME west to MN, south to Panhandle FL, n. peninsular FL, and TX. [= Z; = *Desmodium nudiflorum* (Linnaeus) A.P. de Candolle – RAB, C, F, G, I, K, Pa, SE, W, WH, WV; = *Meibomia nudiflora* (Linnaeus) Kuntze – S]

*Hylodesmum pauciflorum* (Nuttall) H. Ohashi & R.R. Mill, Few-flowered Tick-trefoil. Moist forests. June-August; August-October. NY west to OH and IA, south to Panhandle FL and TX. [= Z; = *Desmodium pauciflorum* (Nuttall) A.P. de Candolle – RAB, C, F, G, I, K, SE, W, WH, WV; = *Meibomia pauciflora* (Nuttall) Kuntze – S]

**59. *Alysicarpus* Necker ex Desvaux 1813 (Alyce Clover)**

A genus of about 25-30 species, herbs, native of the Old World tropics. References: Isely (1998)=I.

\* *Alysicarpus ovalifolius* (Schumacher) J. Léonard, Alyce Clover. Disturbed areas; native of the Old World Tropics, planted as a forage crop (at least formerly), and rarely naturalized. The VA occurrence is from chrome ore piles in Newport News – presumably a waif. It is possible that *A. vaginalis* (in the strict sense) is represented in our area as well. It differs from *A. ovalifolius* in having a densely congested inflorescence (with rachis internodes shorter than the flowers) vs. a lax inflorescence with the flowers much shorter than the rachis internodes. [= WH; < *Alysicarpus vaginalis* (Linnaeus) A.P. de Candolle – I, K, SE]

**60. *Orbexilum* Rafinesque 1832 (Scurfpea, Sampson's-snakeroot)**

A genus of about 9 species, perennial herbs, of s. North America and Mexico (south to Chiapas). References: Grimes (1988, 1990)=Z; Isely (1998)=I.

- 1 Leaves unifoliolate; [subgenus *Poikadenia*] ..... *O. virgatum*
- 1 Leaves with 3-7 leaflets.
  - 2 Leaves palmately (3-) 5-7 foliolate, the leaflets linear to very narrowly oblanceolate, 2-7 cm long, 0.5-2.0 (-3.5) mm wide, > 10× as long as wide; [subgenus *Orbexilum*] ..... *O. lupinellum*
  - 2 Leaves pinnately 3-foliolate, the leaflets orbicular, ovate, elliptic or lanceolate, > 8 mm wide, 1-8× as long as wide.
  - 3 Leaflets 1.5-7 cm wide, 1-2.5× as long as wide; [subgenus *Orbexilum*].
    - 4 Upper leaf surfaces lacking glands; leaflets 3.7-5.5 cm long; [endemic to Rock Island, Jefferson Co. KY and now considered extinct] ..... *O. stipulatum*
    - 4 Upper leaf surfaces glandular; leaflets 4-12 cm long.
      - 5 Leaflets subcordate, 4-7 cm wide, 1-1.5× as long as wide, glandular-punctate above and below, the apex obtuse; calyx stipitate-glandular; petals 8-10 mm long; [endemic to Polk Co. NC] ..... *O. macrophyllum*
      - 5 Leaflets rounded at base, 2-4 cm wide, 1.5-2.5× as long as wide, eglandular or sparsely glandular above, the apex acute; calyx lacking stipitate glands; petals 5-7 mm long; [widely scattered from w. VA and w. NC westward] ..... *O. onobrychis*
  - 3 Leaflets 0.8-2 cm wide, 2.5-7.5× as long as wide; [subgenus *Poikadenia*].
    - 6 Flowers 8-10 mm long; [of s. AL westward] ..... *O. simplex*
    - 6 Flowers 5-7 mm long; [collectively widespread in our area].
      - 7 Calyx tube, fruits, and bracts of the inflorescence eglandular (rarely slightly glandular-punctate); leaflets eglandular below (rarely slightly punctate); hairs on calyx 0.7-1.0 mm long; upper 2 calyx teeth 1.0-1.5 mm long, lateral teeth 1.5-2.0 mm long, lower calyx tooth 2.0-3.0 mm long ..... *O. pedunculatum* var. *pedunculatum*
      - 7 Calyx tube, fruits, and bracts of the inflorescence conspicuously glandular-punctate; leaflets conspicuously glandular-punctate below; hairs on calyx 0.3-0.5 mm long; upper 2 calyx teeth 0.7-1.0 mm long, lateral teeth 1.2-1.5 mm long, lower calyx tooth 1.7-2.0 mm long ..... *O. pedunculatum* var. *psoraloides*

*Orbexilum lupinellum* (Michaux) Isely, Lupine Scurfpea. Sandhills. May-July; July-October. This peculiar species is a Southeastern Coastal Plain endemic, ranging from sc. and se. NC, south to c. peninsular FL, s. AL, and e. GA. The very peculiar leaves, palmately 5-7-foliolate with "oblinear" leaflets, make the species unmistakable. First reported for SC by McMillan et al. (2002). [= K; = *Psoralea lupinellus* Michaux – RAB; = *Orbexilum lupinellus* – I, SE, WH, Z, orthographic variant; = *Rhytidomene lupinellus* (Michaux) Rydberg – S]

***Orbexilum macrophyllum*** (Rowlee in Small) Rydberg, Bigleaf Scurfpea. Wooded slopes of mountain on Blue Ridge escarpment, precise habitat not known (probably nutrient-rich dry woodlands). June; July-August? This species was discovered on 18 June 1897 and subsequently collected on 8 June 1899 by E.C. Townsend, somewhere on the double peak of Tryon Mountain and White Oak Mountain, Polk County, NC, a phytogeographically interesting area with disjunct, endemic, and relictual species largely of midwestern affinities. It is currently presumed to be extinct, following a number of unsuccessful attempts to relocate it. Isely (1990) states that the assignment of "this distinctive species" to *Orbexilum* is "reasonably assumptive," since fruits have never been seen. [= I, K, S, SE, Z; = *Psoralea macrophylla* Rowlee in Small – RAB, W]



***Orbexilum onobrychis*** (Nuttall) Rydberg, Lanceleaf Scurfpea. In nutrient-rich, open or semi-open areas. June-July; August-October. Primarily a species of prairies and prairie-like areas of OH and KY west to se. IA and e. MO, *O. onobrychis* also occurs (at least formerly) as a rare disjunct in the mountains of w. NC, nw. SC, w. VA, and e. TN. The only report for NC was in the 1800's. [= C, I, K, S, SE, Z; = *Psoralea onobrychis* Nuttall – RAB, F, G, W]

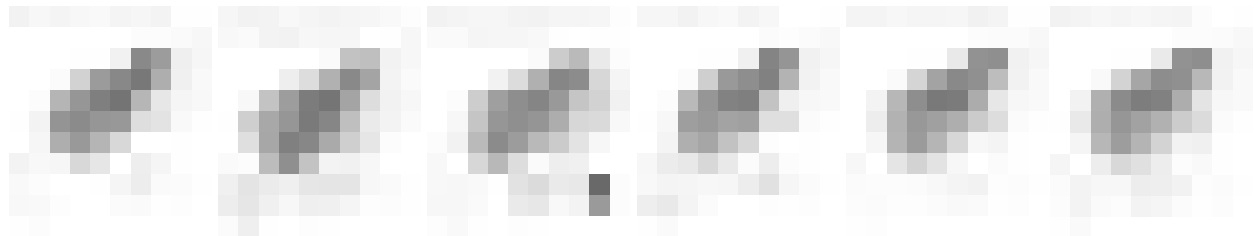
***Orbexilum pedunculatum*** (P. Miller) Rydberg var. ***pedunculatum***, Western Sampson's-snakeroot. Open woodlands. May-July; July-September. Var. *pedunculatum*, the western and more widespread variety, occurs primarily west of the Blue Ridge, with scattered occurrences in and east of the Blue Ridge. Its range is s. OH, s. IN, s. IL, c. MO, and se. KS, south to sw. NC, sc. SC, sw. GA, s. AL, s. LA, and e. TX. [= C, I, K, SE, Z; = *Psoralea psoralioides* (Walter) Cory var. *eglandulosa* (Elliott) F.L. Freeman – RAB, F, G, GW, W; = *Orbexilum pedunculatum* – S]

***Orbexilum pedunculatum*** (P. Miller) Rydberg var. ***psoralioides*** (Walter) Isely, Eastern Sampson's-snakeroot. Savannas, open woodlands. May-July; July-September. Var. *psoralioides*, the eastern variety, occurs primarily on the Atlantic Coastal Plain, ranging from e. VA to ne. FL and Panhandle FL, inland to the Piedmont of NC and SC. [= K; = *Psoralea psoralioides* (Walter) Cory var. *psoralioides* – RAB, F, G, GW; = *Orbexilum pedunculatum* var. *gracile* (Torrey & A. Gray) Grimes – C, I, SE, Z; = *Orbexilum gracile* (Torrey & A. Gray) Rydberg – S; < *Orbexilum pedunculatum* – WH]

***Orbexilum simplex*** (Nuttall ex Torrey & Gray) Rydberg. Prairies, open woodlands. AR and OK south to s. AL, MS, e. and w. LA, and e. TX; perhaps disjunct in IL. [= I, K, S, SE, Z]

***Orbexilum stipulatum*** (Torrey & Gray) Rydberg. Rocky limestone glade. So far as is known, once endemic to Rock Island in the Ohio River, Jefferson Co., KY, and now presumed extinct because of near obliteration of the only known site by dam-building and industrial construction (Baskin, Isely, & Baskin 1986). [= C, I, K, SE, Z; = *Psoralea stipulata* Torrey & Gray – F, G]

***Orbexilum virgatum*** (Nuttall) Rydberg, Slender Leather-root. Sandhills. Se. GA (or SC?) south to ne. FL. A collection by Curtiss is labeled as from South Carolina. [= I, K, S, SE, WH, Z; = *Psoralea virgata* Nuttall]



### 61. *Pediometelum* Rydberg 1919 (Buckroot, Prairie-turnip)

A genus of about 22 species, perennial herbs, of North America. References: Allison, Morris, & Egan (2006)=Y; Grimes (1988, 1990)=Z; Isely (1998)=I.

- 1 Flowering calyx 1.5-2.5 mm long, the legume exerted out of it at maturity; leaves 3-5-foliolate; [of MS and KY and westward]; [former genus *Psoralidium*].....***P. species 1***
- 1 Flowering calyx 7-10 mm long, the legume mostly included within it even at maturity; leaves (1-) 3-7 foliolate; [of TN and AL and eastward].
- 2 Plants acaulescent, 1-2 dm tall; leaves (4-) 5-7-foliolate; [plants of calcareous glades of the Interior (nw. GA, TN, n. AL)]; [subgenus *Disarticulatum*].....***P. subcaule***
- 2 Plants caulescent, 3-10 dm tall; leaves (1-) 3 (-5)-foliolate; [plants of sandhills of the Coastal Plain and rocky woodlands of the lower Piedmont]; [subgenus *Pediometelum*].
- 3 Inflorescence loose (much of the axis exposed); leaflets (1-) 3; leaflets < 2× as long as wide, petiolules 5-9 mm long; [of longleaf pine sandhills of the Coastal Plain].....***P. canescens***
- 3 Inflorescence congested (the axis usually concealed); leaflets 3 (-5); leaflets > 2× as long as wide, petiolules 1.8-3 mm; [of rocky woodlands of the lower Piedmont].....***P. piedmontanum***

***Pediomelum canescens*** (Michaux) Rydberg, Buckroot, Eastern Prairie-turnip, Hoary Scurfpea. Sandhills. May-July; July-October. A Southeastern Coastal Plain endemic: se. VA south to c. peninsular FL, Panhandle FL, and s. AL. This uncommon species tends to occur as very widely scattered individuals in sandhill habitats, rarely with more than a few seen at a time. It is related to *P. esculentum* (Pursh) Rydberg, the "prairie potato," prized by early travelers across the prairies for its edible tubers. An interesting collection label (by R.E. Wicker, collected in 1942, the specimen at NCU) mentions both the edible tubers and the characteristically sparse population structure of the species. "Not uncommon near Pinehurst in ... open places in sandy pine woods..., but usually only one plant at a time. Tuber hard, dark brown, about size of a medium-sized Irish potato, somewhat ventral-elongated with roots coming from pointed base. Internal pure white, apparently almost entirely starch... Mr. Wicker says that he rather likes to take a bit of it and chew when fresh, has a rather condiment taste, but does not think it well to eat..." Because of its rarity, *P. canescens* should not (of course) be eaten. Because of its habit, that of a very bushy, tumbleweed-like plant, it superficially most closely resembles various *Baptisia* species, but it is easily separated by its rather dense and soft pubescence (our *Baptisia* are all glabrous or rather inconspicuously puberulent, except the very unifoliolate *B. arachnifera*). [= C, I, K, S, SE, WH, Z; = *Psoralea canescens* Michaux – RAB, F, G]

***Pediomelum piedmontanum*** J.R. Allison, M.W. Morris, & A.N. Egan, Piedmont Buckroot. Open, rocky woodlands in the lower Piedmont. Late May-late June (-late July); July-August (-September). Apparently endemic to the lower Piedmont of c. SC and e. GA. See Allison, Morris & Egan (2006) for additional details. [= Y]

***Pediomelum species 1***, Gray Scurf-pea. Prairies. KY to MT, south to TX and n. Mexico; disjunct in MS. A recent study (Egan & Crandall 2008) shows that this species belongs in *Pediomelum*, not *Psoralidium*; the new combination has not yet been made. [= *Psoralidium tenuiflorum* (Pursh) Rydberg – C, I, K, SE, Z; = *Psoralea tenuiflora* Pursh – F, G]

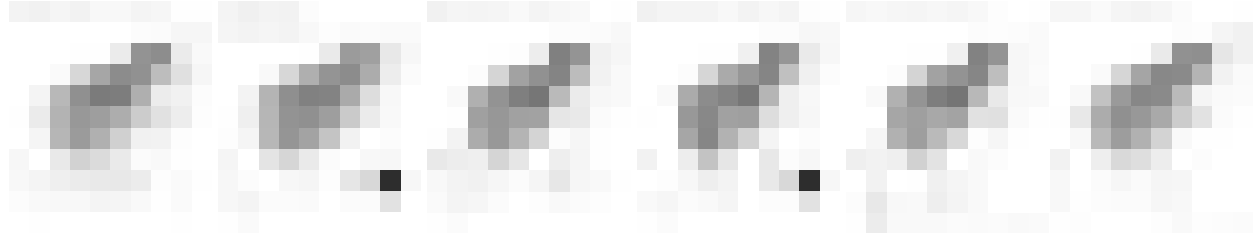
***Pediomelum subacaulis*** (Torrey & A. Gray) Rydberg, Nashville Breadroot. Limestone glades. E. TN and nw. GA west to c. TN and nw. AL. [= I, K, SE, Z; = *P. subacaulis* – S, orthographic variant]

62. *Cullen* Medikus 1787

A genus of ca. 35 species, herbs and shrubs, of the Old World. References: Isely (1998)=I.

\* ***Cullen americanum*** (Linnaeus) Rydberg, Scurf-pea. Waste areas around wool-combing mills, other disturbed areas, perhaps only a waif; native of the w. Mediterranean region (a misnomer). There are other (older) reports from other southeastern states, including FL and MS. [= I, S; = *C. americana* – K1, K2, SE, orthographic variant]

\* ***Cullen corylifolia*** (Linnaeus) Medikus, Malaysian Scurf-pea. On ships ballast, probably only a waif; native of s. Asia [= K1, K2] {add to synonymy; not yet keyed}



63. *Sesbania* Adanson 1760 (Rattlebox, Sesban)

A genus of about 50-60 species, annual herbs, perennial herbs, shrubs, and trees, of tropical, subtropical, and less commonly warm temperate regions of the Old and New World, here circumscribed to include *Glottidium*, following Lewis et al. (2005). References: Isely (1998)=I.

- 1 Corolla 8-9 mm long; legume flat; leaves with 8-13 pairs of leaflets.....*S. vesicaria*
- 1 Corolla 9-25 mm long; legume quadrangular or 4-winged; leaves with 10-35 pairs of leaflets.
- 2 Legume quadrangular in cross-section, the corners not winged, 15-20 cm long, 0.3-0.5 cm wide; corolla 10-15 (-20) mm long, yellow, often marked with purple; leaves with 15-35 pairs of leaflets; [plant a robust herb, to 4 m tall] .....*S. herbacea*
- 2 Legume quadrangular or conspicuously 4-winged longitudinally, 3-8 cm long, 0.5-1.5 cm wide; corolla 9-25 mm long, yellow, orange, or scarlet; leaves with 10-20 pairs of leaflets; [plant a shrub, to 4 m tall].
- 3 Legume quadrangular or slightly flanged, 0.5-0.7 cm wide; corolla 9-12 mm long.....*S. virgata*
- 3 Legume conspicuously 4-winged longitudinally, 1-1.5 cm wide; corolla 13-25 mm long.
- 4 Corolla yellow; pedicels 0.5-1.0 cm long; legume blunt or abruptly acuminate to a beak.....*S. drummondii*
- 4 Corolla orange or red; pedicels 0.5-1.2 (-1.5) cm long; legume acuminate or tapering to a beak .....*S. punicea*

***Sesbania drummondii*** (Rydberg) Cory, Rattlebox, Poison-bean. Disturbed areas, spoil, marsh edges, ditches. Native on the Gulf Coast west to s. TX and Mexico, the exact eastern edge of the native range uncertain, perhaps w. FL Panhandle. First reported for GA and SC by Townsend et al. (2000), where clearly introduced. [= GW, I, K1, K2, SE, WH; = *Daubentonia drummondii* Rydberg – S]

*Sesbania herbacea* (P. Miller) McVaugh, Sesban, Coffee-weed, Indigo-weed, Peatree. Ditches, wet fields, perhaps native only in the deeper South. July-September; August-November. Native distribution uncertain, perhaps e. NC south to s. FL, west on the Coastal Plain and Mississippi Embayment to TX, south into Mexico. [= K1, WH; = *S. exaltata* (Rafinesque) Cory – RAB, C, F, G, I, K2, SE; = *Sesbania macrocarpa* Muhlenberg ex Rafinesque – GW; = *Sesban exaltatus* (Rafinesque) Rydberg – S]

\* *Sesbania punicea* (Cavanilles) Bentham, Rattlebox, Scarlet Wisteria-tree, Purple Sesban. Ditches, wet fields, marshes, ponded wetlands, wet pinelands; presumably native of South America. June-October; August-November. [= GW, I, K1, K2, SE, WH; = *Daubentonia punicea* (Cavanilles) A.P. de Candolle – RAB, S]

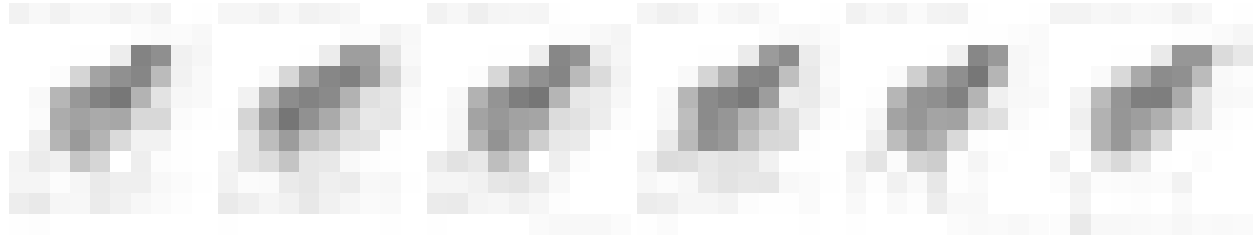
*Sesbania vesicaria* (Jacquin) Elliott, Bladderpod, Bagpod. Ditches, marshes, disturbed wet areas. July-September; August-November. The original native distribution of *S. vesicaria* is uncertain; its distribution is from ne. NC south to s. FL, west to e. OK and se. TX, and Isely (1998) states that it is unknown from outside the United States; occurrences in provinces inland of the Coastal Plain seem to represent introductions into artificial wetlands (such as ditches). [= GW, K2, WH; = *Glottidium vesicarium* (Jacquin) R.M. Harper – RAB, I, K1, S, SE]

\* *Sesbania virgata* (Cavanilles) Poiret. Disturbed areas; native of South America. June-October; August-November. [= I, K1, K2, SE, WH]

**64. *Scorpiurus* Linnaeus 1753 (Scorpion's-tail)**

A genus of 2-4 species, herbs, of Mediterranean Europe west into w. Asia.

\* *Scorpiurus muricatus* Linnaeus. Disturbed areas; native of Mediterranean Europe. [= K] {add synonymy}



**65. *Securigera* A.P. de Candolle 1805 (Crown-vetch)**

A genus of about 12-13 species, annual and perennial herbs, of Eurasia. This genus is sometimes included in *Coronilla*, but is apparently better separated (Isely 1998). References: Isely (1998)=I.

- 1 Corolla yellow; annual; [rare waif].....*S. securidaca*
- 1 Corolla white and pink; perennial; [common alien, planted and established].....*S. varia*

\* *Securigera securidaca* (Linnaeus) Degen & Dörfler. Disturbed areas; native of Europe. Reported by Small (1933); rejected by Isely (1990) on the basis of no material seen to document the occurrence. This taxon's status as part of our flora is uncertain. [= I, SE; = *Bonaveria securidaca* (Linnaeus) Reichenbach – S; = *Coronilla securidaca* Linnaeus – K]

\* *Securigera varia* (Linnaeus) Lassen, Crown-vetch. Roadbanks, woodland borders; native of Europe. This species, generally known as *Coronilla varia*, is now widely used to stabilize road-cuts. [= I; = *Coronilla varia* Linnaeus – RAB, C, F, G, K, Pa, SE, W, WH, WV]

**66. *Anthyllis* Linnaeus 1753 (Kidney-vetch)**

A genus of about 20 species, annual and perennial herbs, of the Mediterranean region. References: Isely (1998)=I.

*Anthyllis vulneraria* Linnaeus, Kidney-vetch. Disturbed areas; native of Mediterranean Europe. June-August. [=I, K2]

**67. *Acmispon* Rafinesque 1832 (American Bird's-foot-trefoil, Prairie-trefoil)**

A genus of about 8 species, annual and perennial herbs, of temperate North America and South America. New World taxa often referred to *Lotus* are not closely related to *Lotus*, and should be segregated (Degtjareva et al 2006; Allan & Porter 2000). References: Isely (1981)=Z; Isely (1998)=I; Sokoloff (2000); Degtjareva et al. (2006); Allan & Porter (2000); Grant & Small (1996).

- 1 Leaflets 3-3.5× as long as wide; plants pubescent, the hairs long; [alien].....*A. americanus*
- 1 Leaflets 4-5× as long as wide; plants glabrate, the hairs short; [native of Piedmont of sc. VA, NC, SC, and e. GA].....*A. helleri*

\* *Acmispon americanus* (Nuttall) Rydberg, Western Prairie-trefoil. Disturbed areas, waste-combing mills. [= *A. americanum* – S, orthographic variation; < *L. americanus* (Nuttall) Bischoff – F; < *L. purshianus* F.E. & E.G. Clements – G; = *L. unifoliolatus* (Hooker) Benth var. *unifoliolatus* – K; = *L. purshianus* F.E. & E.G. Clements var. *purshianus* – C, I, SE, Z]

*Acmispon helleri* (Britton) A.A. Heller, Carolina Prairie-trefoil. Dry woodlands and openings, originally probably limited to prairie-like sites (fire-maintained, post oak-blackjack oak savannas), generally on clayey soils, now primarily seen on roadbanks, along railroads, and in powerline rights-of-way, where mowing and bush-hogging have replaced fire as the force keeping the habitat open, sunny, and suitable for this plant of prairie affinities. (June-) July-August (-September). *A. helleri* is endemic to the Piedmont of extreme sc. VA, NC, SC, and ne. GA. *A. helleri* is clearly closely related to *A. americanus* (= *Lotus unifoliolatus*, = *Lotus purshianus*, = *Lotus americanus*), of prairies of the midwestern states and various habitats farther west, which ranges east to LA, AR, MO, IL, IN, and WI. Isely (1981) reduced *A. helleri* to a variety (in *Lotus*), because it "is but one of many elements within the *L. purshianus* complex and its differences from the rest are less than among the California races," while also stating "since it has no breeding contact with var. *purshianus*, it is reasonably maintained as a species." Since *A. helleri* seems adequately separated from *A. americanus* by its narrower leaflets, glabrate vestiture, and allopatric distribution, I choose to reasonably maintain it as a species. [= S; = *Lotus helleri* Britton – RAB; < *L. americanus* (Nuttall) Bischoff – F; < *L. purshianus* F.E. & E.G. Clements – G; = *L. unifoliolatus* (Hooker) Benth var. *helleri* (Britton) Kartesz & Gandhi – K; = *L. purshianus* F.E. & E.G. Clements var. *helleri* (Britton) Isely – C, I, SE, Z; = *Acmispon americanus* (Nuttall) Rydberg var. *helleri* (Britton) Brouillet]



68. *Lotus* Linnaeus 1753 (Birdsfoot-trefoil)

A genus of about 120-130 species, annual and perennial herbs and shrubs, of temperate Eurasia. New World taxa often referred to *Lotus* are not closely related to *Lotus*, and should be segregated (Degtjareva et al 2006; Allan & Porter 2000). References: Isely (1981)=Z; Isely (1998)=I; Degtjareva et al. (2006); Allan & Porter (2000); Grant & Small (1996). [also see *Acmispon*]

- 1 Leaves 3-foliolate, the upper commonly 1-foliolate; flowers solitary in leaf axils; [native or alien annual herbs].....[see *Acmispon*]
- 1 Leaves 5-foliolate; flowers in umbels; [alien perennial herbs].
- 2 Calyx tube 2.8-3.5 mm long; corolla usually 10-14 mm long; leaflets of the medial leaves mostly 1.5-2.5 (-5)× as long as wide.....*L. corniculatus*
- 2 Calyx tube 1.8-2.8 mm long; corolla usually 8-10 mm long; leaflets of the medial leaves 3-4 (-6)× as long as wide .....*L. tenuis*

\* *Lotus corniculatus* Linnaeus, Birdsfoot-trefoil, Eggs-and-Bacon. Fields, roadsides, and waste places; native of Eurasia. June-September. First reported for GA (Rabun County) by Stiles & Howel (1998). [= RAB, C, F, G, K, Pa, S, SE, W, WV, Z; < *L. corniculatus* Linnaeus – I (also see *L. tenuis*)]

\* *Lotus tenuis* Waldstein & Kitaibel ex Willdenow, Slender Birdsfoot-trefoil. Fields, roadsides, and waste places; native of Eurasia. June-September. First reported for KY by Poindexter & Thompson (2011) and for DE by Knapp et al. (2011). [= C, K, SE, Z; < *L. corniculatus* Linnaeus – I]

69. *Robinia* Linnaeus 1753 (Locust)

A genus of 5-8 species, shrubs and trees, of e. and sw. North America. The Southern Appalachians are a center of diversity of *Robinia*, with active hybridization, introgression, and formation of local (sterile) races involved; a fully satisfying taxonomic treatment of such a situation is not possible. Isely & Peabody's (1984) treatment seems a reasonable approach, and I have largely followed it here, differing in the rank of some of the taxa. References: Isely & Peabody (1984)=Z; Ashe (1922)=Y; Isely (1998)=I.

Identification notes: The key is differently structured than that in RAB or SE; it is presented as an alternative. This treatment may be altered substantially prior to publication. A variety of hybrids (including some cultivars) are known, including the following: *Robinia* × *longiloba* Ashe (pro sp.) [*R. hispida* × *viscosa*], known from NC and SC; *Robinia* × *margarettae* Ashe (pro sp.) [*R. hispida* × *pseudoacacia*], known from NC, SC, and GA; *Robinia* × *ambigua* Poir (pro sp.) [*R. pseudoacacia* × *viscosa*], known from NC; *Robinia hartwigii* × *hispida*, known from Whiteside Mountain, Jackson County, NC; *Robinia hartwigii* × *viscosa*, known from Whiteside Mountain, Jackson County, NC.

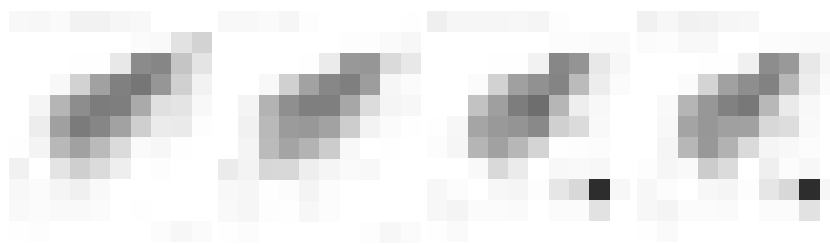
- 1 Corolla white, 1.5-2.0 cm long; peduncles, pedicels, and calyces velvety-puberulent, the hairs neither glandular nor hispid; plant a small to large tree .....*R. pseudoacacia*
- 1 Corolla pink to pink-purple (rarely white or nearly so), (1.5-) 2.0-2.5 cm long; peduncles, pedicels, and calyces glandular-pubescent, hispid, or with short-stalked to sessile glands; plant a shrub to small tree.
- 2 Twigs and leafstalks conspicuously hispid with hairs 1-5 mm long, these stiff, thick-based, and typically persistent several years.
  - 3 Plants fruiting abundantly; shrubs 0.6-2 (-3) m tall; leaflets relatively broad, mostly 1.2-1.8× as long as wide..... *R. hispida* var. *fertilis*



- 3 Plants sterile (rarely fruiting scantily); shrubs 0.5-1.5 m tall; leaflets relatively narrow, mostly 1.8-2.5× as long as wide ..... *R. hispida* var. *hispida*
- 2 Twigs and leafstalks either viscid with sessile or short-stalked glands, or densely glandular-pubescent (the hairs 0.5-2 mm long), or tomentulose, or sparsely hispid with weak, non-persistent hairs.
- 4 Leaflets usually 13-21, permanently but inconspicuously appressed-pubescent beneath; bracts (evident only before anthesis) aristate; plants never with long, hispid pubescence.
- 5 Twigs and peduncles finely glandular-pubescent with hairs 1 (-2) mm long; plants abundantly pod-forming ..... *R. hartwigii*
- 5 Twigs and peduncles viscid with sessile or short-stalked glands (the racemes sometimes with some glandular pubescence); plants sterile or forming pods ..... *R. viscosa*
- 4 Leaflets usually 9-13, initially appressed-silky but later glabrate beneath; bracts (evident only before anthesis) not aristate; plants with or without sparse long, hispid pubescence.
- 6 Plants fruiting abundantly; shrubs 1-3 m tall ..... *R. hispida* var. *kelseyi*
- 6 Plants sterile (rarely fruiting scantily); shrubs or small trees, 0.4-3 (-8) m tall.
- 7 Shrubs or small trees, 1-3 (-8) m tall, much branched, the stems and branches relatively straight, the nodes usually lacking spines; leaflets 1.5-3 cm long ..... *R. hispida* var. *rosea*
- 7 Shrubs, 0.4-1 m tall, little branched, the stems and branches typically zigzag (bent at each node), the nodes usually with spines; leaflets 1-2 (-3) cm long ..... *R. nana*

***Robinia hartwigii*** Koehne, Granite Dome Locust, Highlands Locust, Hartwig's Locust. Forests and outcrop edges on high elevation granitic domes, also clearings. June-July; August-September. Apparently endemic to several mountains within a 5 km radius of Highlands, NC. While certainly related to and apparently hybridizing with *R. viscosa*, *R. hartwigii* seems worthy of recognition as a species. The original spelling (in Koehne 1913) is "*hartwigii*;" it is not clear why the variants (see synonymy) arose. [= RAB, S; = *R. viscosa* var. *hartwegii* (Koehne) Ashe – K, orthographic variant; = *R. viscosa* var. *hartwigii* – SE, Z; < *R. viscosa* – W; = *R. viscosa* var. *hardwegii* – Y, orthographic variant]

***Robinia hispida*** Linnaeus var. *fertilis* (Ashe) Clausen, Arnot Bristly Locust. Woodlands and forests. May-June; July-August. Apparently endemic to the Southern Appalachians of w. NC and e. TN. A horticultural selection of var. *fertilis*, the Arnot Bristly Locust, is used as a soil binder. [= C, F, K, SE, Z; < *R. hispida* – RAB; > *R. fertilis* Ashe – S; > *R. grandiflora* Ashe – S, Y; > *R. pedunculata* Ashe – S; < *R. hispida* – Pa, W]



***Robinia hispida*** Linnaeus var. *hispida*, Common Bristly Locust. Woodlands and forests, and as an escape in disturbed areas and roadsides. May-June. Probably originally endemic to the Southern Appalachians (and perhaps adjacent provinces) of NC, SC, GA, and VA, now widely distributed in e. North America as an escape from cultivation. [= C, F, K, SE, Z; < *R. hispida* – Pa, RAB, W, WH, WV; = *R. hispida* – G, S, WH, Y; > *R. hispida* – S; > *R. pallida* Ashe – S; > *R. speciosa* Ashe – S]

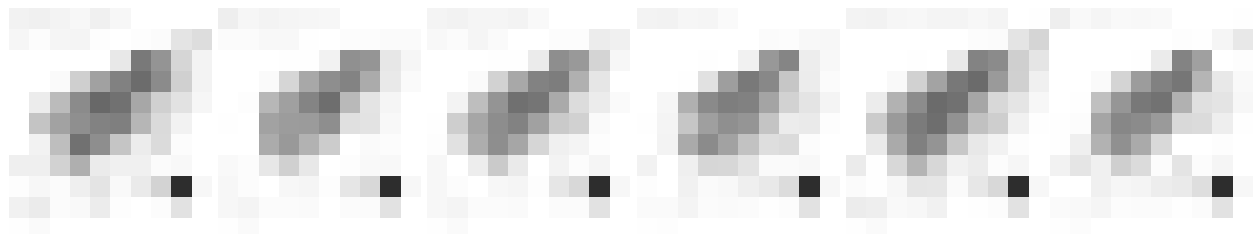
***Robinia hispida*** Linnaeus var. *kelseyi* (Cowell ex Hutchinson) Isely, Kelsey's Locust. Mountain woodlands, introduced elsewhere. April-July; July-October. Traditionally considered an endemic originally restricted to w. NC, but SE and Z suggest that var. *kelseyi* may have been only of horticultural origin. [= K, SE, Z; = *R. kelseyi* Cowell ex Hutchinson – G, RAB, S, Y; < *R. hispida* – Pa, W]

***Robinia hispida*** Linnaeus var. *rosea* Pursh, Boynton's Locust. Mountain woodlands. April-July. Originally distributed from w. NC and e. TN south to nw. SC, n. GA, and ne. AL, now occasionally found outside that range as an escape from cultivation. [= C, K, SE, Z; = *R. boyntonii* Ashe – G, RAB, S, Y; < *R. hispida* – Pa, W]

***Robinia nana*** Elliott, Dwarf Bristly Locust. Sandhills, dry rocky forests (especially associated with chestnut oak). April-June; July-October. Se. and nc. NC south through SC to GA and AL. This species fruits infrequently. [= *R. hispida* Linnaeus var. *nana* (Elliott) A.P. de Candolle – K, SE, Z; = *R. elliotii* (Chapman) Ashe ex Small – F, G; < *R. hispida* – W; > *R. nana* – RAB, S, Y; > *R. elliotii* – RAB, S, Y]

***Robinia pseudoacacia*** Linnaeus, Black Locust. Forests, woodlands, disturbed areas, roadcuts; common (uncommon in DE, rare in FL). April-June; July-November. Native in the s. and c. Appalachians, from PA south to GA and AL, now much more widespread, throughout e. and c. North America, also widely cultivated and escaped in Europe. Generally considered a weed tree. [= C, K, Pa, SE, WH, Z; = *R. pseudo-acacia* – F, RAB, S, WV, orthographic variant; > *R. pseudo-acacia* var. *pseudo-acacia* – G, orthographic variant; > *R. pseudo-acacia* var. *rectissima* (Linnaeus) Raber – G]

***Robinia viscosa*** Ventenat, Clammy Locust. Mountain forests and woodlands, roadsides, disturbed areas, rare in wild, uncommon as an escape. May-July; July-August. Originally a Southern and Central Appalachian endemic, ranging from PA south through w. MD, w. VA, e. WV, w. NC, and e. TN, to n. GA and n. AL, now much more widespread as an escape from cultivation. Reported for GA Coastal Plain (Marion County) (Carter, Baker, & Morris 2009). [= F, G, Pa, RAB, S, WV; = *R. viscosa* var. *viscosa* – C, K, SE, Y, Z; < *R. viscosa* – W (also see *R. hartwigii*)]



70. *Glycyrrhiza* Linnaeus 1753 (Licorice)

A genus of about 20 species, herbs, mainly of Eurasia (isolated taxa in North America, South America, and Australia).  
References: Isely (1998)=I.

\* *Glycyrrhiza lepidota* Pursh, Wild Licorice, American Licorice. Disturbed areas; native of w. North America. Described as naturalized in old fields in e. VA in C, F, and G. [= K; > *G. lepidota* Pursh var. *glutinosa* (Nuttall) S. Watson – C, F, G, I]

71. *Astragalus* Linnaeus 1753 (Milkvetch)

A genus of 2300-2500 species, herbs and shrubs, most diverse in arid regions of w. North America and w. and c. Asia. The habitats of the southeastern species may be characterized as rocky or sandy, "relictual islands" of aridity in the generally moist landscape of eastern North America. References: Barneby (1964)=Z; Isely (1998)=I.

- 1 Legume pilose with > 1 mm or more long; stems conspicuously pubescent, the hairs spreading and simple; plants decumbent, spreading, or ascending, the stems 0.5-4 dm long.
- 2 Corolla 14-19 mm long; leaflets 17-29; legume bilocular; calyx lobes shorter than the calyx tube; [of calcareous habitats of the interior].....*A. tennesseensis*
- 2 Corolla 8-12 mm long; leaflets (5-) 7-15; legume unilocular; calyx lobes equaling or longer than the calyx tube [of dry sandy habitats from SC south].....*A. villosus*
- 1 Legume glabrous; stems glabrous or inconspicuously pubescent, the hairs appressed, simple or dolabriform; plants erect with stems (3-) 4-15 dm long, or decumbent with stems 1-3 dm long (*A. distortus* var. *distortus* and *A. bibullatus*).
- 3 Plants erect, stems (3-) 4-15 dm long; legume straight to moderately curved.
- 4 Lower stipules connate; pubescence dolabriform; legumes 1-1.5 cm long, 4-5 mm in diameter; [typically of dry to mesic soils] .....*A. canadensis* var. *canadensis*
- 4 Lower stipules free; pubescence simple; legumes either longer or wider (2-3 cm long and 4-6 mm in diameter in *A. michauxii*, 1.5-2.0 cm long and 8-18 mm in diameter in *A. neglectus*); [typically of notably dry, either rocky or sandy, soils].
- 5 Leaves with 21-31 coriaceous to somewhat fleshy leaflets, many of the leaflets alternate or subopposite; legumes 2-3 cm long, 4-6 mm in diameter; [of dry sandy habitats from NC south].....*A. michauxii*
- 5 Leaves with 11-23 thin-textured leaflets, all of the leaflets usually opposite; legumes 1.5-2 cm long, 8-18 mm in diameter; [of rocky calcareous habitats from VA north].....*A. neglectus*
- 3 Plants decumbent or ascending, stems 1-5 dm long; legume either dry and strongly curved (about 90 degrees), or globose and initially fleshy.
- 6 Legume globose, 1.3-2 cm in diameter, initially fleshy; corolla 18-25 mm long; [of calcareous glades of c. TN].....*A. bibullatus*
- 6 Legume lanceolate, 1.2-2.5 cm long, 4-7 mm wide, strongly curved; corolla (7-) 8-15 mm long; [of shaly habitats from w. VA northward or of dry sandy sites in FL and possibly adjacent GA].
- 7 Leaflets mostly 1-2x as long as wide, typically noticeably notched at the tip; mature legume reticulately textured; corolla 8-11 mm long; [of dry sandy sites in FL and possibly adjacent GA and s. MS] .....*A. obcordatus*
- 7 Leaflets mostly 2-3.5x as long as wide, truncate or shallowly notched at the tip; mature legume lacking a reticulately textured surface; corolla 9-15 mm long; [either of shaly habitats from w. VA northward or of woodlands and prairies from MS westward]
- 8 Keel 7-9.5 mm long; legume usually 3-4x as long as wide, often curved 90°, grooved along sutures on both sides .....*A. distortus* var. *distortus*
- 8 Keel 6-7 mm long; legume usually 2.5-3.5x as long as wide, nearly straight or curved < 90°, grooved only along one suture.....*A. distortus* var. *engelmannii*

*Astragalus bibullatus* Barneby & E.L. Bridges, Pyne's Ground-plum. Calcareous glades. Endemic to c. TN (Barneby & Bridges 1987). [= I, K, SE; = *Geoprimum crassicaarpum* (Nuttall) Rydberg ex Small – S, misapplied; = *A. crassicaarpus* Nuttall, misapplied]

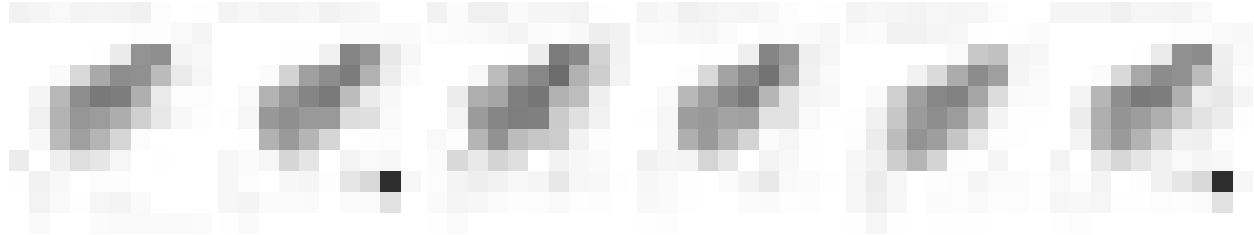
*Astragalus canadensis* Linnaeus var. *canadensis*, Canada Milkvetch. Forests, woodlands, streambanks, rocky slopes and bluffs. June-August; July-October. Ranging through much of North America, from QC and Hudson Bay west to BC, south to GA, TX, CO, and Utah; also apparently in Siberia. The other varieties occur farther west. See Barneby (1964) for a detailed discussion of taxonomic and nomenclatural problems involving *A. canadensis*. Barneby comments that "the eastern mountain race [in the Appalachians] is commonly distinguished from var. *canadensis* of the Mississippi Valley and northward by a narrower and more open flowering and fruiting raceme, and the flowers at the same time are relatively small. There is something to be said in favor of recognizing an eastern montane variety, so long as we confine its distinguishing characteristic to a loose raceme." The distribution, as mapped by Barneby, is suggestive of a composite map of 2 (or more) different taxa, one of them being centered in the Southern and Central Appalachians (extending out into nearby provinces). F and G separate var. *carolinianus*, basing the distinction, however, on a different set of characters, and considering var. *canadensis* to range south to

VA (at least). Further study is needed; it seems we may have in our area 2 taxa worthy of distinction at the varietal level. [= I, K, SE, Z; < *A. canadensis* – RAB, C, Pa, W; > *A. canadensis* var. *canadensis* – F, G; > *A. canadensis* var. *carolinianus* (Linnaeus) M.E. Jones – F, G; > *A. carolinianus* Linnaeus – S]

***Astragalus distortus*** Torrey & A. Gray var. *distortus*, Ozark Milkvetch, Bent Milkvetch. Shale barrens and other dry, shaley places. May-July. *A. distortus* is interpreted by Z (and followed by C and SE) to consist of 2 varieties: var. *distortus*, occurring in the s. Midwest from IL, MO, and OK south to MS, LA, and AR, and disjunct in n. and sc. VA, e. WV, and w. MD, and var. *engelmannii* (Sheldon) M.E. Jones, of TX and ne. LA. The two varieties seem fairly readily distinguishable morphologically in the Midwest. Appalachian var. *distortus* complicates the issue, since it approaches var. *engelmannii* in flower size and matches it in ovule number. The Appalachian plant, with a combination of morphologic characters not matching the two named varieties and far allopatric from them might better be considered a distinct variety. Further study is needed. [= C, I, K, SE, Z; < *A. distortus* – F, G; = *Holcophacos distortus* (Torrey & A. Gray) Rydberg – S]

***Astragalus distortus*** Torrey & A. Gray var. *engelmannii* (Sheldon) M.E. Jones. {habitats}. AR, TX, and w. LA; disjunct eastward in MS (NatureServe 2007). [= I, K, SE, Z]

***Astragalus michauxii*** (Kuntze) F.J. Hermann, Sandhills Milkvetch, Michaux's Milkvetch. Sandhills. Late April-June; June-October (and persisting). Sc. NC south through SC to GA, a Southeastern Coastal Plain endemic (reports from AL and FL are in error). "The Michaux milk-vetch is greatly isolated from any member of the genus morphologically similar" (Barneby 1964). [= RAB, I, K, SE, Z; = *Tium michauxii* (Kuntze) Rydberg – S]



***Astragalus neglectus*** (Torrey & A. Gray) Sheldon, Cooper Milkvetch. Dry calcareous woodlands and barrens, over dolostone and limestone. June-September. Se. ON west to se. SK and ne. ND, south to w. NY, ne. PA, c. PA, n. OH, s. MI, se. WI, and e. SD; disjunct in w. VA and e. WV (Wieboldt et al. 1998). [= C, F, G, I, K, Pa, SE, Z]

***Astragalus obcordatus*** Elliott, Florida Milk-vetch. Sandhills. S. MS south to c. peninsular FL. Reported for s. GA, but no specimen documentation is known (Barneby 1964). [= I, K, SE, WH, Z; = *Phaca obcordata* (Elliott) Rydberg ex Small – S]

***Astragalus tennesseensis*** A. Gray ex Chapman. Calcareous glades. C. TN, n. AL, IL (and formerly IN, and possibly MO). [= I, K, SE, Z; >> *A. tennesseensis* – F; >> *A. plattensis* Nuttall – F; > *Geoprumnon tennesseense* (A. Gray ex Chapman) Rydberg – S; >> *Geoprumnon plattense* (Nuttall) Rydberg – S]

***Astragalus villosus*** Michaux, Bearded Milkvetch, Southern Milkvetch. Sandhills and other dry, sandy places. May-June; June-August. A Southeastern Coastal Plain endemic: s. SC south to Panhandle FL, west to s. MS. This species is described by Barneby (1964) as "a lowly but delightful little astragalus." [= RAB, I, K, SE, WH, Z; = *Phaca intonsa* (Sheldon) Rydberg ex Small – S]

72. ***Cicer*** Linnaeus 1753 (Chick Pea, Garbanzo)

A monotypic genus, of Mediterranean Europe, w. Asia. References: Isely (1998)=I.

\* ***Cicer arietinum*** Linnaeus, Chick Pea, Garbanzo. Disturbed areas; native of Mediterranean Europe and w. Asia. Described by Isely (1998) as "an occasional recurrent waif." [= I, K2, SE]



73. ***Trifolium*** Linnaeus 1753 (Clover)

A genus of about 240-250 species, annual and perennial herbs, nearly cosmopolitan (primarily north temperate). References: Zohary & Heller (1984)=Z; Isely (1998)=I. Draft key adapted from various published sources, including SE and C.

1 Flowers bright yellow (fading brown); [section *Chronosemium*].

2 Leaves palmately trifoliolate (all leaflets essentially sessile); heads 10-13 mm in diameter; flowers 5-7 mm long ..... ***T. aureum***

- 2 Leaves pinnately trifoliolate (the lateral leaflets essentially sessile, the terminal leaflet with a petiolule 0.8-3 mm long; heads 5-13 mm in diameter; flowers 2.5-5 mm long.
- 3 Standard with 5 obvious diagonal veins (striations); heads 8-13 mm in diameter, generally with 20-30 flowers; flowers 3.5-5 mm long; petiolule of the terminal leaflet 1-3 mm long ..... *T. campestre*
- 3 Standard inconspicuously veined; heads 5-8 mm in diameter, generally with 5-15 (-20) flowers; flowers 2.5-3.5 mm long; petiolule of the terminal leaflet ca. 1 mm long ..... *T. dubium*
- 1 Flowers not bright yellow.
- 4 Flowers borne on distinct pedicels, (1-) 2-10 mm long, these often curving or reflexing in age; flowers white, fading pink with age in most species; [native and alien species]; [section *Lotoidea*].
- 5 Plants stoloniferous, all or some of the leaves alternate from ground level and long petioled.
- 6 Calyx lobes narrowly triangular, about as long as the calyx tube; peduncles axillary along the stolons; stipules scarious-membranaceous; [plant an abundant introduced weed] ..... *T. repens*
- 6 Calyx lobes subulate, distinctly longer than the calyx tube; peduncles terminal, either at tips of the stolons, or at tips of erect flowering branches; stipules green, foliaceous; [plants rare natives].
- 7 Peduncle terminal, at the tip of the stolon, lacking leaves; pedicels 2-3 mm long ..... *T. calcaricum*
- 7 Peduncle terminal at tip of erect flowering branches, subtended by a pair of opposite or subopposite, short-petioled leaves; pedicels (2-) 4-8 mm long ..... *T. stoloniferum*
- 5 Plants not stoloniferous, clumped (though sometimes with prostrate or lax stems).
- 8 Calyx lobes narrowly triangular, about as long as the calyx tube (or longer in *T. hybridum*); stipules scarious-membranaceous; [plants introduced].
- 9 Calyx lobes not scarious-margined, straight, equal to or longer than the tube ..... *T. hybridum*
- 9 Calyx lobes scarious-margined, becoming divergent and twisted, about equal to the tube ..... *T. nigrescens*
- 8 Calyx lobes subulate to lanceolate, distinctly longer than the calyx tube; stipules green, foliaceous; [plants rare natives].
- 10 Flowers 4-6 mm long; calyx lobes lanceolate, foliaceous, 3-nerved, 0.4-0.8 mm wide ..... *T. carolinianum*
- 10 Flowers 8-12 mm long; calyx lobes subulate, setaceous, 1-nerved, < 0.4 mm wide.
- 11 Leaflets 1-2.8× as long as wide; stems erect or ascending; flowers purplish; plant an annual or biennial; [plants of a variety of natural woodlands, widespread in our area] ..... *T. reflexum*
- 11 Leaflets 3-7× as long as wide; stems prostrate; flowers creamy white and purple-veined; plant a perennial; [plants of shale barrens and other rock outcrops, from VA northward] ..... *T. virginicum*
- 4 Flowers sessile or on very short pedicels (usually < 1 mm long); flowers pink, purplish, white, or scarlet; [alien species].
- 12 Plants stoloniferous, all or some of the leaves alternate from ground level and long petioled.
- 13 All flowers with petals; fruiting heads enlarging, becoming a reddish brown, pubescent ball ca. 2 cm in diameter, remaining aerial; [section *Vesicaria*] ..... *T. fragiferum*
- 13 Only 2-5 outer flowers of the head with petals, the others lacking petals and sterile; fruiting heads becoming a subterranean bur, buried by curvature and growth of the peduncle; [section *Trichocephalum*] ..... *T. subterraneum*
- 12 Plants not stoloniferous, the leaves clustered at or near ground level and/or produced on aerial stems.
- 14 Heads subtended by a pseudo-involucre of 2 (-3) enlarged stipules and/or opposite or subopposite leaves; [section *Trifolium*].
- 15 Flowers white (fading pink), 7-8 mm long; calyx tube **both** externally glabrous **and** 20-nerved ..... *T. lappaceum*
- 15 Flowers red, pink-purple, or bicolored, **either** 11-20 mm long **or** 4-6 mm long; calyx tube not **both** externally glabrous **and** 20-nerved (externally pubescent, or 10-nerved, or both).
- 16 Flowers 4-6 mm long ..... *T. striatum*
- 16 Flowers 11-20 mm long.
- 17 Stipules gradually tapering to a long slender tip, longer than the fused part; calyx densely hirsute; stem soft pubescent with deflexed to spreading hairs ..... *T. hirtum*
- 17 Stipules abruptly narrowed to a short awn; calyx glabrous to pilose; stem appressed pubescent ..... *T. pratense*
- 14 Heads not subtended by a pseudo-involucre of leaves or expanded stipules.
- 18 Heads axillary, sessile, in the axils of subtending leaves; calyx tube glabrous (except for a few hairs at apex); [section *Lotoidea*] ...  
..... *T. glomeratum*
- 18 Heads terminal or axillary; calyx tube pubescent.
- 19 Calyx bladderly-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 bladderly-inflated in fruit; corolla orientation normal (standard uppermost).
- 21 Corolla 3-6 mm long; [section *Trifolium*] ..... *T. arvense*
- 21 Corolla 10-18 mm long.
- 22 Corolla crimson, 10-13 (-15) mm long; floral bracts absent; heads 1-1.5 (-2) cm in diameter; [section *Trifolium*] .....  
..... *T. incarnatum*
- 22 Corolla white, 15-18 mm long; floral bracts present; heads 2.5-3 cm in diameter; [section *Mistyllus*] ..... *T. vesiculosum*

\* *Trifolium angustifolium* Linnaeus, Narrowleaf Clover. Waste areas near wool-combing mills, perhaps only a waif; native of Mediterranean Europe and w. Asia. Reported for SC (Kartesz 1999), based on specimen at NCU. [= I, K] {not yet keyed}

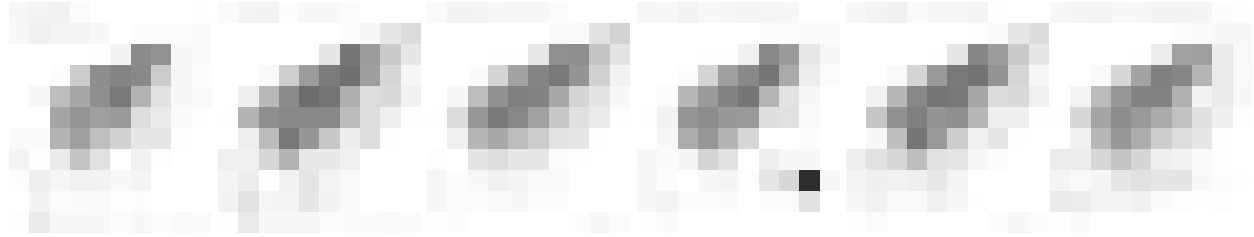
\* *Trifolium arvense* Linnaeus, Rabbitfoot Clover. Disturbed areas, shale barrens; native of the Mediterranean region. April-August. [= RAB, C, F, G, I, K, Pa, S, SE, W, WH, WV]

\* *Trifolium aureum* Pollich, Large Hop Clover, Yellow Clover. Fields, roadsides, disturbed areas; native of Eurasia. May-August. [= C, I, K, Pa, SE, W; = *T. agrarium* Linnaeus – RAB, F, G, S, WV, misapplied]

*Trifolium calcaricum* J.L. Collins & Wieboldt. Limestone glades. In c. TN (Chester, Wofford, & Kral 1997). For additional information, see Collins & Wieboldt (1992). [= I, K]

\* *Trifolium campestre* Schreber, Hop Clover. Roadsides, fields, lawns, disturbed areas; native of Eurasia. April-October. [= RAB, C, I, K, Pa, SE, W, WH, WV; ? *T. procumbens* Linnaeus – F, G, S, misapplied]

***Trifolium carolinianum*** Michaux, Wild White Clover, Carolina Clover. Open woodlands, woodland edges, pine savannas, thin soils around rock outcrops, disturbed areas. April-July. Se. NC south to n. FL, west to MO, OK, and c. TX. [= RAB, C, F, G, I, K, SE, W, WH; > *T. carolinianum* – S; > *T. saxicola* Small – S]



\* ***Trifolium cernuum*** Brotero, Nodding-head Clover. Waste areas near wool-combing mills, perhaps only a waif; native of Mediterranean Europ and n. Africa. [= K] {not yet keyed}

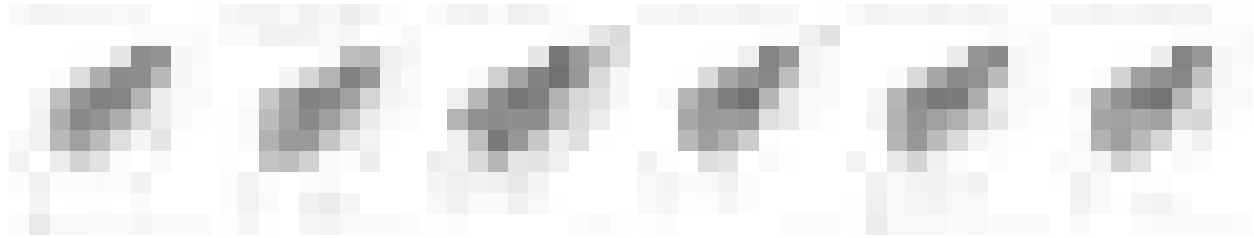
\* ***Trifolium depauperatum*** Desvaux var. *depauperatum*, Cowbag Clover, Balloon-sack Clover, Poverty Clover. Waste areas near wool-combing mills, perhaps only a waif; native of w. North America (BC south to CA). [= I, K] {not yet keyed}

\* ***Trifolium dubium*** Sibthorp, Low Hop Clover. Roadsides, lawns, disturbed areas; native of Europe. April-October. [= RAB, C, F, G, I, K, Pa, S, SE, W, WH, WV]

\* ***Trifolium fragiferum*** Linnaeus, Strawberry Clover. Disturbed areas; native of Middle East. Introduced in c. GA (Jones & Coile 1988) and reported from an old collection from se. PA (Rhoads & Klein 1993). [= C, F, G, I, K, SE]

\* ***Trifolium glomeratum*** Linnaeus, Cluster Clover. {habitat}; native of Mediterranean region. Also reported for SC by Kartesz (1999), but the specimen is actually *T. cernuum*. [= I, K1, K2, S, SE]

\* ***Trifolium gracilentum*** Torrey & A. Gray. Waste areas near wool-combing mills, perhaps only a waif; native of w. North America. [> *T. gracilentum* var. *gracilentum* – K1, K2] {not yet keyed; add synonymy}



\* ***Trifolium hirtum*** Allioni, Rose Clover. Roadsides, disturbed areas; native of Eurasia and n. Africa. April-July. A report for VA has no documentation. [= RAB, C, G, I, K, SE]

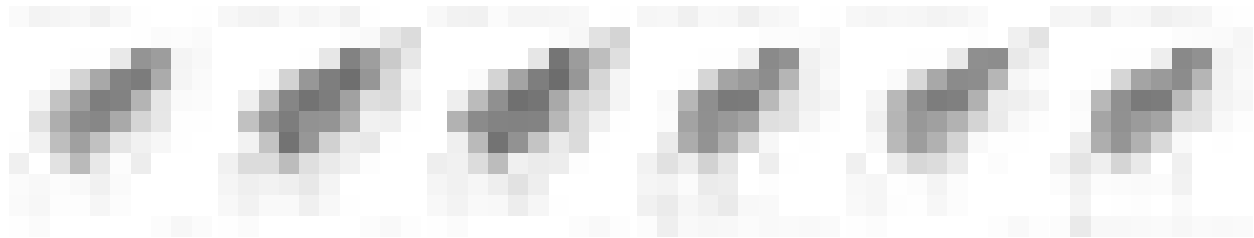
\* ***Trifolium hybridum*** Linnaeus, Alsike Clover. Lawns, fields, roadsides, disturbed areas; native of Europe. April-October. [= RAB, C, G, I, K, Pa, S, SE, W, WH, WV; > *T. hybridum* var. *hybridum* – F; > *T. hybridum* var. *elegans* (Savi) Boiss. – F]

\* ***Trifolium incarnatum*** Linnaeus, Crimson Clover. Fields, disturbed areas; native of Europe. April-September; June-October. [= RAB, C, F, G, I, K, Pa, S, SE, W, WH, WV]

\* ***Trifolium lappaceum*** Linnaeus, Lappa Clover, Burdock Clover. Disturbed areas; native of Mediterranean Eurasia and Africa. April-August. [= RAB, I, K, S, SE, WH]

\* ***Trifolium medium*** Linnaeus, Zigzag Clover. Reported as introduced in MD and NJ (Kartesz 1999; Kartesz 2010). Native of Europe. [= K] {not keyed; rejected as a component of our flora}

\* ***Trifolium michelianum*** Savi, Big-flower Clover. Disturbed areas; native of Mediterranean Europe. [> *T. michelianum* var. *balansae* (Boiss.) Ponert – K2] {not keyed}



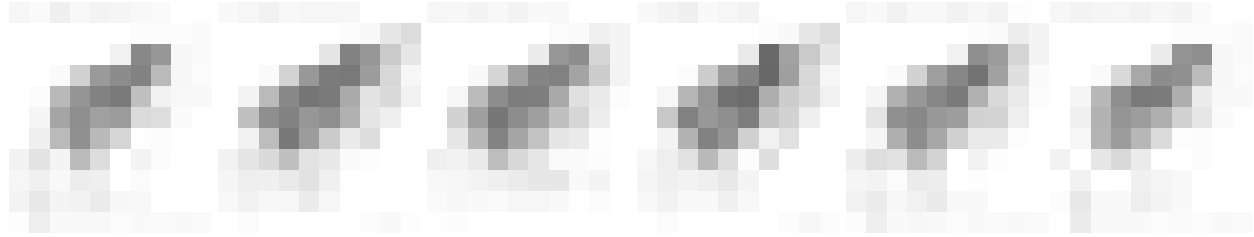
\* ***Trifolium nigrescens*** Viviani, Ball Clover. Disturbed areas; native of Mediterranean Europe and n. Africa. Introduced in c. TN (Chester, Wofford, & Kral 1997). [= I, K, S, SE, WH]

\* ***Trifolium pratense*** Linnaeus, Red Clover. Fields, roadsides, disturbed areas; native of Europe. April-October. [= RAB, C, G, I, K, Pa, S, SE, W, WH, WV; > *T. pratense* var. *pratense* – F; > *T. pratense* var. *sativum* (P. Miller) Schreber – F]

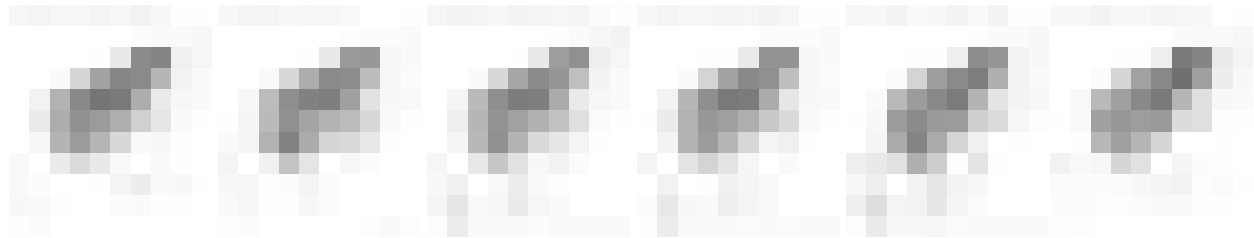
\* ***Trifolium reflexum*** Linnaeus, Buffalo Clover. Open woodlands, woodland edges, dry shaly places. April-May. [= RAB, C, I, K, Pa, S, SE, W, WH, WV; > *T. reflexum* var. *reflexum* – F, G; > *T. reflexum* var. *glabrum* Lojaccono – F, G]

\* ***Trifolium repens*** Linnaeus, White Clover, Dutch Clover, Ladino Clover. Lawns, roadsides, disturbed areas; native of Eurasia. April-November. [= RAB, C, F, G, I, K, Pa, S, SE, W, WH, WV]

- \* *Trifolium resupinatum* Linnaeus, Persian Clover, Reversed Clover. Lawns and disturbed areas; native of Mediterranean region and w. Asia. April-September. [= RAB, C, F, G, I, K, Pa, S, SE, WH]
- \* *Trifolium spumosum* Linnaeus, Pink Clover. Disturbed areas; rare, native of Mediterranean Europe. [= K, WH] {not yet keyed}



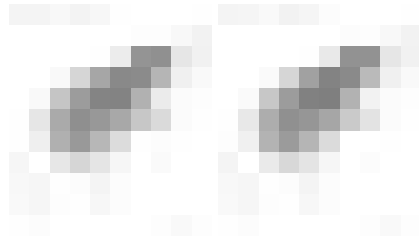
- Trifolium stoloniferum* Muhlenberg ex Eaton, Running Buffalo-clover. Dry upland woodlands and prairies. WV, OH, n. IN, IL, MO, and e. KS, south to KY and AR, now extirpated from significant portions of its range. [= C, F, G, I, K, S, SE, WV]
- \* *Trifolium striatum* Linnaeus, Knotted Clover. Roadsides, disturbed areas, waste areas near wool-combing mills; native of Europe. April-August. [= RAB, C, F, G, I, K, S, SE]
- \* *Trifolium subterraneum* Linnaeus, Subterranean Clover. Disturbed areas, waste areas near wool-combing mills; native of Europe, Asia, and n. Africa. Reported for NC and SC by Isely (1990); reported for Piedmont of GA by Jones & Coile (1988), and collected in MS (Stone County) (S.W. Leonard, pers. comm. 2007). [= I, K, SE]
- \* *Trifolium tomentosum* Linnaeus. Waste areas near wool-combing mills, other disturbed areas; native of Mediterranean region. Reported for NC by Isely (1998). [= I, K, WH]
- \* *Trifolium vesiculosum* Savi, Arrowleaf Clover. Roadsides, disturbed areas; native of s. Europe. First reported for South Carolina by Hill & Horn (1997). [= I, K, SE, WH]
- Trifolium virginicum* Small, Kates Mountain Clover, Shale-barren Clover. Shale barrens, other rock outcrops. May-August. Sc. PA through w. MD south to w. VA and e. WV. [= C, F, G, I, K, Pa, SE, W, WV]



74. *Ononis* Linnaeus 1753 (Rest-harrow)

A genus of about 70 species, annual and perennial herbs and shrubs, of Europe (especially Mediterranean), w. Asia, and n. Africa. References: Sell & Murrell (2009)=Z; Stace (2010)=Y.

- 1 Stems procumbent to ascending, uniformly hairy; leaflets < 3× as long as wide, obtuse to emarginate ..... *O. repens* ssp. *repens*
- 1 Stems ascending to erect, mainly hairy along 1 side, or along 2 opposite sides; leaflets > 3× as long as wide, acute or nearly so .... *O. spinosa*
- \* *Ononis repens* Linnaeus ssp. *repens*, Common Rest-harrow. Disturbed areas, probably only a waif; native of Europe. [= Y; = *O. spinosa* Linnaeus ssp. *procurrens* (Wallroth) Briquet – Z; < *O. repens* – K2]
- \* *Ononis spinosa* Linnaeus, Spiny Rest-harrow. Disturbed areas, probably only a waif; native of Europe. [= K2, Y; = *O. spinosa* ssp. *spinosa* – Z; > *Ononis campestris* W.D.J. Koch & Ziz]



75. *Melilotus* P. Miller 1754 (Melilot, Sweetclover, Sourclover)

A genus of about 20 species, annual and perennial herbs, of temperate Eurasia and Africa. References: Stace (2010)=Z; Isely (1998)=I. Key based in part on Stace (2010).

- 1 Corolla white ..... *M. albus*
- 1 Corolla yellow.

- 2 Corolla 2-3.5 mm long; fruits < 3 mm long.....*M. indicus*  
 2 Corolla > 4 mm long; fruits > 3 mm long..... *M. officinalis*

\* *Melilotus albus* Medikus, White Melilot, White Sweetclover. Fields, roadsides, disturbed areas; native of Eurasia. April-October. *M. albus* and *M. officinalis*, nearly identical except in flower color, are apparently incompatible (Isely 1998); they should not be synonymized, as was done by Kartesz (1999). Other differences useful in the determination of faded herbarium specimens are given by Isely (1998): corolla 3.5-5 mm long, the wing petals about as long as the keel (*M. albus*) vs. corolla 5-7 mm long, the wing petals generally longer than the keel (*M. officinalis*). [= I, WH, Z; = *M. alba* – RAB, C, F, G, Pa, S, SE, W, WV, orthographic variant; < *M. officinalis* – K]

\* *Melilotus indicus* (Linnaeus) Allioni, Small Melilot, Sourclover. Roadsides, disturbed areas; native of Mediterranean Europe. April-October. [= I, K, WH, Z; = *M. indica* – RAB, C, F, G, S, SE, orthographic variant]

\* *Melilotus officinalis* (Linnaeus) Pallas, Yellow Melilot, Yellow Sweetclover, Ribbed Melilot. Fields, roadsides, disturbed areas; native of Eurasia. April-October. [= RAB, C, F, G, I, Pa, S, SE, W, WH, WV, Z; < *M. officinalis* – K]

\* *Melilotus sulcatus* Desfontaines, Mediterranean Sweetclover. Native of Mediterranean Europe. Reported for AL by Kartesz (2010) based on misidentified specimens. {not keyed; not mapped; rejected as a component of our flora}

### 76. *Medicago* Linnaeus 1753 (Medick, Bur-clover)

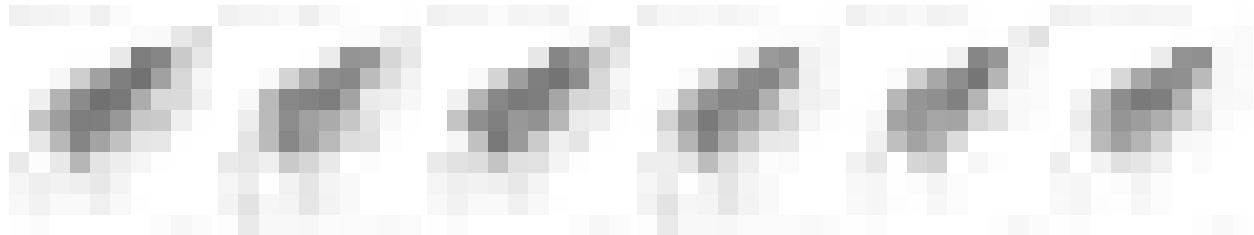
A genus of about 80 species, annual and perennial herbs, of Eurasia and Africa. References: Isely (1998)=I. Key based largely on SE.

- 1 Legume 1-seeded, reniform, black at maturity; corolla 2-3 mm long.....*M. lupulina*  
 1 Legume several-seeded, spirally coiled or falcate, tan to dark brown; corolla 3-11 mm long.  
 2 Plants perennial, mostly erect or ascending, 2-8 (-10) dm tall; corolla 6-11 mm long, violet, yellow, or varicolored; legumes spineless.  
 3 Legume falcate; corolla yellow.....*M. falcata*  
 3 Legume spiral; corolla violet or varicolored (rarely yellow).....*M. sativa*  
 2 Plant annual, mostly prostrate or ascending, 1-6 dm tall; corolla 3-6 mm long, yellow; legumes spiny (except lacking spines in *M. orbicularis*).  
 4 Stipules entire or slightly dentate (*M. minima*) or the base only of the stipule lacerate (*M. laciniata*); plants pilose (*M. minima*) or glabrous (*M. laciniata*).  
 5 Stipules lacerate at the base; plant glabrous.....*M. laciniata*  
 5 Stipules entire or slightly dentate; plant pilose.....*M. minima*  
 4 Stipules lacerate; plants glabrous or sparsely pubescent.  
 6 Legume lacking spines; stipules deeply lacerate, the sinuses extending nearly to the base.....*M. orbicularis*  
 6 Legume spiny; stipules **either** deeply lacerate (*M. polymorpha*) or shallowly lacerate (*M. arabica*).  
 7 Leaflets 0.7-1.1× as long as wide, usually marked with a central dark spot; leaflet tip usually strongly notched; stipules shallowly lacerate, the sinuses extending < ½ way to the base.....*M. arabica*  
 7 Leaflets 1-2× as long as wide, not marked with a central dark spot; leaflet tip not strongly notched; stipules deeply lacerate, the sinuses extending > ½ way to the base.....*M. polymorpha*

\* *Medicago arabica* (Linnaeus) Hudson, Spotted Medick, Spotted Bur-clover. Fields, roadsides, disturbed areas; native of Mediterranean Europe. April-August. [= RAB, F, G, I, K, S, SE]

\* *Medicago falcata* Linnaeus, Yellow Alfalfa, Sickle Medick. Disturbed areas, perhaps only a waif; native of n. Eurasia. April-July. [= F, G, I, S, SE; = *M. sativa* Linnaeus ssp. *falcata* (Linnaeus) Arcangeli – C, K]

\* *Medicago laciniata* (Linnaeus) P. Miller. Waste areas around wool-combing mills; rare, native of Europe, perhaps merely a waif. [= F, I, K]



\* *Medicago lupulina* Linnaeus, Black Medick, Yellow Trefoil. Fields, roadsides, disturbed areas; native of Europe. March-December. [= RAB, C, G, I, K, Pa, S, SE, W, WH, WV; > *M. lupulina* var. *lupulina* – F; > *M. lupulina* var. *glandulosa* Neilreich – F]

\* *Medicago minima* (Linnaeus) Linnaeus, Downy Bur-clover, Bur Medick. Fields, roadsides, disturbed areas; native of Eurasia. April-August. [= RAB, C, G, I, K, S, SE, WH; > *M. minima* var. *minima* – F; > *M. minima* var. *compacta* Neyraut – F; > *M. minima* var. *longiseta* A.P. de Candolle – F]

\* *Medicago orbicularis* (Linnaeus) Bartalini. Lawns, disturbed areas; native of Mediterranean Europe and n. Africa. April-July. [= RAB, G, I, K, SE, WH]

\* *Medicago polymorpha* Linnaeus, Smooth Bur-clover, Toothed Medick. Fields, roadsides, lawns, disturbed areas; native of Mediterranean Europe. March-April. [= RAB, C, I, K, SE, WH; = *M. hispida* Gaertner – F, G, S]

\* *Medicago sativa* Linnaeus, Alfalfa, Lucerne, Blue Alfalfa. Roadsides, fields, disturbed areas; native of se. Europe. April-July. [= RAB, F, G, I, Pa, S, SE, W, WH, WV; = *M. sativa* Linnaeus ssp. *sativa* – C, K]



77. *Vicia* Linnaeus 1753 (Vetch, Tare)

A genus of about 150-160 species, annual and perennial herbs, of temperate Eurasia and North America. References: Isely (1998)=I; van de Wouw, Maxted, & Ford-Lloyd (2003)=Y. Key adapted from I.

- 1 Inflorescence nearly sessile, of 1-4 flowers clustered in the leaf axil; [alien species].
  - 2 Leaves with 2-6 leaflets, succulent; leaflets 3-7 cm long; legume with pectinate sutures..... *V. narbonensis*
  - 2 Leaves with 4-20 leaflets, not succulent; leaflets 0.3-3.5 cm long; legume not pectinate (except *V. lutea*).
  - 3 Corolla 5-6 mm long; leaves with 4-6 (-8) leaflets..... *V. lathyroides*
  - 3 Corolla 10-30 mm long; leaflets 6-16 (-20).
    - 4 Calyx lobes conspicuously unequal; legumes pilose with pustulate-based hairs..... *V. lutea*
    - 4 Calyx lobes more or less equal; legumes glabrous at maturity, or very finely pubescent with non-pustulate-based hairs.
      - 5 Calyx lobes all shorter than the calyx tube; corolla yellow, often streaked with purple, 25-30 mm long ..... *V. grandiflora*
      - 5 Calyx lobes (at least the longer) about as long as the calyx tube; corolla pink, purple, lavender, white, or creamy yellow, 10-25 (-30) mm long.
        - 6 Standard pubescent dorsally; corolla 15-25 (-30) mm long, creamy yellow to purple; legume pubescent, with a basal stipe..... *V. pannonica*
        - 6 Standard glabrous; corolla 10-25 (-30) mm long, pink, purple, lavender, or whitish; legume glabrous, sessile.
          - 7 Calyx 7-11 (-12) mm long; corolla pink-purple to whitish, 10-18 mm long; leaflets 4-10× as long as wide ..... *V. sativa* ssp. *nigra*
          - 7 Calyx 10-15 mm long; corolla generally pink-purple, 18-25 (-30) mm long; leaflets 2-5 (-7)× as long as wide ..... *V. sativa* ssp. *sativa*
  - 1 Inflorescence pedunculate, of 2-many flowers along a well-developed raceme; [alien and native species].
    - 8 Peduncles 1-10 mm long; raceme axis 2-10 mm long, with 2-7 (-10) flowers.
      - 9 Plant a robust annual, 10-20 dm tall; tendrils absent; leaves with (2-) 4-6 leaflets; leaflets 5-10 cm long; corolla 20-30 mm long ..... *V. faba*
      - 9 Plant a trailing perennial, 3-10 dm tall; tendrils present; leaves with 8-16 leaflets; leaflets 2-3.5 cm long; corolla 10-15 mm long ..... *V. sepium*
    - 8 Peduncles usually >10 mm long; raceme axis usually >10 mm long, with (1-) 2-many flowers.
      - 10 Corolla 10-25 mm long.
        - 11 Stipules dimorphic, one of each pair entire, the other palmately lacerate; flowers 1 (-2) per inflorescence..... [*V. articulata*]
        - 11 Stipules of a pair alike; flowers 1-numerous per inflorescence.
          - 12 Flowers 15-22 (-25) mm long; legumes with a basal stipe 2-5 mm long; leaves with 8-16 leaflets..... *V. americana* var. *americana*
          - 12 Flowers 8-16 (-18) mm long; legumes with a basal stipe 1-3 mm long; leaves with 8-22 leaflets.
            - 13 Calyx swollen on one side; plant an annual; inflorescence secund.
              - 14 Plant glabrate or with pubescence of hairs < 1 mm long; lower calyx lobe lanceolate to linear-lanceolate, 1-2 (-2.4) mm long ..... *V. villosa* ssp. *varia*
              - 14 Plant conspicuously villous, the hairs 1-2 mm long; lower calyx lobe acicular or weak, 2-4 mm long .... *V. villosa* ssp. *villosa*
            - 13 Calyx not swollen on one side; plant a rhizomatous perennial; inflorescence not secund.
              - 16 Flowers white to lavender, the keel spotted; legumes 4-5 mm wide; inflorescence not secund..... *V. caroliniana*
              - 16 Flowers blue-violet or purple; legumes 6-8 mm wide; inflorescence generally secund..... *V. cracca*
      - 10 Corolla 2.5-8 (-10) mm long.
        - 17 Plant a rhizomatous perennial.
          - 18 Leaves with 2-4 (-6) leaflets; [plants of s. SC southward, native, of the Coastal Plain].
            - 19 Legumes 2.5-3.0 cm long; leaflets 1.5-4.5 cm long, oblong to linear, 8-20× as long as wide ..... *V. acutifolia*
            - 19 Legumes 0.8-1.5 cm long; leaflets 1-1.5 cm long, usually elliptic, 2-4 (-10)× as long as wide ..... *V. floridana*
          - 18 Leaves with 10-25 leaflets; [plants collectively widespread in our area, native or alien].
            - 20 Flowers white to lavender, the keel spotted; legumes 4-5 mm wide; inflorescence not secund ..... *V. caroliniana*
            - 20 Flowers blue-violet or purple; legumes 6-8 mm wide; inflorescence generally secund ..... *V. cracca*
    - 17 Plant an annual.
      - 21 Legume symmetrically rounded at the apex; inflorescence with 1-2 (-4) flowers ..... *V. tetrasperma*
      - 21 Legume asymmetrically acute at the apex; inflorescence with 1-15 flowers.
        - 22 Leaves with 2-4 leaflets; legume glabrous to inconspicuously puberulent..... *V. minutiflora*
        - 22 Leaves with (8-) 10-16 leaflets; legume glabrous or finely hirsute.
          - 23 Legume finely hirsute; calyx 2-2.5 mm long; corolla 2.5-4.5 mm long..... *V. hirsuta*
          - 23 Legume glabrous; calyx 2.8-3.7 mm long; corolla 4.5-8 mm long.
            - 24 Racemes (2-) 4-9 (-12) flowered; corolla blue-purple; leaves with (4-) 8-12 (-14) leaflets.....



- .....*V. ludoviciana* ssp. *ludoviciana*  
 24 Racemes 1-6-flowered; corolla pinkish-white or lavender; leaves with (6-) 12-14 (-18) leaflets .....  
 .....*V. ludoviciana* ssp. *leavenworthii*

*Vicia acutifolia* Elliott, Fourleaf Vetch. Pond margins, pine flatwoods, ditches. April-May; May-June. Se. SC south to s. FL, west to e. Panhandle FL. [= RAB, GW, I, K, S, SE, WH]

*Vicia americana* Willdenow var. *americana*, American Vetch, Purple Vetch, Tare. Moist soils. May-July. Var. *americana* ranges from QC west to AK, south to w. VA, s. WV, MO, OK, TX, Mexico. Var. *minor* Hooker occurs in w. North America. The report for AL (Woods & Diamond 2006) has been shown to be a misidentification (Spaulding, pers. comm.). [= C, F, G, I, SE; = *V. americana* ssp. *americana* – K; < *V. americana* – Pa, W, WV]

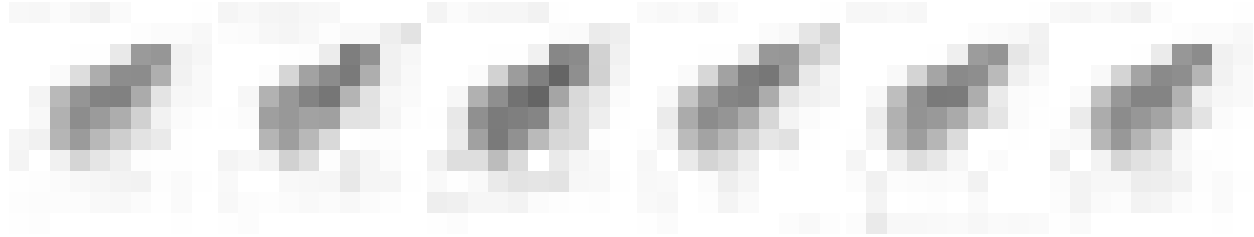
\* *Vicia articulata* Hornemann, Monantha Vetch, Oneflower Vetch. Perhaps only cultivated; native of Europe. [=I, K, SE] {not mapped; reject a component of our flora}

*Vicia caroliniana* Walter, Pale Vetch, Wood Vetch, Carolina Vetch. Forests, woodlands, and disturbed areas. April-June; May-July. NY west to WI, south to s. GA, s. MS, and c. TX. [= C, F, G, I, K, Pa, SE, W, WH, WV; > *V. caroliniana* – RAB, S; > *V. hugeri* Small – RAB, S]

\* *Vicia cracca* Linnaeus, Tufted Vetch, Cow Vetch, Canada-pea. Disturbed areas; native of Europe. May-August; June-September. [= RAB, C, G, Pa, S, SE; > *V. cracca* var. *cracca* – F, I; > *V. cracca* ssp. *cracca* – K]

\* *Vicia faba* Linnaeus, Horse Bean, Faba Bean, Broad Bean. Disturbed areas; native of Mediterranean Europe. Introduced in se. PA (Rhoads & Klein 1993). [= C, F, G, I, K, SE]

*Vicia floridana* S. Watson, Florida Vetch. Moist soils of hammocks, ditches, roadbanks. E. GA (McIntosh Co.) south to c. peninsular FL. [= GW, I, K, S, SE, WH]



\* *Vicia grandiflora* Scopoli, Large Yellow Vetch. Disturbed areas; native of Europe. April-June; May-July. [= C, I, F, G, K, SE, W, WH; > *V. grandiflora* var. *kitaibeliana* W.D.J. Koch – RAB]

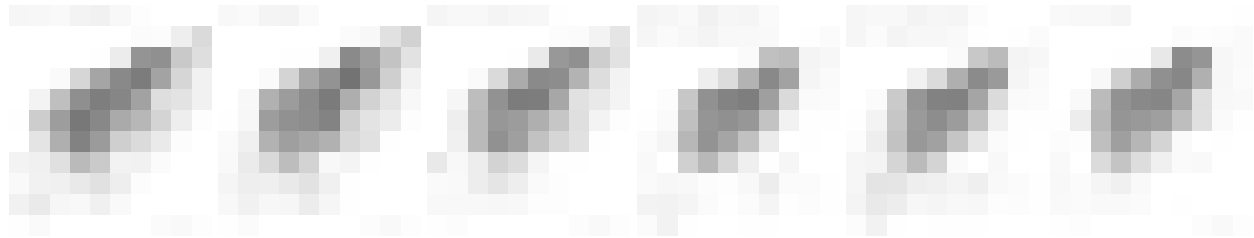
\* *Vicia hirsuta* (Linnaeus) S.F. Gray, Tiny Vetch, Hairy Tare. Disturbed areas, native of Europe. April-June; May-July. [= RAB, C, F, G, I, K, Pa, S, SE, WH]

\* *Vicia lathyroides* Linnaeus, Spring Vetch. Lawns, disturbed areas; native of Europe. April-June; May-July. [= RAB, C, I, F, G, K, SE]

*Vicia ludoviciana* Nuttall ssp. *leavenworthii* (Torrey & A. Gray) Lassetter & Gunn. Woodlands, prairies, dunes, disturbed areas. MS and MO west to NM and TX. In our area is Race 2 (“*louisianica*” race) of ssp. *leavenworthii* (Isely 1998). [= I, K, SE] {add to synonymy}

*Vicia ludoviciana* Nuttall ssp. *ludoviciana*, Louisiana Vetch. Woodlands, prairies, dunes, disturbed areas. AL and Panhandle FL west to OR and CA. In our area is Race 1 (“*ludoviciana*” race) of ssp. *ludoviciana* (Isely 1998). [= I, K, SE; = *V. ludoviciana* – WH] {add to synonymy}

\* *Vicia lutea* Linnaeus, Yellow Vetch. Disturbed areas; native of Europe. [= I, K, SE]



*Vicia minutiflora* F.G. Dietrich, Smallflower Vetch. Woodlands, dry hammocks. TN, Panhandle FL, and sw. GA west to OK and TX. [= GW, I, K, SE, WH, Y; = *V. micrantha* Nuttall ex Torrey & A. Gray – F, G, S]

\* *Vicia narbonensis* Linnaeus, Narbonne Vetch. Disturbed areas; native of Europe. Introduced in MD and DC (Fernald 1950). [= C, F, G, I, K, SE]

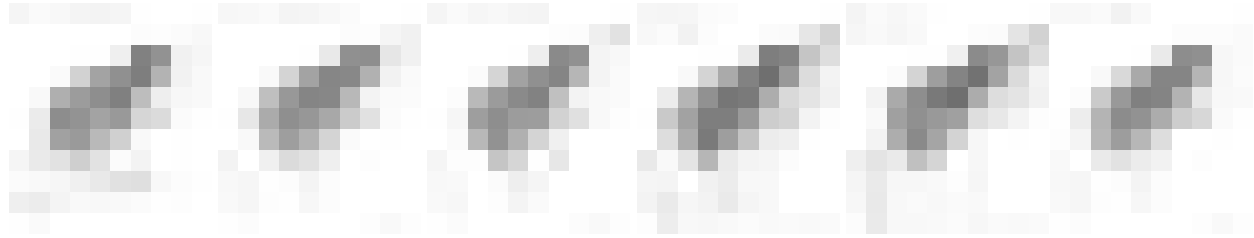
\* *Vicia pannonica* Crantz, Hungarian Vetch. Disturbed areas; native of Europe. Introduced in c. GA. Reported for NC (Isely 1998). {investigate} [= I, K, SE]

\* *Vicia sativa* Linnaeus ssp. *nigra* (Linnaeus) Ehrhart, Narrowleaf Vetch. Disturbed areas; native of Mediterranean Europe. March-June; May-July. [= I, K, Pa, SE; = *V. angustifolia* Linnaeus – RAB, C, S, W; = *V. sativa* var. *angustifolia* (Linnaeus) Ehrhart; > *V.*

*angustifolia* var. *angustifolia* – F, G, WV; > *V. angustifolia* var. *segetalis* (Thuill.) Ser. – F, G, WV; > *V. angustifolia* var. *uncinata* (Desv.) Rouy – F]

\* ***Vicia sativa*** Linnaeus ssp. *sativa*, Common Vetch. Disturbed areas; native of Mediterranean Europe. April-June; May-July. [= I, K, Pa, SE; = *V. sativa* – RAB, C, G, S; > *V. sativa* var. *sativa* – F; > *V. sativa* var. *linearis* Lange – F]

\* ***Vicia sepium*** Linnaeus, Bush Vetch, Wild Tare. Disturbed areas; native of Europe. Introduced south to WV and in e. PA (Rhoads & Klein 1993). [= C, G, I, SE; > *L. sepium* var. *sepium* – F, K]



\* ***Vicia tetrasperma*** (Linnaeus) Schreber, Slender Vetch, Smooth Tare, Lentil Vetch. Disturbed areas; native of Europe. April-June; May-July. [= RAB, C, G, I, K, Pa, S, SE, WH; > *V. tetrasperma* var. *tetrasperma* – F; > *V. tetrasperma* var. *tenuissima* Druce – F]

\* ***Vicia villosa*** Roth ssp. *varia* (Host) Corbière, Winter Vetch. Disturbed areas; native of Europe. May-September. [= I, K, Pa, SE; = *V. dasycarpa* Tenore – RAB, C, F, G, W, WV; < *V. villosa* – WH]

\* ***Vicia villosa*** Roth ssp. *villosa*, Hairy Vetch, Fodder Vetch. Disturbed areas; native of Europe. May-September. [= I, K, Pa, SE; = *V. villosa* – RAB, C, F, G, W, WV; < *V. villosa* – WH]

### 78. *Lens* P. Miller (Lentil)

A genus of about 5 species, herbs, of sw. Asia, s. Europe, and n. Africa. References: Isely (1998)=I.

\* ***Lens culinaris*** Medikus, Lentil. Disturbed areas; native of Mediterranean Europe and w. Asia. {MD, NJ}. [= I, K1, K2]

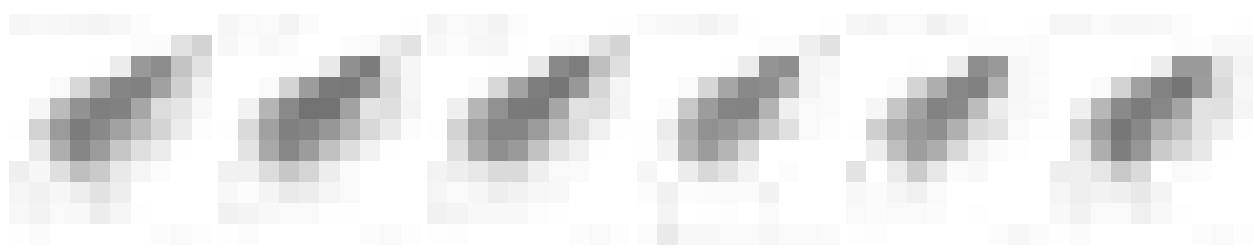
### 79. *Lathyrus* Linnaeus 1753 (Wild-pea, Vetchling)

A genus of about 150-160 species, annual and perennial herbs, of nearly cosmopolitan distribution. References: Isely (1998)=I.

- 1 Leaflets > 2, generally 4-12; [native species of various habitats].
  - 2 Foliaceous stipules laterally symmetrical, with 2 approximately equal basal lobes; leaves somewhat fleshy; [plants of ocean beaches and dunes].....*L. japonicus*
  - 2 Foliaceous stipules asymmetrical, oblique at the base, the basal lobe well-developed only on one side.
    - 3 Racemes with 2-6 (-9) flowers; leaflets 4-8 (-10) per leaf; [plants of marshes, bottomlands, and other wet habitats].....*L. palustris*
    - 3 Racemes with (5-) 10-20 flowers; leaflets (8-) 10-14 per leaf; [plants of dry to mesic forests].....*L. venosus*
- 1 Leaflets 0-2; [alien species, except *L. pusillus*].
  - 4 Leaflets absent (but with foliaceous stipules).....*L. aphaca*
  - 4 Leaflets 2.
    - 5 Stems not winged or flanged; corollas 10-15 mm long; flowers 3-10 per inflorescence.
      - 6 Corollas yellow .....*V. pratensis*
      - 6 Corollas red-purple.....*V. tuberosus*
    - 5 Stems winged; corollas 6-30 mm long; flowers 1-15 per inflorescence.
      - 7 Stems with wings 0-1 (-2) mm wide; corolla 6-14 mm long; flowers 1-3 (-4) per raceme.
        - 8 Legume (in fruit) and ovary (in flower) hirsute with swollen-based hairs; corolla 9-14 mm long.....*L. hirsutus*
        - 8 Legume (in fruit) and ovary (in flower) glabrous; corolla 6-9 mm long.....*L. pusillus*
      - 7 Stems with wings 1-3 mm wide; corolla 13-30 mm long; flowers 2-12 per raceme.
        - 9 Stems hirsute with swollen-based hairs; plant an annual; flowers 2-4 per raceme .....*L. odoratus*
        - 9 Stems glabrate; plant a perennial; flowers (3-) 4-12 per raceme.
          - 10 Stipules 4-10 mm wide; leaflets 2-5× as long as wide .....*L. latifolius*
          - 10 Stipules 2-3 mm wide; leaflets 6-15× as long as wide .....*L. sylvestris*

\* ***Lathyrus aphaca*** Linnaeus, Yellow Vetchling. Disturbed areas; native of Eurasia. Scattered in occurrence in the Southeast, including AL, TN, and KY (Kartesz 1999). [= G, I, K, SE]

\* ***Lathyrus hirsutus*** Linnaeus, Caley Pea, Singletary Pea. Roadsides, fields, disturbed areas; native of Europe. April-July. [= RAB, C, F, G, I, K, S, SE, W, WH]



***Lathyrus japonicus*** Willdenow, Beach Pea. Beaches. June-September. Circumboreal, south in eastern North America to NJ (or NC?) and the shores of the Great Lakes. Reported from ocean beaches in Dare County (NC), but without adequate documentation. [= I; > *L. maritimus* (Linnaeus) Bigelow var. *pellitus* (Fernald) Gleason – C, G; > *Lathyrus japonicus* Willdenow var. *pellitus* Fernald – F, K1; < *L. japonicus* – I; > *L. japonicus* var. *maritimus* (Linnaeus) Kartesz & Gandhi – K2; > *L. japonicus* var. *glaber* (Seringe) Fernald – Pa]

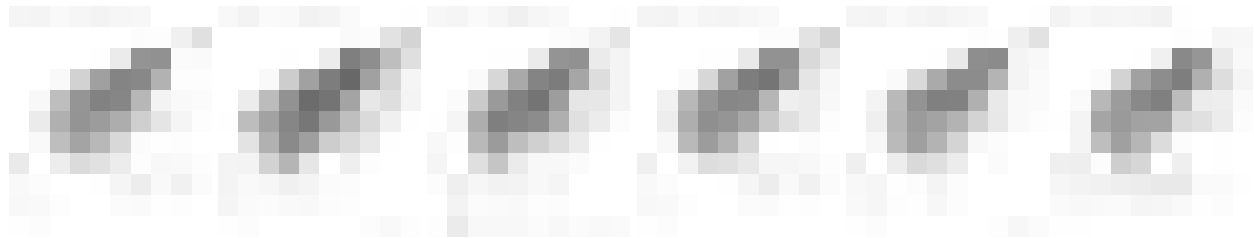
\* ***Lathyrus latifolius*** Linnaeus, Everlasting Pea, Perennial Sweet Pea. Roadsides, fencerows, disturbed areas; native of Europe. May-October. [= RAB, C, F, G, I, K, Pa, SE, W, WV]

\* ***Lathyrus odoratus*** Linnaeus, Sweet Pea. Cultivated, and occasionally persisting; native of s. Europe. [= C, F, G, I, K, SE, WV]

***Lathyrus palustris*** Linnaeus, Marsh Pea, Marsh Vetchling. Bottomland forests, marshes, streambanks. May-August; July-September. Circumboreal, ranging in North America south to DE, VA, ne. NC, ec. GA, OH, IN, MO, CO, and CA. [= RAB, I, K, Pa, SE; > *L. palustris* var. *palustris* – C, F, G, WV; > *L. palustris* var. *myrtifolius* (Muhlenberg ex Willdenow) A. Gray – F, G, WV; > *L. palustris* var. *linearifolius* Seringe – G; > *L. myrtifolius* Muhlenberg ex Willdenow – S]

\* ***Lathyrus pratensis*** Linnaeus, Meadow Pea. Disturbed areas; native of Eurasia. Reported for VA on the basis of "personal communication" (Kartesz 1999). {investigate} [= C, F, I, K]

***Lathyrus pusillus*** Elliott, Tiny Pea. Open areas in bottomlands, disturbed areas. April-July. E. VA, MO and KS, south to FL Panhandle and TX. [= RAB, F, G, I, K, S, SE, WH]



\* ***Lathyrus sylvestris*** Linnaeus, Perennial Pea. Cultivated, and occasionally persisting; native of Europe. June-September. [= C, F, G, I, K, Pa, SE, WV]

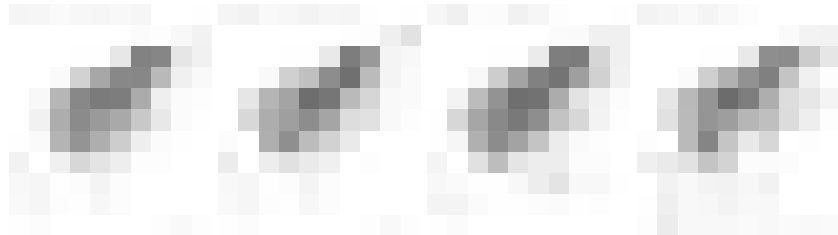
\* ***Lathyrus tuberosus*** Linnaeus, Tuberous Vetchling. Disturbed areas; native of Europe. June-July. Introduced in e. TN (Chester, Wofford, & Kral 1997), WV (Strausbaugh & Core 1978), and KY. [= C, F, G, I, K, Pa, SE, WV]

***Lathyrus venosus*** Muhlenberg ex Willdenow, Forest Pea, Bush Vetch. Dry to mesic slope and bottomlands forests and woodlands, especially in base-rich soils. May-September. S. ON west to MN and SK, south to c. NC, wc. GA, and MO. [= RAB, I, K, Pa, S, SE, W; > *L. venosus* var. *venosus* – C, F, G, WV; > *L. venosus* var. *intonsus* Butters & St. John – C, F, G, WV; > *L. venosus* var. *meridionalis* Butters & St. John – F; "L. palustris var. meridionalis" – WV]

#### 80. *Pisum* Linnaeus 1753 (Pea)

A genus of 2-3 species, annual herbs, native to w. Asia and the Mediterranean region. References: Isely (1998)=I.

\* ***Pisum sativum*** Linnaeus, Pea, Garden Pea, English Pea. Commonly cultivated in home gardens, rarely found as a waif; native of w. Asia and Mediterranean Europe. March-May. [= I, K, SE, WH; > *P. sativum* var. *sativum* – F; > *P. sativum* var. *arvense* (Linnaeus) Poiret – RAB, F]



#### 146. POLYGALACEAE R. Brown 1814 (Milkwort Family) [in FABALES]

A family of 17-21 genera and 800-1000 species, trees, shrubs, woody vines, and herbs, nearly cosmopolitan, but most diverse in tropical and subtropical areas. References: Abbott (2011); Miller (1971b); Eriksen & Persson in Kubitzki, Bayer, & Stevens (2007).

**Identification notes:** The Polygalaceae has a distinctive flower structure which can be confusing. The corolla consists of **3 fused petals**, partly fused into a tube, 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 (in most species). 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 Corolla keel blunt, lacking a crest or beak.....**1. Asemeia**
- 1 Corolla keel appendaged, with a lobed or tufted crest.
  - 2 Flowers in terminal spikes, racemes, or corymbs .....**3. Polygala**
  - 2 Flowers axillary; plants perennial.....**2. Polygaloides**

### **1. Asemeia** Rafinesque 1833 (Milkwort)

A genus of 25-30 species, herbs, neotropical north to the se. United States. References: Abbott (2011)=Z.

**Asemeia grandiflora** (Walter) Small, Showy Milkwort. Sandhills, dry sandy soils of roadsides and fields. May-July. S. NC south to s. FL, west to s. MS. Sometimes included in the neotropical *P. violacea* Aublet, or alternatively subdivided into varieties or species (see synonymy). [= Z; > *Polygala grandiflora* Walter var. *grandiflora* – K; = *Polygala grandiflora* – RAB, WH; > *Asemeia grandiflora* (Walter) Small – S; > *Asemeia cumulicola* Small – S; < *Polygala violacea* Aublet – K2]

### **2. Polygaloides** Haller 1768 (Milkwort)

A genus of 6-7 species, herbs, all but our one species of Europe and n. Africa. References: Abbott (2011)=Z.

**Polygaloides paucifolia** (Willdenow) J.R. Abbott, Gaywings, Fringed Polygala, Flowering Wintergreen, Bird-on-the-wing. Moist forests, mostly at moderate to high elevations. April-June; June-September. NB and QC west to SK, south to CT, NY, WI, and in the Appalachians south to w. NC, nw. SC, n. GA, and e. TN. [= Z; = *Polygala paucifolia* Willdenow – RAB, C, F, G, K1, K2, Pa, W, WV; = *Triclisperma paucifolia* (Willdenow) Nieuwland – S]

### **3. Polygala** Linnaeus 1753 (Milkwort)

A genus of 300-400 species, trees, shrubs, and herbs, nearly cosmopolitan in distribution. The circumscription of the genus and its monophyly are uncertain, even after the removal of some elements that are not closely related to the core of *Polygala* (Abbott 2011). References: Smith & Ward (1976)=Z; Haines (2010)=Y; Eriksen & Persson in Kubitzki, Bayer, & Stevens (2007).

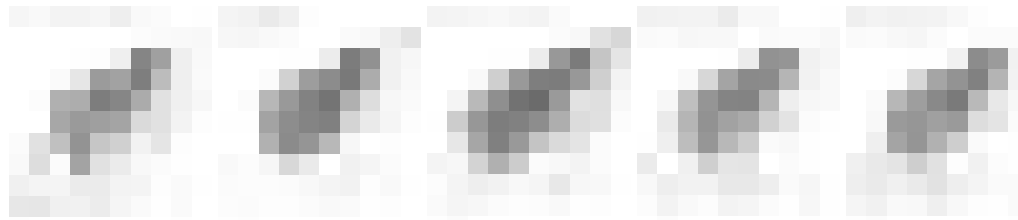
- 1 Fresh flowers orange, yellow, greenish-yellow, or greenish white (if greenish white, then the inflorescence a terminal many-brached cyme); [subgenus *Polygala*, series *Decurrentes*].
  - 2 Inflorescence a dense pom-pom-like raceme, terminating leafy branches.
    - 3 Fresh flowers lemon-yellow or greenish yellow; subulate bracts of the inflorescence 4.5-6.5 mm long; plants 3-10 (-15) cm tall; lobes of lower petal (keel) 1.5-2.5 mm long .....**P. nana**
    - 3 Fresh flowers bright orange or bright yellow; subulate bracts of the inflorescence 2-4 mm long; plants 5-80 cm tall; lobes of lower petal (keel) 0.5-1.1 mm long.
      - 4 Racemes ca. 1.5 cm in diameter; flowers bright orange (rarely individual plants within a population with bright yellow flowers); plants 5-40 cm tall; [widespread].....**P. lutea**
      - 4 Racemes ca. 2.5 cm in diameter; flowers bright yellow; plants 30-80 cm tall; [of FL].....**P. rugelii**
  - 2 Inflorescence a terminal, many-branched cyme, the many individual branches loosely to densely flowered.
    - 5 Fresh flowers cream-white to greenish-white; [of GA southward].....**P. baldunii** var. **baldunii**
    - 5 Fresh flowers bright yellow; [collectively widespread in the Coastal Plain of our area].
      - 6 Plants 4.5-12 dm tall, the stem solitary; basal leaves 3.5-14 cm long, linear-lanceolate, about 15-20× as long as wide, persistent as a basal rosette; stem leaves linear-subulate, sharp-tipped, much reduced from the basal leaves, becoming bractlike upward; seeds glabrous, 0.7-0.9 mm long.....**P. cymosa**
      - 6 Plants 1-4 dm tall, the stems 1-several from the base; basal leaves 3-7 cm long, spatulate, about 10× as long as wide, usually not persistent after flowering; stem leaves narrowly spatulate to linear, blunt-tipped, only slightly reduced from the basal leaves; seeds pubescent, 0.5-0.7 mm long.....**P. ramosa**
- 1 Fresh flowers pink, purple, white, or green (if green or white, then the inflorescence a simple raceme, not a many-branched cyme).
  - 7 Leaves few, clustered near the tip of the stem; wings 13-20 mm long; stamens 6; [of moist soils of forests in the Mountains].....**[see Polygaloides]**
  - 7 Leaves many, evenly distributed along the stem, or not at least strongly clustered near the tip; wings < 10 mm long; stamens 8; [collectively of a wide variety of habitats, but generally not as above, either in more open, drier, or non-montane habitats].
  - 8 Leaves whorled, at least at the principal lower nodes; annual, from a slender taproot; [subgenus *Polygala*, series *Polygala*].
    - 9 Racemes 3-6 mm in diameter, pointed in outline.
      - 10 Racemes 2-5 cm long, becoming interrupted below through persistence of the fruits on the axis; wings equaling the fruit .....

- .....*P. ambigua*
- 10 Racemes 0.5-1.5 cm long, the fruits falling promptly, thus the inflorescence compact and truncate below; wings shorter than the fruit.
- 11 Seeds finely pubescent; pedicels  $\frac{1}{4}$ - $\frac{1}{3}$  as long as the fruit; raceme peduncles 0.5-4 cm long.....*P. verticillata* var. *isocycla*
- 11 Seeds hirsute; pedicels  $\frac{1}{3}$ - $\frac{1}{2}$  as long as the fruit; raceme peduncles 2-7 cm long.....*P. verticillata* var. *verticillata*
- 9 Racemes 8-15 mm in diameter, rounded in outline (somewhat rounded in *P. hookeri*).
- 12 Racemes loosely flowered, with ca. 10 flowers per cm of length; raceme 7-12 mm in diameter, the tip pointed in outline (obconical apically); full raceme (including the portion with dropped fruits) to 6 cm long.....*P. hookeri*
- 12 Racemes densely flowered, with ca. 20 flowers per cm of length; raceme 7-20 mm in diameter, the tip rounded to truncate in outline; full raceme (including the portion with dropped fruits) to 4.5 cm long.
- 13 Bracts of the inflorescence ca. 1 mm long; wings 1.5-2.5 mm wide, acute or short-mucronate at the tip; raceme peduncle (0.8-) 3-5 cm long.....*P. brevifolia*
- 13 Bracts of the inflorescence 1.5-3 mm long; wings 3-4 mm wide, acuminate, the tips cuspidate; raceme peduncle 0-0.8 (-4.0) cm long.....*P. cruciata*
- 8 Leaves all alternate; **either** annual, from a slender taproot, the stems solitary, **or** biennial to perennial, from a taproot, the stems solitary to several, **or** perennial, from a thick rhizome, the stems several.
- 14 Leaves glaucous, somewhat succulent, linear; corolla 7-10 mm long,  $> 2\times$  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 Perennial or biennial, usually several stems arising together from a rhizome or taproot.
- 16 Wings white, 2-3 mm long; flowers sessile or subsessile; plants from a thick crown.
- 17 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*
- 17 Larger leaves mostly 2-15 mm wide; capsules 2.5-3.5 mm long; seeds ca. 2.5 mm long.....*P. senega* var. *senega*
- 16 Wings pink, 4-7 mm long; flowers pedicelled; plants from a taproot.
- 18 Corolla keel entire at the tip; wings 5-7 mm long, reniform-orbicular; plants lacking cleistogamous flowers .....[see *Asemeia*]
- 18 Corolla keel fringed at the tip; wings 4-6 mm long, elliptic; plants producing cleistogamous flowers in loose subterranean or surficial racemes .....*P. polygama*
- 15 Annual, the stems solitary.
- 19 Corolla about 0.5 $\times$  as long as the wings .....*P. sanguinea*
- 19 Corolla about 1 $\times$  as long as the wings.
- 20 Inflorescence bracts dropping from the axis promptly following flowering .....*P. mariana*
- 20 Inflorescence bracts persistent.
- 21 Wings 3-5 mm long; pedicels 1.5-2.5 mm long; racemes 8-13 mm in diameter .....*P. curtissii*
- 21 Wings 2-2.5 mm long; pedicels 0.5-1.5 mm long; racemes 5-6 mm in diameter .....*P. nuttallii*

*Polygala ambigua* Nuttall, Loose Milkwort. Fields, woodlands, openings. 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, K1, K2, S; = *P. verticillata* Linnaeus var. *ambigua* (Nuttall) Wood - Pa, RAB;  $> P. verticillata$  var. *ambigua* - F, WV;  $> P. verticillata$  var. *dolichoptera* Fernald - F, WV;  $< P. verticillata$  - W]

*Polygala baldwinii* Nuttall var. *baldwinii*, White Milkwort, Baldwin's Milkwort. Wet pine savannas. E. GA south to s. FL, west to s. MS; e. TX; Cuba; the Bahamas (Andros Island). Var. *carteri* (Small) R.R. Smith & D.B. Ward occurs in s. FL. [= GW, Z;  $< P. polygala$  *baldwinii* - K1, K2, WH; = *Pilostaxis baldwinii* (Nuttall) Small - S, orthographic variant; = *Pylostachya baldwinii* (Nuttall) Small]

*Polygala boykinii* Nuttall var. *boykinii*, Boykin's Milkwort. Longleaf pine flatwoods and savannas. Var. *sparsiflora* Wheelock occurs in s. FL. [= K1, K2; = *P. boykinii* - S;  $< P. boykinii$  - WH] {not yet keyed; synonymy incomplete}



*Polygala brevifolia* Nuttall, Shortleaf Milkwort, Little-leaf Milkwort. Pine savannas, pocosin margins, pocosin interiors after fire. June-October. NJ south to Panhandle FL, west to s. MS. [= RAB, C, F, G, GW, K1, K2, S, WH]

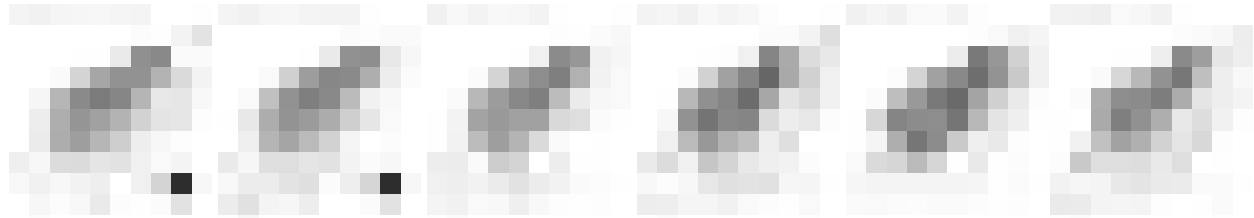
*Polygala chapmanii* Torrey & A. Gray. Pine savannas, seepage bogs. Panhandle FL and sw. GA west to s. MS. [= GW, K1, K2, S, WH] {not yet keyed; synonymy incomplete}

*Polygala crenata* C.W. James. Wet pine flatwoods, bogs, bayheads. FL Panhandle and AL west to TX; reported for GA (Sorrie, pers. comm.). [= GW, K1, K2, WH] {not yet keyed; synonymy incomplete}

*Polygala cruciata* Linnaeus, Drumheads. Bogs, damp or wet soil in openings. June-October. ME west to MN, south to e. VA, w. NC, n. AL, and TN. Two varieties or subspecies are sometimes recognized. [= RAB, C, G, GW, S, W, WV;  $> P. cruciata$  var. *aquilonia* Fernald & Schubert - F, K1, K2;  $> P. cruciata$  var. *cruciata* - F, K1, K2;  $> P. ramosior (Nash) Small - S;  $> P. cruciata$  ssp. *aquilonia* (Fernald & Schubert) A. Haines - Y;  $> P. cruciata$  ssp. *cruciata* - Y]$

*Polygala curtissii* A. Gray, Appalachian Milkwort. Mafic barrens, old fields, thickets, openings. June-October. DE and se. PA (Rhoads & Block 2007) west to OH, south to SC, GA, and MS. [= RAB, C, F, G, K1, K2, Pa, S, W, WV]

***Polygala cymosa*** Walter, Tall Pinebarren Milkwort. Pond-cypress savannas, Coastal Plain depression ponds, clay-based Carolina bays, other sites with seasonally flooded hydrology. May-July. E. NC south to s. FL, west to s. MS; disjunct in s. DE. [= RAB, C, F, G, GW, K1, K2, WH, Z; = *Pilostaxis cymosa* (Walter) Small – S; = *Pylostachya cymosa* (Walter) Small]



***Polygala hookeri*** Torrey & A. Gray, Hooker's Milkwort. Pine savannas. June-August. Sw. GA and adjacent Panhandle FL, west to s. MS; disjunct in se. NC and ne. SC. [= RAB, GW, K1, K2, S, WH]

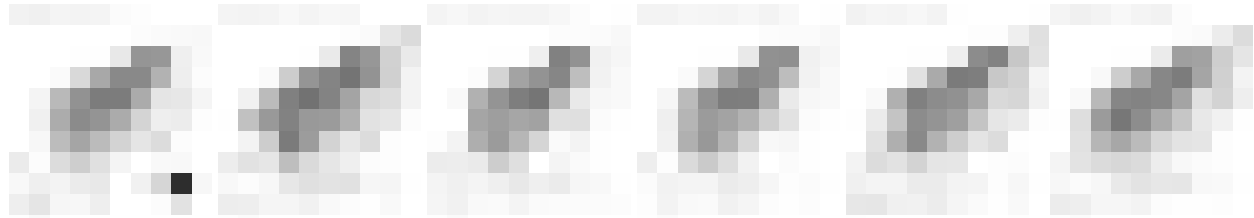
***Polygala incarnata*** Linnaeus, Pink Milkwort, Procession Flower. Pine savannas, woodlands, fields. June-July. NY (Long Island) and se. PA (Rhoads & Block 2007) west to MI, WI, and IA, south to s. FL and TX. [= RAB, C, F, G, GW, K1, K2, Pa, W, WH; = *Galypola incarnata* (Linnaeus) Nieuwland – S]

***Polygala leptocaulis*** Torrey & A. Gray, Swamp Milkwort. Bogs and pond margins. Ne. and Panhandle FL west to e. TX; Mexico, Central America, and South America; Cuba. [= GW, S, WH; = *P. tenella* Willdenow – K2]

***Polygala leptostachys*** Shuttleworth ex A. Gray, Georgia Milkwort. Sandhills. Ne. FL south to c. peninsular FL, west to sw. GA (Jones & Coile 1988), s. AL (Sorrie & LeBlond 2008), s. MS (Sorrie & Leonard 1999). [= K1, K2, S, WH] {not yet keyed; synonymy incomplete}

***Polygala lutea*** Linnaeus, Orange Milkwort, Red-hot-poker. Wet savannas, ditches, bogs, other wet areas. April-October. NY (Long Island), se. PA (Rhoads & Block 2007), and NJ south to s. FL, west to e. LA. [= RAB, C, F, G, GW, K1, K2, Pa, WH, Z; = *Pilostaxis lutea* (Linnaeus) Small – S; = *Pylostachya lutea* (Linnaeus) Small]

***Polygala mariana*** P. Miller, Maryland Milkwort. Bogs, pine savannas, other open wet habitats. June-October. S. NJ south to c. peninsular FL, west to TX; disjunct inland in sw. TN (Chester, Wofford, & Kral 1997). [= RAB, C, G, GW, K1, K2; > *P. mariana* – F, S; > *P. harperi* Small – F, S]



***Polygala nana*** (Michaux) A.P. de Candolle, Dwarf Milkwort, Candyroot. longleaf pine flatwoods, other open moist areas. E. GA south to s. FL, west to e. TX, with scattered populations inland to n. SC, w. NC, nw. GA, n. AL, c. TN (Chester, Wofford, & Kral 1997), and ne. MS. This species is primarily a Coastal Plain species of the deeper south; *P. nana* may be introduced in parts of our area. [= RAB, GW, K1, K2, WH, Z; = *Pilostaxis nana* (Michaux) Rafinesque – S; = *Pylostachya nana* (Michaux) Rafinesque]

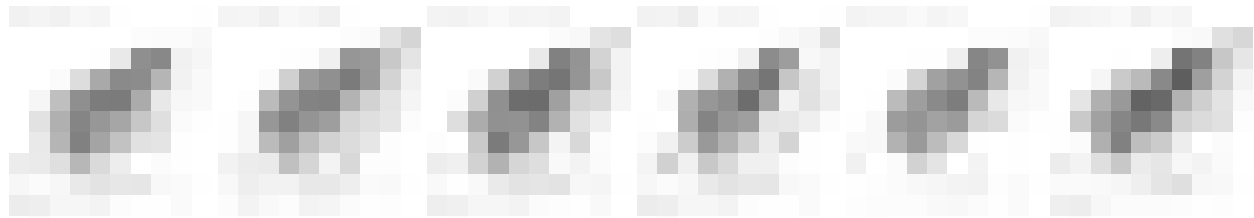
***Polygala nuttallii*** Torrey & A. Gray, Nuttall's Milkwort. pocosins, pine savannas, also in depression ponds (in Augusta and Rockingham counties, VA). June-August. MA south to ne. FL and e. Panhandle FL; disjunct inland in w. VA, c. TN (Chester, Wofford, & Kral 1997), sc. KY, and allegedly c. AR. [= RAB, C, F, G, K1, K2, Pa, S, W, WH]

***Polygala polygama*** Walter, Bitter Milkwort, Racemed Milkwort. sandhills, woodlands, woodland borders. May-July; June-July. NS, ON, and MN south to s. FL and TX. Two varieties are sometimes recognized. [=RAB, K1, K2, Pa, W, WH; > *P. polygama* Walter var. *obtusata* Chodat – C, F, G, WV; > *P. polygama* var. *polygama* – C, F, G; > *P. polygama* – S; > *P. aboriginum* Small – S]

***Polygala ramosa*** Elliott, Short Pinebarren Milkwort, Low Pinebarren Milkwort. wet savannas, pocosin margins, bogs. 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, K1, K2, WH, Z; = *Pilostaxis ramosa* (Elliott) Small – S; = *Pylostachya ramosa* (Elliott) Small]

***Polygala rugelii*** Shuttleworth ex Chapman. Wet pine flatwoods. Extreme e. Panhandle FL and n. peninsular FL south to s. FL. [= GW, K1, K2, WH, Z; = *Pilostaxis rugelii* (Shuttleworth ex Chapman) Small – S]

***Polygala sanguinea*** Linnaeus, Blood Milkwort, Field Milkwort. Woodlands, openings, woodland borders. June-August. NS and MN, south to nw. SC, n. GA, and LA. [= RAB, C, F, G, GW, K1, K2, Pa, W, WV; ? *P. viridescens* Linnaeus – S]



*Polygala senega* Linnaeus var. *latifolia* Torrey & A. Gray, Seneca Snakeroot. Mt (VA, WV), Pd (DE), {Mt (GA, NC, SC), Pd (NC, SC, VA): woodlands and openings, especially over calcareous or mafic rocks; uncommon (rare in NC and WV)}. May-June. DE, PA, and MN, south to NC, TN, and MO. Trauth-Nare & Naczi (1998) studied the two varieties of *P. senega* and concluded that the taxa should be recognized at the specific level. The relative distributions, habitats, and phenology of the two taxa need assessment for our area. [= F, G, Pa, WV; < *P. senega* – RAB, C, K1, K2, S, W]

*Polygala senega* Linnaeus var. *senega*, Seneca Snakeroot. Mt (WV), {Mt (GA, NC, SC, VA), Pd (NC, SC, VA): woodlands and openings, especially over calcareous or mafic rocks; uncommon (rare in NC)}. April-May. QC west to AB, south to n. GA, TN, AR, and SD. The relative distributions, habitats, and phenology of the two taxa need assessment for our area. [= F, G, Pa, WV; < *P. senega* – RAB, C, K1, K2, S, W]

*Polygala setacea* Michaux, Coastal Plain Milkwort. Pine flatwoods and bogs. E. GA and Panhandle FL south to s. FL. Reported by Small (1933) as occurring north to NC and west to s. MS (apparently an error). [= GW, K1, K2, S, WH] {not yet keyed; synonymy incomplete}

*Polygala verticillata* Linnaeus var. *isocycla* Fernald, Whorled Milkwort. Cp (FL), Mt (WV), {Mt, Pd, Cp (DE, GA, NC, SC, VA): dry woodlands, woodland borders, openings, fields; uncommon. June-September. The validity and relative distributions, habitats, phenology of the two varieties need additional assessment in the herbarium and the field.} VT west to MB, south to Panhandle FL (Kunzer et al. 2009), s. FL, and TX. [= C, F, G, K1, Pa, WH, WV; < *P. verticillata* var. *verticillata* – RAB; = *P. verticillata* – S, apparently misapplied; < *P. verticillata* – K2, W]

*Polygala verticillata* Linnaeus var. *verticillata*, Whorled Milkwort. Mt (WV), {Mt, Pd, Cp (DE, GA, NC, SC, VA): dry woodlands, woodland borders, openings, fields; uncommon. June-September. The validity and relative distributions, habitats, phenology of the two varieties need additional assessment in the herbarium and the field.} ME west to MI, south to w. VA, w. NC, and TN. [= C, F, G, K1, Pa, WV; < *P. verticillata* var. *verticillata* – RAB; = *P. pretzii* Pennell – S; < *P. verticillata* – K2, W]



**147. ROSACEAE** A.L. de Jussieu 1789 (Rose Family) [in ROSALES]

A family of about 85-95 genera and 2000-3000 species, trees, shrubs, and herbs, nearly cosmopolitan, but mainly boreal and temperate. References: Potter et al. (2007); Eriksson et al. (2003); Kalkman in Kubitzki (2004); Ertter (2007).

Subfamily Rosoideae

1. *Filipendula*

Supertribe Rosodae

2. *Rosa*

3. *Rubus*

Tribe Sanguisorbeae: 4. *Agrimonia*, 5. *Poterium*, 6. *Poteridium*, 7. *Sanguisorba*

Tribe Potentilleae: 8a. *Argentina*, 8b. *Potentilla*, 9. *Aphanes*, 10. *Dasiphora*, 11. *Dryocallis*, 12. *Fragaria*, 13. *Sibbaldia*

Tribe Colurieae: 14. *Geum*

Subfamily Spiraeoideae

Tribe Amygdaleae: 15. *Prunus*

Tribe Neillieae: 16. *Neillia*, 17. *Physocarpus*

Tribe Sorbarieae: 18. *Sorbaria*

Tribe Spiraeae: 19. *Aruncus*, 20. *Spiraea*

Supertribe Kerriodae

Tribe Osmaronieae: 21. *Exochorda*

Tribe Kerrieae: 22. *Kerria*, 23. *Neviusia*, 24. *Rhodotypos*

Supertribe Pyrodae

25. *Gillenia*

Tribe Pyreae: 26. *Amelanchier*, 27. *Crataegus*, 28. *Pyracantha*, 29. *Sorbus*, 30. *Pyrus*, 31. *Rhaphiolepis*, 32. *Eriobotrya*, 33.

*Pseudocdonia*, 34. *Chaenomeles*, 35. *Photinia*, 36. *Pourthiaea*, 37. *Aronia*, 38. *Cydonia*, 39. *Malus*

- 1 Herbs or subshrubs (if woody at base, then < 3 dm tall).
  - 2 Leaves simple..... **Key A**
  - 2 Leaves compound (at least the lower and better developed)..... **Key B**
- 1 Trees, shrubs, or woody vines (with arching “canes” or climbing, arching, or scrambling stems).
  - 3 Leaves simple..... **Key C**
  - 3 Leaves compound..... **Key D**

**Key A – Herbs and subshrubs with simple leaves**

- 1 Leaves crenate, unlobed; inflorescence of a solitary flower; [tribe *Rubeeae*]..... **3. *Rubus dalibarda***

- 1 Leaves 3-many lobed; inflorescences cymose.
  - 2 Leaf blades 0.3-1.0 cm long and wide, deeply 3-lobed, each lobe further lobed or deeply toothed; petals 0; [tribe *Potentilleae*] ..... **10. Aphanes**
  - 2 Leaf blades 3-8 cm long and wide, 3-lobed, each lobe toothed; petals 5; [tribe *Colurieae*]..... **15. Geum lobatum**

**Key B – Herbs and subshrubs with compound leaves**

- 1 Leaves 2- to 3-ternately compound; [tribe *Spiraeae*] ..... **20. Aruncus**
- 1 Leaves 1-compound, either simply pinnately compound or simply palmately compound,
  - 2 Principal (basalmost) leaves pinnately compound, with (5-) 7-many leaflets (stem leaves sometimes 3-foliolate, especially in *Geum*).
    - 3 Principal leaves with leaflets of markedly disparate shape and size (large leaflets alternating with much smaller leaflets, or a large terminal leaflet and much smaller lateral leaflets).
      - 4 Lateral leaflets alternating between small and large, the terminal leaflet similar in size and shape to the larger lateral leaflets; terminal leaflet < 3 cm wide; hypanthium **either** conical or turbinate, armed with hooked bristles, the pistils 2, **or** hemispheric, the pistils >5.
        - 5 Leaves glabrous or sparsely pubescent beneath; flowers many in racemes; hypanthium conical or turbinate, armed with hooked bristles, the pistils 2; [tribe *Sanguisorbeae*] ..... **4. Agrimonia**
        - 5 Leaves silvery sericeous beneath; flowers solitary and axillary; hypanthium hemispheric, the pistils >5; [tribe *Potentilleae*] ..... **8. Argentina**
      - 4 Leaflets variable in size and shape, usually the terminal leaflet much larger than any of the lateral leaflets; terminal leaflet 3-20 cm wide; hypanthium either saucer-shaped or hemispheric to conical; pistils 5 or more.
        - 6 Pistils 5-15, in a circle on a saucer-shaped hypanthium, ripening into upright fruits that resemble follicles but are indehiscent; corolla white or pink; plant 10-20 dm tall; [tribe *Ulmariaceae*] ..... **1. Filipendula**
        - 6 Pistils many, densely covering the hemispheric to conical hypanthium, ripening into achenes terminated by the persistent style; corolla white, cream, pale yellow, bright yellow, lavender, maroon, or purple; plant 2-10 dm tall; [tribe *Colurieae*] ..... **15. Geum**
    - 3 Principal leaves with leaflets of generally similar shape and size (the lowest leaflets may be smaller but of similar shape and tootching to the other leaflets).
      - 7 Foliage and stems viscid-pubescent with brownish hairs; inflorescence a cyme; petals 5, cream-colored; [tribe *Potentilleae*]..... **12. Drymocallis**
      - 7 Foliage not viscid-pubescent (if hairy, the hairs not brown or viscid); inflorescence of very many (>100) small flowers in a spike, the rachis hidden by the tightly packed flowers; petals 0; [tribe *Sanguisorbeae*].
        - 8 Leaflets pinnatifid (each leaflet incised nearly to the midvein); stamens 2 or 4 per flower ..... **6. Poteridium**
        - 8 Leaflets toothed (the incisions not nearly to the midvein); stamens **either 4 or 15-20** per flower (in well-developed, staminate flowers).
          - 9 Leaflets 0.8-2 cm long; spike 1-2 cm long, 1-2× as long as broad, globose; stamens 15-20 per flower (in well-developed staminate flowers), the filaments 3-4 mm long; sepals green to pinkish-purple; [cultivated, occasionally escaped].... **5. Poterium**
          - 9 Leaflets 3-10 cm long; spike 6-30 cm long, elongate; stamens 4 per flower, the filaments 8-10 mm long; sepals white (sometimes fading greenish); [native]..... **7. Sanguisorba**
  - 2 Principal (basal-most) leaves palmately compound, with 3-7 (-9) leaflets.
    - 10 Principal leaves sessile, 3-foliolate; fruit of follicles; leaves cauline; [tribe *Gillenieae*]..... **26. Gillenia**
    - 10 Principal leaves distinctly petiolate, the petiole often longer than the leaflets, 3-7 (-9)-foliolate; fruit of achenes; leaves basal and cauline.
      - 11 Principal leaves 5-7 (-9)-foliolate; [tribe *Potentilleae*] ..... **9. Potentilla**
      - 11 Principal leaves 3-foliolate.
        - 12 Plants in flower.
          - 13 Petals yellow.
            - 14 Pistils 2-6; [tribe *Colurieae*]..... **15. Geum**
            - 14 Pistils (10-) numerous; [tribe *Potentilleae*] ..... **9. Potentilla**
          - 13 Petals white (or slightly pinkish).
            - 15 Calyx lobes not subtended by bractlets; [tribe *Rubeae*] ..... **3. Rubus pubescens**
            - 15 Calyx lobes subtended by 5 sepaloïd bractlets; [tribe *Potentilleae*].
              - 16 Leaves evenly serrate with many serrations; [widespread] ..... **13. Fragaria**
              - 16 Leaves with 3 (-5) teeth at the apex, otherwise entire; [Mountains]..... **14. Sibbaldia**
        - 12 Plants in fruit (or sterile).
          - 17 Leaflets entire, except for 3 (-5) teeth at the apex; [Mountains] ; [tribe *Potentilleae*]..... **14. Sibbaldia**
          - 17 Leaflets evenly serrate or crenate, each well-developed leaflet with > 7 teeth.
            - 18 Calyx lobes not subtended by bractlets.
              - 19 Fruit an aggregate of dry, non-adherent achenes; leaflets obtuse at apex; [tribe *Colurieae*] ..... **15. Geum**
              - 19 Fruit an aggregate of fleshy, adherent drupelets; leaflets acuminate at apex; [tribe *Rubeae*] ..... **3. Rubus pubescens**
            - 18 Calyx lobes subtended by 5 sepaloïd bractlets; [tribe *Potentilleae*].
              - 20 Fruit an aggregate of dry achenes ..... **9. Potentilla**
              - 20 Fruit an accessory fruit of achenes borne on the surface of a fleshy, red receptacle.
                - 21 Fresh fruit reddish inside; leaflets serrate, 2.5-12 cm long; sepaloïd bracts narrowing to apex, untoothed.... **13. Fragaria**
                - 21 Fresh fruit whitish inside; leaflets crenate, 2-4 cm long; sepaloïd bracts widest at apex, 3-5-toothed ..... **9. Potentilla indica**

**Key C – Shrubs and trees with simple leaves**

- 1 Ovary superior; fruit dehiscent (aggregate of follicles, or capsule) or indehiscent (drupe, aggregate of drupelets, aggregate of achenes).
  - 2 Leaves opposite; fruit a drupe; [tribe *Kerrieae*]..... **25. Rhodotypos**



- 2 Leaves alternate; fruit various (see below).
  - 3 Leaves large, > 10 cm wide, palmately veined, and pinnately lobed; fruit an aggregate of drupelets; [tribe *Rubeae*].....**3. *Rubus odoratus***
  - 3 Leaves smaller, < 8 cm wide, pinnately veined, **either** not lobed **or** basally pinnately lobed; fruit a drupe, a capsule, an aggregate of follicles, or an aggregate of achenes.
  - 4 Leaves singly serrate, not lobed basally.
    - 5 Gynoecium of separate carpels; fruit an aggregate of follicles; [tribe *Spiraeae*] .....**21. *Spiraea***
    - 5 Gynoecium of fused carpels; fruit either a fleshy drupe or a capsule.
      - 6 Ovary 5-angled in  $\times$ -section; fruit a 5-angled capsule; leaves obovate, obviously broadest towards the tip; [tribe *Osmaronieae*] .  
.....**22. *Exochorda***
      - 6 Ovary circular in  $\times$ -section; fruit a fleshy spherical drupe; leaves generally broadest near or below the middle; [tribe *Amygdaleae*].....**16. *Prunus***
  - 4 Leaves doubly serrate, also often lobed towards the base.
    - 7 Corolla yellow; stems arching, green; fruit an aggregate of drupe-like achenes (dry and indehiscent); [tribe *Kerrieae*].....**23. *Kerria***
    - 7 Corolla white to pink or rose; stems not both arching and green; fruit various (see below).
      - 8 Inflorescence a dense, umbel-like corymb; leaf apices rounded to acute; fruit an aggregate of 5 follicles; [tribe *Neillieae*] .....  
.....**18. *Physocarpus***
      - 8 Inflorescence a raceme or a leafy panicle; leaf apices acuminate.
        - 9 Fruit a single follicle; [alien, planted, and rarely naturalized, as in e. VA]; [tribe *Neillieae*].....**17. *Neillia***
        - 9 Fruit an aggregate of 2-4 drupe-like achenes; [rare native of calcareous habitats in sc. TN, nw. GA, n. AL, and disjunct westward in AR and MO]; [tribe *Kerrieae*].....**24. *Neviusia***
  - 1 Ovary inferior; fruit indehiscent (pome); [tribe *Pyreae*].
    - 10 Upper surface of leaves bearing dark glandular trichomes along the midrib (most easily seen with a 10 $\times$  hand lens); shrubs .....**38. *Aronia***
    - 10 Upper surface of leaves lacking dark glandular trichomes along the midrib; shrubs and trees.
      - 11 Ovary and fruit 10-locular; inflorescence a raceme (rarely a fascicle); pome < 1 cm in diameter .....**27. *Amelanchier***
      - 11 Ovary and fruit 5-locular; inflorescence a cyme, umbel, or fascicle (lacking an elongated central axis); pome 0.7-10 cm in diameter.
        - 12 Styles distinct; exocarps (carpels within pericarp) bony and seedlike; trees and shrubs, with thorns .....**28. *Crataegus***
        - 12 Styles usually connate at base; exocarps leather or papery and easily opened to expose seeds; small trees, unarmed, or armed with sharp spur branches.
          - 13 Pome globose to ovoid, lacking stone cells; anthers yellow to white; styles connate at the base; leaves blunt to acuminate; [apples and crabapples] .....**40. *Malus***
          - 13 Pome globose or pyriform, with stone cells; anthers reddish; styles distinct; leaves acute to acuminate; [pears].....**31. *Pyrus***
- {add to KEY under 1b: **35. *Chaenomeles*, 39. *Cydonia*, 33. *Eriobotrya*, 36. *Photinia*, 37. *Pourthiaea*, 29. *Pyracantha*, [32. *Rhaphirolepis*]**}

**Key D – Shrubs and trees with compound leaves**

- 1 Leaflets < 5 mm wide, entire; densely-branched shrub to 1 m tall; flowers yellow; [tribe *Potentilleae*].....**11. *Dasiphora***
- 1 Leaflets > 10 mm wide, serrate or crenate; shrubs, trees, or woody vines (see below); flowers white, pink, or purplish (rarely yellow in *Rosa*).
- 2 Leaves 1-pinnately compound, generally with > 11 leaflets; inflorescence a terminal panicle or corymb with numerous (> 100) flowers, the petals white and < 4 mm long; fruit a pome or follicle; upright tree or shrub with unarmed stems.
  - 3 Inflorescence a panicle; fruit a follicle; shrub, to 2 m tall; [tribe *Sorbarieae*] .....**19. *Sorbaria***
  - 3 Inflorescence a corymb; fruit a pome; tree, generally > 2 m tall; [tribe *Pyreae*] .....**30. *Sorbus***
- 2 Leaves palmately or 1-pinnately compound, generally with < 11 leaflets; inflorescences axillary or terminal panicles or corymbs with few (<15) flowers, the petals white, pink, or purplish (rarely yellow) and > 6 mm long; fruit a hip or aggregate of drupelets; arching or upright shrubs or climbing or sprawling woody vines, the stems usually armed with prickles.
  - 4 Fruit a hip, developing from a globose to urceolate hypanthium, enclosing the ovaries and achenes, except for the apical orifice; leaflets usually acute to obtuse at the apex; leaflet margins crenulate or serrulate; [tribe *Roseae*] .....**2. *Rosa***
  - 4 Fruit an aggregate of drupelets, developing from a flattish or hemispheric hypanthium, with the ovaries and drupelets exposed; leaflets usually acuminate at the apex; leaflet margins serrate or doubly serrate; [tribe *Rubeae*] .....**3. *Rubus***

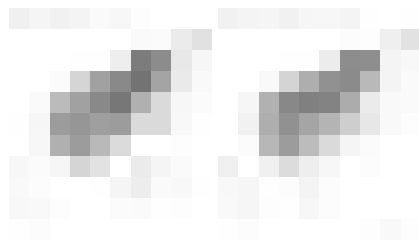
***I. Filipendula* P. Miller 1754 (Queen-of-the-Prairie)**

A genus of about 15 species, herbs, north temperate in e. and nw. North America, Europe, and Asia. References: Schanzer in FNA (in press); Schanzer (1994)=Y; Robertson (1974)=Z.

- 1 Lateral leaflets lobed and toothed; flowers pink; fruit straight; rootstock with long subterranean runners; [native plant of wetlands, also sometimes cultivated]; [section *Albicoma*] .....***F. rubra***
- 1 Lateral leaflets merely coarsely toothed; flowers white; fruit twisted; rootstock short, without runners; [introduced species, sometimes escaped]; [section *Filipendula*].....***F. ulmaria***

***Filipendula rubra*** (Hill) B.L. Robinson, Queen-of-the-Prairie. Bogs, wet meadows, over mafic or calcareous rocks. June-July; July-September. PA west to n. IL and MN, south to WV, w. VA, w. NC, e. TN (Roane County, fide Gattinger 1901), and MO (reports from GA appear to be unsubstantiated). The closest relatives are the other two members of section *Albicoma*: *F. palmata* (Pallas) Maximowicz and *F. angustifolia* (Turczaninow) Maximowicz, both of ne. Asia. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV, Y, Z]

\* ***Filipendula ulmaria*** (Linnaeus) Maximowicz, Meadowsweet, Queen-of-the-Meadow. Disturbed areas; native of Europe. Late June-July. Cultivated and sometimes escaped or persistent. It is reported for KY, WV, PA, and NJ (Kartesz 1999). [= FNA, Pa, WV, Y; > *F. ulmaria* var. *ulmaria* – C, F, G; > *F. ulmaria* ssp. *ulmaria* – K]



2. *Rosa* Linnaeus 1753 (Rose)

A genus of more than 100 species, shrubs or woody vines; mainly of north temperate regions. Many cultivars cannot be readily identified to species. References: Joly & Bruneau (2007)=Y; Lewis (2008); Robertson (1974)=Z; Kalkman in Kubitzki (2004). Key adapted in part from FNA and Y.

- 1 Stipules adnate to the petiole only basally, for < ½ their length; vigorous climbing vines, 3-5 (-10) m tall; petals white.
  - 2 Stems brown-tomentose, stipitate-glandular; terminal leaflet petiolules 3-5 mm; pedicels tomentose, 3-6 mm; hypanthia subglobose, white tomentose; [section *Bracteatae*] ..... ***R. bracteata***
  - 2 Stems glabrous, eglandular; terminal leaflet petiolules 9-13 mm; pedicels glabrous, 12-30 mm; hypanthia cupulate, densely setose [section *Laevigatae*] ..... ***R. laevigata***
- 1 Stipules adnate to the petiole > ½ their length; vigorous climbing vines or shrubs, 0.3-4 m tall; petals white, pink, rose-purple, or yellow.
  - 3 Styles connate into a column which protrudes from the orifice by 3-6 mm (sometimes separating in fruit); stipule margins and auricles deeply laciniate (or entire to ciliate in *R. setigera*); vines, climbing and scrambling to 4 m tall; [section *Systylae*].
    - 4 Leaflets 3-5; stipule margins and auricles mostly entire or ciliate; inflorescences laxly corymbose; flowers 3-5 cm in diameter, petals single, rose-purple to pink; carpels 20-25, styles glabrous, exerted 5-6 mm beyond the orifice; [native] ..... ***R. setigera***
    - 4 Leaflets (5-) 7-9; stipule margins and auricles deeply laciniate; inflorescences paniculate; flowers 1.5-2.5 cm in diameter, petals single or double, white to shades of pink; carpels 6-20; styles glabrous or pubescent, exerted 3-5 mm beyond the orifice; [alien].
      - 5 Pedicels 18-25 mm, glabrous, eglandular; flowers 2-2.5 cm in diameter, hypanthium elongate-ovoid, 4-6.5 mm x 2-3 mm, eglandular; carpels 12-20, styles pubescent, exerted 3.5-5 mm beyond orifices (1.5-2 mm in diameter) of flat discs (3-4 mm in diameter) ..... ***R. luciae***
      - 5 Pedicels 5-12 mm, tomentose, stipitate glandular at least near the base; flowers 1.5-2.5 cm in diameter; hypanthium 2 mm x 1-1.5 mm, eglandular or stipitate-glandular; carpels 6-11, styles glabrous, exerted 3-4 mm beyond the orifice (0.5-1 mm in diameter) of conical discs (2-3 mm in diameter) ..... ***R. multiflora***
  - 3 Styles distinct, usually only the stigmas protruding from the orifice, by 0-4 mm; stipule margins and auricles entire to serrate, not laciniate; shrubs, erect or arching, to 0.3-5 m tall.
    - 6 Sepals entire, tapering to apex, persistent on fruit and erect or nearly erect; flowers generally solitary, or with 1-3 laterals.
      - 7 Fruit dark red when ripe, 20-25 mm in diameter; petals 3-5 cm long; pedicel subtended by a clasping bract; [section *Cassiorhodon*] ..... ***R. rugosa***
      - 7 Fruit blackish when ripe, 8-16 mm in diameter; petals 1-2.5 cm long; pedicel lacking a clasping bract, though often with a modified 3-foliolate leaf; [section *Pimpinellifoliae*] ..... ***R. spinosissima***
    - 6 Sepals either lobed or with broadened apices, or if entire then spreading, reflexed, or deciduous from fruit; flowers solitary or corymbose.
      - 8 Inflorescence of a solitary flower (rarely with a few laterals), the paired bracts on the pedicel caducous; [section *Gallicae*].
        - 9 Leaves not glandular-ciliate (or only remotely so); leaves not rugose ..... ***R. xdamascena***
        - 9 Leaves glandular-ciliate; leaves rugose ..... ***R. gallica***
      - 8 Inflorescence either corymbose, or of a solitary flower and its pedicel subtended by persistent bracts.
    - 10 Sepals disparate in size and shape, the outer pinnatifid with leafy segments; orifice of the hypanthium ca. 1 mm in diameter, the styles slightly exerted; [aliens]; [section *Caninae*].
      - 11 Stems to 5 m tall, prickles all similar; leaflets abaxially glabrous or rarely pubescent on midveins, eglandular; bracts 6-18 mm x 4-5 mm, glabrous; sepals abaxially eglandular ..... ***R. canina***
      - 11 Stems to 3 m tall, prickles of varying sizes; leaflets abaxially pubescent or tomentose, rarely glabrous, glandular; bracts 13-15 mm x 5-7 mm, tomentose; sepals abaxially densely stipitate-glandular.
        - 12 Stipules 6-10 mm x 2-4 mm, margins mostly stipitate-glandular; leaflet blades 10-22 mm x 8-15 mm, abaxial surfaces glabrous or pubescent; glands of the leaves apple-scented; bracts caducous, glabrous, margins stipitate-glandular; pedicels 6-9 mm long, densely stipitate- or setose-glandular; flowers 2.5-4 cm in diameter; hips red, 10-25 mm x 10-22 mm, sepals subpersistent ..... ***R. rubiginosa***
        - 12 Stipules 10-16 (-20) mm x 3-4 mm, margins densely glandular-ciliate; leaflet blades 15-30 (-60) mm x 8-22 (-50) mm, abaxial surfaces tomentose; glands of the leaves resin-scented; bracts persistent, tomentose, margins ciliate-glandular; pedicels (11-) 20-35 mm long, densely stipitate-glandular; flowers 3.5-5 cm in diameter; hips dark red, 10-15 mm x 10-12 mm, sepals caducous before hips mature ..... ***R. tomentosa***
  - 10 Sepals alike, all entire or with a few scarcely leafy teeth near the base; orifice of the hypanthium ca. 2-4 mm in diameter, the opening blocked by the stigmas; [natives and aliens]; [section *Cinnamomeae*].
    - 13 Petals 10 or more (flowers 'doubled'); [alien] ..... ***R. cinnamomea***
    - 13 Petals 5; [native to North America (some populations may be locally introduced)].
      - 14 Hypanthium glabrous.
        - 15 Long and straight prickles present throughout the stems ..... ***R. acicularis* ssp. *sayi***
        - 15 Prickles absent from the stems, or present and short or curved.
          - 16 Infrastipular prickles stout and broad-based ..... ***R. virginiana***
          - 16 Infrastipular prickles absent or not especially stout or broad-based.

- 17 Lower leaf surface with generally < 2 hairs per mm<sup>2</sup>; infrastipular prickles always absent on new stems; bristles always present on new stems; leaflets 7-9..... *R. arkansana*
- 17 Lower leaf surface with generally >2 hairs per mm<sup>2</sup>; infrastipular prickles present or absent on new stems; bristles generally absent on new stems; leaflets 5-7 ..... *R. blanda*
- 14 Hypanthium with glands.
  - 18 Bristles present on new branches.
    - 19 Infrastipular prickles absent..... *R. arkansana*
    - 19 Infrastipular prickles present ..... *R. carolina*
    - 20 Fertile branches armed with straight, thin or rarely stout, circular or somewhat flattened infrastipular prickles, lacking internodal prickles or aciculi (or if these present , few and scattered); stems mostly thin, pendent or upright; hypanthia (later hips) and pedicels stipitate-glandular (rarely eglandular)..... *R. carolina ssp. carolina*
    - 20 Fertile branches armed with straight, thin or often stout, circular or flattened infrastipular prickles, with internodal prickles of small prickles, aciculi, or stipitate glands, usually densely covering branches and adjacent stems; stems mostly thick, or upright; hypanthia (later hips) and pedicels stipitate-glandular or eglandular ..... *R. carolina ssp. subserrulata*
  - 18 Bristles absent on new branches.
    - 21 Leaflets 3.5-5× as long as wide; leaves with (5-) 7-9 (-11) leaflets; [c. MS westward] ..... *R. foliolosa*
    - 21 Leaflets 1-3× as long as wide; leaves with (3-) 5-7 (-9) leaflets; [collectively widespread].
      - 22 Hypanthium typically with > 86 glands; terminal leaflet oblong, generally with 20-30 small teeth per side ..... *R. palustris*
      - 22 Hypanthium typically with < 86 glands; terminal leaflet ovate, elliptic, or obovate, with 10-18 (-23) small teeth per side.
        - 23 Bristles absent on new stems; auricles > 3.8 mm long; stipules > 1.1 mm wide; infrastipular prickles stout, broad-based, and often curved ..... *R. virginiana*
        - 23 Bristles present or absent on new stems; auricles < 3.8 mm long; stipules < 1.1 mm wide; infrastipular prickles slender and not especially broad-based or curved.
          - 23 Fertile branches armed with straight, thin or rarely stout, circular or somewhat flattened infrastipular prickles, lacking internodal prickles or aciculi (or if these present , few and scattered); stems mostly thin, pendent or upright; hypanthia (later hips) and pedicels stipitate-glandular (rarely eglandular)..... *R. carolina ssp. carolina*
          - 23 Fertile branches armed with straight, thin or often stout, circular or flattened infrastipular prickles, with internodal prickles of small prickles, aciculi, or stipitate glands, usually densely covering branches and adjacent stems; stems mostly thick, upright; hypanthia (later hips) and pedicels stipitate-glandular or eglandular..... *R. carolina ssp. subserrulata*

*Rosa acicularis* Lindley *ssp. sayi* (Schweinitz) W.H. Lewis, Prickly Rose. Mt (WV): rocky forests; rare. June. South and east to WV (Cronquist 1991, Harmon, Ford-Werntz, & Grafton 2006). [= FNA, K1, K2, WV; = *R. acicularis* var. *bourgeauiana* (Crépin) Crépin – C, F; < *R. acicularis* – G, Y]

\*? *Rosa arkansana* Porter. Mt (NC): {habitat}; rare. Reported from North Carolina portion of the Great Smoky Mountains National Park. [= C, FNA, K2, Y; > *R. arkansana* var. *suffulta* (Greene) Cockerell – F, K1]

*Rosa blanda* Aiton, Smooth Rose, Meadow Rose. Mt (WV), Pd (VA): rocky forests; rare. June. QC west to MB, south to S. PA (Rhoads & Klein 1993; Rhoads & Block 2007), MD, VA, WV (Harmon, Ford-Werntz, & Grafton 2006), OH, IN, IL, MO, KS, and MT. [= C, F, FNA, G, Pa, Y; > *R. blanda* var. *blanda* – K1, K2]

\* *Rosa bracteata* J.C. Wendland, McCartney Rose, Chickasaw Rose. Cp (FL, VA), Pd (GA, NC, SC, VA): disturbed areas, suburban borders; uncommon (rare in GA, NC, SC, VA), persistent after cultivation, introduced. May-November; July-November. [= RAB, C, F, FNA, G, K1, K2, S, WH, Z]

\* *Rosa canina* Linnaeus, Dog Rose. Mt (NC, VA, WV), Pd (VA), Cp (VA): pastures; rare, introduced. May-June; September-October. [= RAB, C, F, FNA, G, K1, K2, Pa, S, W, WV, Z]

*Rosa carolina* Linnaeus *ssp. carolina*, Carolina Rose. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, GA, NC, SC, VA): upland forests, woodlands, pastures, roadsides; common (rare in FL). May-June; August-October. NB and ON south to FL and TX. [= FNA, K2; < *R. carolina* – RAB, C, G, Pa, W, Y, Z; > *R. carolina* var. *carolina* – F; > *R. carolina* var. *grandiflora* (Baker) Rehder – F; > *R. carolina* var. *villosa* (Best) Rehder – F; < *R. carolina* var. *carolina* – K1; > *R. carolina* – S; > *R. lyoni* Pursh – S; > *R. serrulata* Rafinesque – S]

*Rosa carolina* Linnaeus *ssp. subserrulata* (Rydberg) W.H. Lewis, Carolina Rose. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA): glades and barrens; rare. May-June; August-October. PA, IN, ON, and MI, and MO, south to SC, AL, and TX. [= FNA, K2; < *R. carolina* – RAB, C, G, Pa, W, Y, Z; > *R. carolina* var. *carolina* – F; ? *R. carolina* var. *grandiflora* (Baker) Rehder – F; ? *R. carolina* var. *villosa* (Best) Rehder – F; < *R. carolina* var. *carolina* – K1; ? *R. carolina* – S; ? *R. lyoni* Pursh – S; ? *R. serrulata* Rafinesque – S]

\* *Rosa chinensis* Thunberg, Chinese Rose. Cp (AL, MS), {VA}. Reported for AL, MS, and VA (Kartesz 2010). [= K1, K2] {not yet keyed}

\* *Rosa cinnamomea* Linnaeus, Cinnamon Rose. Mt (VA): disturbed areas; rare, native of Eurasia. [= F, FNA, G, K, Pa, Z; ? *R. majalis* Herrmann – C]

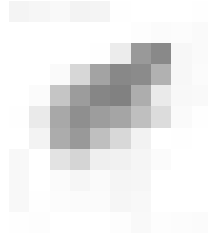
\* *Rosa xdamascena* P. Miller (pro sp.) [*R. gallica* Linnaeus × *moschata* J. Herrmann], Damask Rose. Mt (NC): disturbed areas; rare, persistent after cultivation, native of Europe. May-June; September-October. [= K; = *R. damascena* P. Miller – RAB]

\* *Rosa x dumetorum* Thuillier (pro sp.) [= *R. canina* Linnaeus × *R. obtusifolia* Desvauux]. {KY} Introduced in KY. [= K1, K2] {not yet keyed}

\* *Rosa ferruginea* Villars, Red-leaf Rose. {SC} Reported for SC (Kartesz 1999). [= *R. ferruginea* – K2, orthographic error; = *Rosa rubrifolia* Villars – K1]

*Rosa foliolosa* Nuttall in Torrey & Gray, White Prairie Rose. Cp (MS): prairies; rare. SE. KS and w. OK south to w. AR, and e. and c. TX; disjunct in c. MS. [= FNA, K1, K2]

- \* *Rosa gallica* Linnaeus, French Rose. Cp (DE), Mt (NC, VA), Pd (SC, VA): disturbed areas; uncommon (rare in NC, SC, and VA), native of Europe. May-June; September-October. There is a question as to whether the name *R. gallica* can be used; if not, it would be replaced with *R. austriaca*. Represented by many cultivated forms, some involving complex hybridization with other species. *R. ×damascena* P. Miller is apparently a hybrid of *R. gallica* and *R. moschata* J. Herrmann. [= RAB, C, F, FNA, G, K, Pa, Z; = *R. austriaca* Crantz]
- \* *Rosa laevigata* Michaux, Cherokee Rose. Cp (FL, GA, NC, SC), {VA}: roadsides, moist forests; common (rare in NC, rare [if present] in VA), native of China. Late March-April; September-October. [= RAB, FNA, K, S, WH, Z]
- \* *Rosa luciae* Franchet & Rochebrune ex Crépin, Memorial Rose, Dorothy Perkins Rose, Lucie Rose. Pd (GA, NC, SC, VA), Cp (FL, NC, SC, VA), Mt (VA, WV): roadbanks, railroad embankments, disturbed areas; uncommon (rare in WV), native of e. Asia. May-June; September-October. See Duncan (1985) for documentation for GA. [= FNA; > *Rosa wichuriana* Crépin – C, F, G, K1, K2, Pa, W, WH, Z; > *R. wichuriana* – RAB, orthographic variant]
- \* *Rosa moschata* J. Herrmann, Musk Rose. Allegedly introduced in AL. [= K1, K2, S] {not yet keyed; investigate}
- \* *Rosa multiflora* Thunberg ex Murray, Multiflora Rose. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): pastures, thickets, bottomlands, upland forests, bogs; common (uncommon in FL), native of Asia, aggressively invasive. May-June; September-October. [= RAB, C, F, FNA, G, K1, K2, Pa, S, W, WH, WV, Z]
- \* *Rosa palustris* Marshall, Swamp Rose. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): swamp forests, bogs, streamsides; common. May-July; September-October. NB and ON south to c. peninsular FL, MS, and AR. [= RAB, C, F, FNA, G, GW, K, Pa, W, WH, WV, Y, Z; > *R. palustris* – K1, K2, S; > *R. floridana* Rydberg – S; > *R. obtusiuscula* Rydberg – K1, K2, S]
- \* *Rosa rubiginosa* Linnaeus, Eglantine Rose, Sweetbriar Rose. Mt (GA, NC, SC, VA, WV), Cp (DE, NC, SC, VA), Pd (DE, GA, NC, SC, VA): pastures, disturbed areas; uncommon (rare in GA, NC, and SC), native of Europe. May-June; September-October. Brummitt (2005) rejected the name *R. eglanteria* for *R. rubiginosa* [= FNA; > *R. eglanteria* Linnaeus – RAB, C, F, G, K, Pa, W, WV, Z; > *Rosa micrantha* Borrer ex J.E. Smith – RAB, C, F, G, K1, K2, Pa, S, W, Z; > *R. rubiginosa* – K2, S]
- \* *Rosa rugosa* Thunberg, Japanese Rose, Rugosa Rose. Cp (DE, VA), Pd (VA), Mt (WV): coastal dunes, disturbed areas, cultivated and sometimes escaped; common (rare in VA), native of Asia. [= C, F, FNA, G, K1, K2, Pa, WV, Z]
- \* *Rosa setigera* Michaux, Climbing Prairie Rose. Mt (GA\*, NC, VA, WV), Cp (DE, FL, NC\*, SC\*), Pd (GA): stream banks, pastures; rare, nativity uncertain in portions of our area. May-June; September-October. [= RAB, C, FNA, K2, Pa, S, W; > *R. setigera* var. *setigera* – F, G, K1, WV, Z; > *R. setigera* var. *tomentosa* Torrey & A. Gray – F, G, K1, WV, Z]
- \* *Rosa spinosissima* Linnaeus, Scotch Rose. Mt (VA): cultivated and rarely escaped; rare, native of Eurasia. [= F, FNA, G, K1, K2; > *R. pimpinellifolia* Linnaeus – C]
- \* *Rosa tomentosa* J.E. Smith. Reported for NC and TN by Kartesz (2010). [= C, F, FNA, K1, K2, S] {uncertain if naturalized; investigate; not mapped}
- \* *Rosa virginiana* P. Miller, Virginia Rose. Pd (DE, VA), Cp (DE), Mt (WV), {GA, NC}: moist to dry forests and woodlands; uncommon (rare in DE, NC, VA, and WV). May-June; August-October. NL (Newfoundland) and ON south to GA, AL, and MO. C. TN (Chester, Wofford, & Kral 1997), e. and c. KY (Clark et al. 2005). [= C, F, FNA, G, Pa, S, W, Y, Z; > *R. virginiana* var. *virginiana* – K]
- \* *Rosa xanthina* Lindley, Yellow Rose, Manchu Rose. Disturbed areas; native of China. Reported for SC (Kartesz 1999, Kartesz 2010). [= K1, K2] {not yet keyed; uncertain if naturalized; investigate}



3. *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); Widrechner (1998); Kalkman in Kubitzki (2004).

**Identification Notes:** All of our species of *Rubus* except *R. dalibarda*, *R. odoratus*, and *R. pubescens* have biennial stems. The first year the stems remain sterile and are termed **primocanes**. The second year, these stems produce lateral branches with flowers and are termed **floricanes**. Primocane and floricane leaves differ.

- 1 Leaves simple.
  - 2 Leaves unlobed, elliptic to ovate-orbicular, finely toothed, 1.5-3 cm long; plant an herb, < 1 dm tall; petals white.....*R. dalibarda*
  - 2 Leaves palmately lobed, orbicular, coarsely toothed, 9-30 cm long; plant a shrub, 10-20 dm tall; petals deep pink; [subgenus *Anoplobatus* – **flowering raspberries**].....*R. odoratus*
- 1 Leaves 3-9-foliolate (reduced simple leaves may also be present in the inflorescence).
  - 2 Upright stems herbaceous, annual, not differentiated into primocanes and floricanes, unarmed or with a few weak bristles; stipules oblanceolate; [e. WV northward]; [subgenus *Cylactis* – **dwarf raspberries**] .....*R. pubescens*

- 2 Upright stems woody, biennial, differentiated into primocanes and floricanes, these usually well-armed with bristles and/or curved prickles; stipules linear; [collectively widespread].
- 3 Fruit separating from the receptacle, the receptacle remaining on the pedicel; stems either strongly white-glaucous (*R. occidentalis*), or densely beset with slender-based prickles and bristles (*R. idaeus*), or densely pubescent with 3-5 mm long glandular hairs (*R. phoenicolasius*), or if not as above then the leaves pinnately 5-9-foliolate (*R. illecebrosus*); [subgenus *Idaebatus* – raspberries].
- 4 Floricane leaves pinnately 5-9-foliolate..... *R. illecebrosus*
- 4 Floricane leaves 1-3-foliolate.
  - 5 Inflorescence paniculiform, many-flowered; berries sticky, purplish-red, lacking a glaucous bloom ..... *R. phoenicolasius*
  - 5 Inflorescence corymbiform, few-flowered; berries not sticky, black or red (rarely purplish or yellow), with a glaucous bloom.
    - 6 Fruit black (rarely yellow); pedicels with stout curved prickles; stems (at least the primocanes) strongly white-glaucous ..... *R. occidentalis*
    - 6 Fruit red (rarely purple or yellow); pedicels with narrow straight bristles and sometimes also glandular hairs; stems green.
      - 7 Inflorescence without glandular hairs or gland-tipped bristles; [alien, cultivated, sometimes escaped or persistent] ..... *R. idaeus* var. *idaeus*
      - 7 Inflorescence with glandular hairs and gland-tipped bristles; [native in Mountains of NC and VA]..... *R. idaeus* var. *strigosus*
- 3 Fruit retaining the receptacle; stems or leaves not as described above, except if beset with slender-based prickles and bristles then also < 1 m tall; [subgenus *Rubus* – blackberries and dewberries].
- 8 Canes very coarse, scrambling, often 2-3 m long, heavily armed; inflorescence cymose-paniculate; branches and pedicels of the floricanes armed with strong, flattened prickles (or nearly straight in *R. bifrons*); [alien, generally in disturbed habitats]; [alien blackberries].
  - 9 Leaves compound, the leaflets additionally laciniately divided; leaves green beneath..... *R. laciniatus*
  - 9 Leaves compound, the leaflets toothed; leaves grayish-tomentose beneath.
    - 10 Prickles nearly straight; stems glabrescent; petals pale pink to red..... *R. bifrons*
    - 10 Prickles recurved; stems canescent above; petals white to pale pink ..... *R. discolor*
- 8 Canes delicate to coarse, arching or trailing, 0-4 m long, unarmed to strongly armed; inflorescence racemiform; branches and pedicels of the floricanes generally unarmed; [native, though often in disturbed habitats].
- 11 Primocanes prostrate, creeping, or low-arching, rooting at the tip or also at the nodes; [dewberries].
  - 12 Stems armed with stout-based, usually recurved prickles, bristles lacking ..... *R. flagellaris*
  - 12 Stems primarily armed with narrow-based prickles or even narrower bristles, with or without stout-based prickles as well.
    - 13 Inflorescence racemiform; bristles of the stem nonglandular (very small glandular hairs may be present) ..... *R. hispida*
    - 13 Inflorescence reduced, normally to a single flower per branch of the floricane..... *R. trivialis*
- 11 Primocanes erect, ascending, or high-arching, not rooting; [native blackberries].
  - 14 Canes armed primarily with bristles or slender-based prickles ..... *R. setosus*
  - 14 Canes armed with heavy, stout-based, often recurved, prickles (or the canes essentially unarmed, the broad-based prickles few or almost absent).
    - 15 Leaflets oblanceolate to obovate, definitely wider beyond the middle, generally obtuse or rounded at the tip; leaves densely white- or gray-tomentose beneath; [primarily of the Coastal Plain] ..... *R. cuneifolius*
    - 15 Leaflets lanceolate to ovate, widest below or near the middle, generally acute or acuminate at the tip; leaves glabrous to pubescent beneath, but the pubescence not notably tight and white or gray; [collectively widespread].
      - 16 Pubescence of the inflorescence rachis and pedicels predominantly gland-tipped, glandular hairs often present also on the young primocanes and the branches of the floricanes, the glands flattened to cupulate ..... *R. allegheniensis*
      - 16 Pubescence of the inflorescence rachis and pedicels nonglandular or glandular, glandular hairs absent elsewhere, the glands rounded.
        - 17 Leaves glabrous (or very nearly so) beneath; canes with at most few and weak prickles; leaflets of the primocanes with attenuate to caudate apices ..... *R. canadensis*
        - 17 Leaves softly pubescent beneath; canes with many and strong prickles; leaflets of the primocanes with acute to acuminate apices ..... *R. pensilvanicus*

*Rubus allegheniensis* Porter, Allegheny Blackberry. Mt (GA, NC, VA, WV), Pd (DE, NC, VA): forests, woodlands, grassy balds; common. May-June; July. NS west to MN, south to w. NC, n. GA, and e. TN. [= RAB, C, G, Pa, W; > *R. allegheniensis* var. *allegheniensis* – F, K, WV; > *R. allegheniensis* var. *gravesii* Fernald – F, K, WV; > *R. alumnus* L.H. Bailey – F, K, WV; > *R. concameratus* H.A. Davis & T. Davis – WV; ? *R. nigrobaccus* L.H. Bailey – S; > *R. pugnax* L.H. Bailey – WV; > *R. reravus* L.H. Bailey – F; > *R. rosa* L.H. Bailey – WV]

\* *Rubus bifrons* Vest ex Trattinick. Disturbed areas, roadsides, thickets; native of Europe. May-June; late June-July. [= RAB, C, F, G, K, Pa, W]

\* *Rubus caesius* Linnaeus, European Dewberry. Reported for KY (Kartesz 2010). [= K2, Pa] {not yet keyed; add synonymy}

*Rubus canadensis* Linnaeus, Smooth Blackberry, Thornless Blackberry. Mt (GA, NC, SC, VA, WV): forests, woodlands, grassy balds, especially common at high elevations; common. June-July; July-August. NL (Newfoundland) west to MN, south (primarily in the Appalachians) to w. NC, e. TN, and n. GA. [= RAB, C, F, G, K, Pa, S, W, WV]

*Rubus cuneifolius* Pursh, Sand Blackberry. Cp (DE, FL, GA, NC, SC), Pd (GA, NC, SC, VA), Mt (VA): woodlands, forests, disturbed areas; common (rare in Mountains). Late April-early June; June-July. CT and NY (Long Island) south to s. FL and AL, MS, and se. LA, primarily on the Coastal Plain. [= RAB, C, G, GW, Pa, S, W; > *R. cuneifolius* var. *cuneifolius* – F; > *R. cuneifolius* var. *subellipticus* Fernald – F; > *R. cuneifolius* – K; > *R. longii* Fernald – F, K; > *R. probabilis* L.H. Bailey – K; > *R. sejunctus* L.H. Bailey – F]

*Rubus dalibarda* Linnaeus, Dewdrop, Robin-runaway, Star-violet. Bog margins and mountain swamp forests, often along spring seeps, mostly in dense shade beneath *Rhododendron maximum*. June-September. NL (Newfoundland) west to MI and MN, south to NJ and OH, and disjunct to WV, sw. VA, and w. NC. [= *Dalibarda repens* Linnaeus – RAB, C, G, GW, K, S, W, WV; = *R. repens* (Linnaeus) Kuntze]

\* ***Rubus discolor*** Weihe & Nees, Himalaya-berry. Cp, Pd (NC?, SC?, VA): disturbed areas, thickets; uncommon, native of Europe. June-July; August. [= C, K, Pa; = *R. procerus* P.J. Mueller – F; ? *R. linkianus* Seringe – S, misapplied?]

***Rubus flagellaris*** Willdenow, Common Dewberry. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): old fields, woodlands, roadsides, disturbed areas; common. April-May; May-July. NS west to MN, south to GA and LA. [= RAB, W; > *R. flagellaris* – C, F, G, K, Pa, S, WV; > *R. enslenii* – C, F, G, K, Pa, S, WV; > *R. akermani* Fernald – F; > *R. arundelanus* Blanchard – G; > *R. baileyanus* Britton – F, K, S, WV; > *R. boyntoni* W.W. Ashe – F, orthographic variant; > *R. boyntonii* W.W. Ashe – K; > *R. cacaponensis* H.A. Davis & T. Davis – WV; > *R. cathartium* Fernald – F; > *R. celer* L.H. Bailey – F, K, WV; > *R. clarus* L.H. Bailey – F, K; > *R. scordifrons* L.H. Bailey – F; > *R. deamii* – K, WV; > *R. decor* L.H. Bailey – F, WV; > *R. depavitus* L.H. Bailey – F, K; > *R. exsularis* L.H. Bailey – WV; > *R. fecundus* L.H. Bailey – WV; > *R. felix* L.H. Bailey – F, WV; > *R. grimesii* L.H. Bailey – F, K; > *R. hypolasius* Fernald – F; > *R. imperiorum* Fernald – F; > *R. iniens* L.H. Bailey – F, K; > *R. injunctus* L.H. Bailey – F, WV; > *R. invisus* (L.H. Bailey) Britton – F, K, S, WV; > *R. jaysmithii* – F, K; > *R. kentuckiensis* L.H. Bailey – F, WV; > *R. leviculus* L.H. Bailey – F, K; > *R. longipes* Fernald – F; > *R. michiganensis* (Card ex L.H. Bailey) L.H. Bailey – WV; > *R. montensis* L.H. Bailey – WV; > *R. multiflorus* L.H. Bailey – WV; > *R. nefrens* L.H. Bailey – F, K; > *R. obivius* L.H. Bailey – F, K; > *R. particularis* L.H. Bailey – F, K, WV; > *R. pernagaeus* Fernald – F, K; > *R. plexus* Fernald – F, K; > *R. profusiflorus* L.H. Bailey – WV; > *R. pronus* L.H. Bailey – WV; > *R. recurvicaulis* Blanchard – C, F, Pa; > *R. redundans* L.H. Bailey – F; > *R. roribaccus* (L.H. Bailey) Rydberg – F, K, WV; > *R. rosagneticus* L.H. Bailey – F; > *R. russeus* L.H. Bailey – WV; > *R. sailori* – L.H. Bailey – F, K; > *R. scambens* L.H. Bailey – F, K; > *R. sewardianus* – F, K; > *R. steelei* L.H. Bailey – WV; > *R. subinnoxius* Fernald – F; > *R. temerarius* L.H. Bailey – F, K; > *R. terraltanus* L.H. Bailey – WV; > *R. tetricus* L.H. Bailey – F; > *R. vixalacer* L.H. Bailey – WV; > *R. whartoniae* L.H. Bailey – F, K]

\* ***Rubus hirsutus*** {}, Sikkim Raspberry. Suburban woodland, native of China. Identification awaiting confirmation (D. Goldman, pers. comm.). {not yet keyed}

***Rubus hispidus*** Linnaeus, Swamp Dewberry. Cp (DE, GA, NC, SC, VA), Mt (GA, NC, VA, WV), Pd (GA, NC, VA): bogs, moist woodlands and forests, disturbed moist areas; common. May-June; June-July. NS and QC west to WI, south to n. SC, n. and wc. GA (Carter, Baker, & Morris 2009), and MO. [= RAB, C, G, GW, Pa, S, W; > *R. ambigens* Fernald – F; > *R. davisiorum* L.H. Bailey – F, WV; > *R. hispidus* – K, WV; > *R. hispidus* var. *hispidus* – F; > *R. hispidus* var. *obovalis* (Michaux) Fernald – F; > *R. huttonii* L.H. Bailey – F, WV; > *R. paganus* L.H. Bailey – K, WV; > *R. porteri* L.H. Bailey – F, K; > *R. provincialis* L.H. Bailey – K, WV; > *R. tardatus* Blanchard – F, K; > *R. vagulus* L.H. Bailey – F; > *R. vegrandis* L.H. Bailey – F; > *R. vigil* L.H. Bailey – F; > *R. zaplutus* L.H. Bailey – F]

\* ***Rubus idaeus*** Linnaeus var. *idaeus*, Cultivated Red Raspberry. Mt (NC, VA): disturbed areas; rare (commonly cultivated in the cooler portions of our area, rarely escaped or persistent), native of Eurasia. June-August; July-September. [= C, F; = *R. idaeus* – G; = *R. idaeus* ssp. *idaeus* – K]

***Rubus idaeus*** Linnaeus var. *strigosus* (Michaux) Maximowicz, Red Raspberry. Mt (NC, VA, WV): high elevation forests and thickets, adelgid-killed spruce-fir forests; uncommon (rare in NC and VA). June-August; July-September. The species is circumboreal; var. *strigosus* ranges from NL (Newfoundland) west to AK, south to PA, IN, IA, and AZ; disjunct farther south in nw. VA and ne. WV, and in w. NC and e. TN. [= C, Pa; > *R. idaeus* Linnaeus var. *canadensis* (Richardson) House – RAB, F; > *R. idaeus* var. *strigosus* – F; = *R. strigosus* Michaux – G, WV; = *R. idaeus* ssp. *strigosus* (Michaux) Focke – K; > *R. carolinianus* Rydberg – S; > *R. idaeus* ssp. *sachalinensis* (Levl.) Focke – W; > *R. idaeus* ssp. *melanolasius* Focke var. *canadensis* – Z]

\* ***Rubus illecebrosus*** Focke, Strawberry-raspberry. Mt (NC, VA, WV): disturbed areas; rare, native of Japan. June-July; August. [= RAB, C, F, G, K, Pa, WV]

\* ***Rubus laciniatus*** Willdenow, Cut-leaved Blackberry, Evergreen Blackberry. Disturbed areas, thickets; native of Europe. May-June; June-July. [= RAB, C, F, K, Pa, W, WV]

***Rubus occidentalis*** Linnaeus, Black Raspberry, Blackcap. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (NC, SC, VA), {GA}: roadsides, woodlands, thickets, disturbed areas; common (increasingly rare southward in our area; much more common in VA and WV than in NC, and rare in n. SC). Late April-early June; June-July. QC to ND and e. CO, south to n. GA, c. AL, n. MS, AR, and c. OK. [= RAB, C, F, G, K, Pa, S, W, WV, Z]

***Rubus odoratus*** Linnaeus, Purple-flowering Raspberry. Mt (GA, NC, VA, WV), Pd (DE): moist roadsides, thickets, and forests; common (rare in DE). June-August; July-October. NS west to MI, south to w. NC, n. GA, and e. TN. [= RAB, C, G, Pa, W, Z; > *Rubus odoratus* var. *odoratus* – F, K, WV; > *Rubus odoratus* var. *columbianus* Millsbaugh – F, K, WV; = *Rubacera odoratum* (Linnaeus) Rydberg – S]

***Rubus pensilvanicus*** Poirer, Pennsylvania Blackberry. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides, thickets, woodlands; common. April-May; late May-July. ME west to MN, south to FL and TX. The most common “highbush” blackberry in most of our area. [= *R. argutus* – W; > *R. pensilvanicus* – C, F, G, K, Pa, WV; > *R. argutus* Link – RAB, C, F, G, GW, K, S; > *R. abactus* L.H. Bailey – WV; > *R. andrewsianus* Blanchard – WV; > *R. barbarus* L.H. Bailey – F; > *R. bellobatus* L.H. Bailey – WV; > *R. betulifolius* Small – RAB, S; > *R. blakei* L.H. Bailey – F; > *R. condensiflorus* L.H. Bailey – F; > *R. congruus* Bailey – F; > *R. cupressorum* Fernald – F; > *R. defectionis* Fernald – F, K; > *R. densissimus* H.A. Davis & T. Davis – WV; > *R. dissitiflorus* Fernald – F; > *R. fatuus* Bailey – F; > *R. floricomus* Blanchard – F, K; > *R. floridus* Trattinick – F, S; > *R. frondosus* Bigelow – F, K, WV; > *R. immanis* L.H. Bailey – K; > *R. jennisonii* L.H. Bailey – WV; > *R. jugosus* L.H. Bailey – F; > *R. laudatus* Berger – K, WV; > *R. leggii* H.A. Davis & T. Davis – WV; > *R. libratus* L.H. Bailey – F; > *R. louisianus* Berger – F; > *R. orarius* Blanchard – C; > *R. ostryfolius* Rydberg – G; > *R. pauciflorus* L.H. Bailey – F, K; > *R. pergratus* Blanchard – K; > *R. philadelphicus* Blanchard – WV; > *R. praepes* L.H. Bailey – F; > *R. prestonensis* H.A. Davis & T. Davis – WV; > *R. recurvans* Blanchard – F, K; > *R. rosarius* L.H. Bailey – K; > *R. subsolanus* L.H. Bailey – F, WV; > *R. tygartensis* H.A. Davis & T. Davis – WV]

\* ***Rubus phoenicolasius*** Maximowicz, Wineberry. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, VA): roadsides, thickets; common, native of e. Asia. May-June; June-July. [= RAB, C, F, G, K, Pa, S, W, WV]

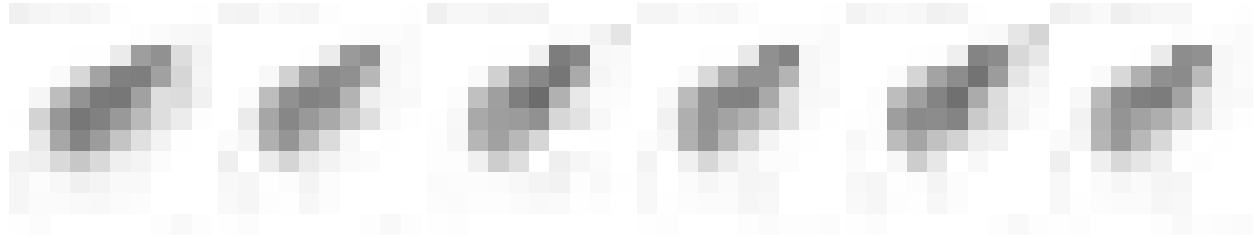
***Rubus pubescens*** Rafinesque, Dwarf Raspberry. Mt (WV): bogs; rare. May-June; July. NL (Labrador) to YT, south to e. WV and s. PA (Rhoads & Klein 1993; Rhoads & Block 2007), IN, CO, and WA. [= C, G, Pa, WV; > *R. pubescens* var. *pubescens* – F, K]

***Rubus setosus*** Bigelow, Bristly Blackberry. Mt (VA, WV): thickets; rare. June-July. QC west to MN, south to VA and IL. [= C, G, Pa; > *R. angustifolius* L.H. Bailey – F; > *R. benneri* L.H. Bailey – F; > *R. elegantulus* Blanchard – K; > *R. groutianus* Blanchard

– WV; > *R. nocivus* L.H. Bailey – F; > *R. notatus* L.H. Bailey – WV; > *R. racemiger* L.H. Bailey – F, K, WV; > *R. semisetosus* Blanchard – F, K; > *R. setosus* – F, K, WV]

\* *Rubus triphyllus* Thunberg. Pd (DE): disturbed areas; uncommon, native of Japan. [= F, K] {not yet keyed}

*Rubus trivialis* Michaux, Southern Dewberry, Coastal Plain Dewberry. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC): roadsides, old fields, thickets, disturbed areas; common (rare in Mountains). March-April; late April-May. E. MD south to s. FL, west to TX, north in the interior to MO. [= RAB, C, F, G, GW, K, W; > *R. trivialis* – S; > *R. lucidus* Rydberg – S]



4. *Agrimonia* Linnaeus 1753 (Agrimony)

A genus of about 10-15 species, herbs, mainly north temperate. References: Kline & Sørensen in FNA (in press); Kline & Sørensen (2008)=Y; Robertson (1974)=Z; Kalkman in Kubitzki (2004). Key adapted from Y.

- 1 Stem and inflorescence axis lacking sessile or short-stalked glistening glands (but with spreading or ascending non-glandular hairs).
  - 2 Stipules deeply incised, half-ovate; hirsute hairs of the stem 3 mm or longer; 0-1 pair minor leaflets between major; mature fruiting hypanthium as broad as long or broader; hypanthium ridges rarely with eglandular hairs ..... *A. microcarpa*
  - 2 Stipules toothed, not deeply, half-ovate to half-round; hirsute hairs of the stem 3 mm or shorter; 0-3 or 0-1 pair minor leaflets between major; mature fruiting hypanthium as long as broad or longer; hypanthium ridges usually with hirsute eglandular hairs..... *A. pubescens*
- 1 Stem and inflorescence with glistening glands, these **either** sessile, **or** short-stalked, **or** both (and also with spreading or ascending non-glandular hairs).
  - 3 Glistening glands of the stem and inflorescence axis short stalked, or both short-stalked and sessile
    - 4 Lower inflorescence rachis with mostly erect hirsute eglandular hairs ca. 2 mm long; minor leaflets rarely only one pair between all major leaflet pairs; roots merely fibrous ..... *A. gryposepala*
    - 4 Lower inflorescence rachis with mostly ascending hirsute eglandular hairs less than 1 mm long; minor leaflets one pair between major leaflet pairs; roots with fusiform tubers ..... *A. rostellata*
  - 3 Glistening glands of the stem and inflorescence axis only sessile.
    - 5 Mid-cauline leaf with 5-7 major leaflets; stipule proximally incised or nearly entire ..... *A. striata*
    - 5 Mid-cauline leaf with 7-13 major leaflets; stipule incised along entire margin.
      - 6 Major leaflets obovate to elliptic, apex obtuse to acute; flowers mostly alternate along inflorescence axis; [Coastal Plain pinelands; e. SC south to c. peninsular FL and west to e. TX] ..... *A. incisa*
      - 6 Major leaflets lanceolate to narrowly elliptic, apex acuminate to rarely acute; flowers mostly sub-opposite along inflorescence axis; [bottomlands, marshes; CT west to s. MI and SD, south to FL, TX, the West Indies and Mexico] ..... *A. parviflora*

\* *Agrimonia eupatoria* Linnaeus, Medicinal Agrimony. Fields and disturbed areas, apparently naturalized; native of Eurasia. July-September. Introduced at scattered localities in ne. North America. [= C, F, FNA, G, K, Y, Z] {not yet keyed}

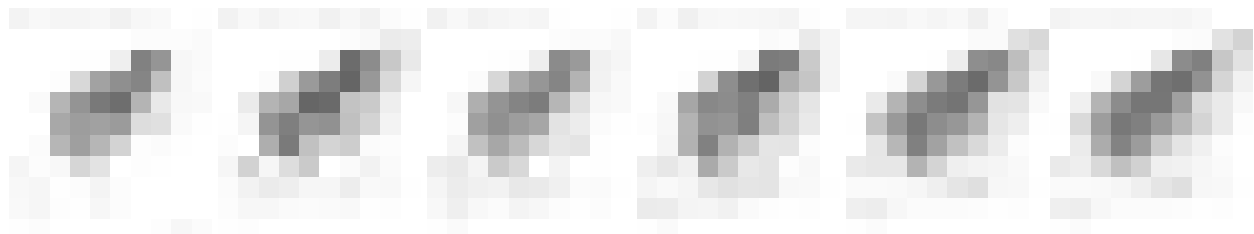
*Agrimonia gryposepala* Wallroth, Common Agrimony. Mesic forests, thickets, marshes, bogs, wet meadows, wet forests. July-August; July-October. ME and ON west to MT, south to NJ, w. NC, e. TN, IN, and KS; also in CA and NM. [= RAB, C, F, FNA, G, K, Pa, S, W, Y, Z]

*Agrimonia incisa* Torrey & A. Gray, Pineland Agrimony. Pinelands, disturbed areas associated with pinelands. July-early September. E. SC south to c. peninsular FL and west to e. TX (also reported from NC, but no specimen has been seen). [= RAB, C, FNA, K, S, WH, Y, Z]

*Agrimonia microcarpa* Wallroth, Low Agrimony. Dry to moist forests and woodlands. July-September; August-October. NJ south to n. FL, west to e. TX. [= C, F, FNA, G, K, Pa, S, W, WH, Y, Z; = *A. pubescens* Wallroth var. *microcarpa* (Wallroth) H.E. Ahles – RAB; > *A. microcarpa* – S; > *A. platycarpa* Wallroth – S]

*Agrimonia parviflora* Aiton, Southern Agrimony. Marshes, bottomland forests, wet pastures. July-September; July-October. CT west to s. MI and SD, south to FL, TX, the West Indies and Mexico. [= RAB, C, F, FNA, G, K, Pa, S, W, Y, Z]

*Agrimonia pubescens* Wallroth, Downy Agrimony. Dry to moist forests and woodlands. July-September; August-October. ME west to MI and SD, south to NC, GA, and OK. [= C, F, FNA, G, Pa, Y; = *A. pubescens* var. *pubescens* – RAB; > *A. pubescens* – K, S, W, Z; > *A. bicknellii* (Kearney) Rydberg – K, S, Z]



*Agrimonia rostellata* Wallroth, Woodland Agrimony. Moist to wet forests and woodlands. July-August; July-October. CT west to IN and KS, south to SC, GA, Panhandle FL, LA, and OK. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, Y, Z]

*Agrimonia striata* Michaux, Roadside Agrimony. Rich forests, floodplains, fields. July-August. NL (Newfoundland) west to BC, south to se. PA (Rhoads & Klein 1993; Rhoads & Block 2007), MD, DE, WV, KY, OK, NM, AZ, and Mexico; with scattered occurrences farther south w. NC, GA, AL), where probably adventive. [= C, F, FNA, G, K, Pa, Y]

**5. *Poterium* Linnaeus 1753 (Salad Burnet)**

A genus of 6 or more species, herbs, of Eurasia, n. Africa, and North America. References: Weakley in FNA (in press); Robertson (1974)=Z; Nordborg (1966, 1967)=Y; Kalkman in Kubitzki (2004).

\* *Poterium sanguisorba* Linnaeus ssp. *muricatum* (Spach) Rouy, Salad Burnet, Garden Burnet, Fodder Burnet. Cultivated as an herb and salad green, escaped to moist, disturbed areas; native of Europe. June-July. [= FNA; = *Sanguisorba minor* Scopoli ssp. *muricata* (Spach) Nordborg – K, Y, Z; < *Sanguisorba minor* – RAB, C, F, G, Pa, WV; < *Poterium sanguisorba* Linnaeus – S; = *Poterium polygamum* Waldstein & Kitaibel]

**6. *Poteridium* Spach 1846 (American Burnet)**

A genus of 2 species, herbs, of c. and w. North America. References: Weakley in FNA (in press); Robertson (1974)=Z; Nordborg (1966, 1967)=Y; Kalkman in Kubitzki (2004).

\* *Poteridium annuum* (Nuttall ex Hooker) Spach, Prairie Burnet. Roadsides; native of sc. United States. April-May. [= FNA; = *Sanguisorba annua* (Nuttall ex Hooker) Torrey & A. Gray – RAB, G, K, Z]

**7. *Sanguisorba* Linnaeus 1753 (Burnet)**

A genus of 15 or more species, herbs, of Eurasia, n. Africa, and North America, as here circumscribed to exclude *Poterium* and *Poteridium* (for our area). References: Weakley in FNA (in press); Robertson (1974)=Z; Nordborg (1966, 1967)=Y; Kalkman in Kubitzki (2004). [also see *Poteridium* and *Poterium*]

- 1 Leaflets pinnatifid (each leaflet incised nearly to the midvein).....[*Poteridium annuum*]
- 1 Leaflets toothed (the incisions not nearly to the midvein).
  - 2 Leaflets 3-10 cm long; inflorescence 6-30 cm long, spike-like; stamens 4 per flower, the filaments 8-10 mm long; sepals white (sometimes fading greenish); [native] .....*Sanguisorba canadensis*
  - 2 Leaflets 0.8-2 cm long; inflorescence 1-2 cm long, globose; stamens 15-20 per flower, the filaments 3-4 mm long; sepals green to pinkish-purple; [cultivated, occasionally escaped] .....[*Poterium minor* ssp. *muricata*]

*Sanguisorba canadensis* Linnaeus, Canada Burnet, American Burnet, White Burnet. Fens, seepage over mafic or ultramafic rocks (such as amphibolite, greenstone, serpentinite), spray zones around waterfalls, other seepage wetlands, wet meadows. June-September. NL (Newfoundland) and NL (Labrador) west to MB, south to NJ, PA, OH, and IN; disjunct southward in KY, nc. VA, and from sw. VA south to sw. NC, ne. TN, and ne. GA. First reported for SC by Hill & Horn (1997) and Hill (1999). [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV, Z]



**8. *Argentina* Hill 1756 (Silverweed)**



A genus of ca. 64 species, herbs, primarily Asian, but extending into Europe. Best separated from *Potentilla*, based on morphological and molecular grounds, based on the work of Dobeš & Paule (2010) and Soják (2010). References: Ertter, Elven, Reveal, & Murray in FNA (in press); Dobeš & Paule (2010); Soják (2010); Robertson (1974)=Z; Eriksson, Donoghue, & Hibbs (1998); Eriksson et al. (2003); Kalkman in Kubitzki (2004).

\* *Argentina anserina* (Linnaeus) Rydberg, Silverweed. Lawns, disturbed areas. May-June. Circumboreal, south in North America to MA, NY, nw. PA, OH, IN, IL, IA, NE, NM, AZ, and CA; also scattered farther south, apparently as an introduction, as in Sevier County, TN (Chester, Wofford, & Kral 1997), se. PA (Rhoads & Klein 1993; Rhoads & Klein 2007), MD (BONAP 2010), and n. NJ (BONAP 2010). [= K; = *Potentilla anserina* Linnaeus – C, F, G, Pa; > *Potentilla anserina* ssp. *anserina* – FNA]

### 9. *Potentilla* Linnaeus 1753 (Cinquefoil, Five-fingers, Potentilla)

A genus of 350-400 species, depending on the controversial circumscription. *Potentilla* here excludes *Argentina*, *Dasiphora*, *Drymocallis*, and *Sibbaldia* (for our area), but includes *Duchesnea*, following studies by Dobeš & Paule (2010), Soják (2010); and Eriksson et al. (2003). References: Ertter, Elven, Reveal, & Murray in FNA (in press); Robertson (1974)=Z; Eriksson, Donoghue, & Hibbs (1998); Eriksson et al. (2003); Kalkman in Kubitzki (2004).

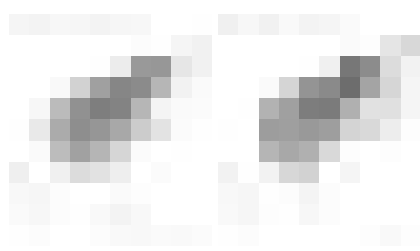
- 1 Flowers in terminal cymes; leaves palmately 3-9-foliolate.
  - 2 Leaves 3-foliolate; [section *Rivales*].
    - 3 Petals and sepals subequal; stamens (15-) 20; achenes usually ridged ..... *P. norvegica*
    - 3 Petals much shorter than the sepals; stamens 5-10 (-15); achenes smooth ..... *P. rivalis*
  - 2 Leaves 5-9-foliolate.
    - 4 Leaves (5-) 7-9-foliolate; petals 8-15 mm long, pale (sulphur) yellow; [section *Rectae*] ..... *P. recta*
    - 4 Leaves 5 (-7)-foliolate; petals 3-7 (-8) mm long, medium yellow; [section *Terminales*].
      - 5 Leaves pubescent beneath, the green surface not concealed; petals 4-5 mm long ..... *P. intermedia*
      - 5 Leaves densely tomentose beneath, the surface concealed; petals **either** 2.5-4 mm long **or** 5-7 (-8) mm long.
        - 6 Pubescence of the stem and veins of the leaf undersurface tomentose only; lower leaf surface silvery-white tomentose; leaves revolute; petals 2.5-4 mm long ..... *P. argentea*
        - 6 Pubescence of the stem and veins of the leaf undersurface tomentose and also with long, spreading hairs; lower leaf surface somewhat to strongly grayish-tomentose; leaves not revolute; petals 5-7 (-8) mm long ..... *P. inclinata*
  - 1 Flowers solitary, on naked, axillary pedicels; leaves **either** palmately 3-5-foliolate **or** pinnately (5-) 7-21 (-31)-foliolate.
    - 7 Leaves pinnately (5-) 7-21 (-31)-foliolate; [section *Anserinae*] ..... [see *Argentina*]
    - 7 Leaves palmately 3-5-foliolate.
      - 8 Leaves 3-foliolate; fruit strawberry-like, fleshy and red, consisting of an expanded fleshy receptacle bearing superficial achenes; [formerly genus *Duchesnea*] ..... *P. indica*
      - 8 Leaves primarily 5-foliolate on a plant (some poorly developed leaves may be 3-4-foliolate); fruit a head of achenes, dry; [section *Potentilla*].
        - 9 Plants lacking rhizomes; petals (6-) 8-12 mm long; anthers 1.3-2.0 mm long ..... *P. reptans*
        - 9 Plants with horizontal rhizomes; petals 4-10 mm long; anthers 0.6-1.0 mm long.
          - 10 Terminal leaflet toothed for > ½ its length; plant flowering at 2<sup>nd</sup> node of stolon, typically with 2 leaves and 1 pedicel at each subsequent node; plants only flowering on elongating stolons ..... *P. simplex*
          - 10 Terminal leaflet toothed for < ½ its length; plant flowering at 1<sup>st</sup> node of stolon, typically with only 1 leaf and pedicel at each subsequent node; plants often flowering on short stolons obscured by basal leaves.
            - 11 Middle leaflet of larger leaves 1.5-4 cm long; plants silky-pilose, the pubescence appressed or loosely ascending ..... *P. canadensis* var. *canadensis*
            - 11 Middle leaflet of larger leaves 3-6 cm long; plants long-villous, the pubescence loosely spreading to reflexed ..... *P. canadensis* var. *villosissima*

\* *Potentilla argentea* Linnaeus, Silvery Five-fingers, Hoary Five-fingers. Disturbed areas; native of Europe. May-July. [= RAB, C, F, FNA, G, Pa, W; > *P. argentea* var. *argentea* – K]

*Potentilla canadensis* Linnaeus var. *canadensis*, Running Five-fingers. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): woodlands, forests, fields, lawns, disturbed areas; common. March-May; April-June. The relative distributions and habitats of the two varieties are obscure. [= F, G, K; < *P. canadensis* – RAB, C, FNA, Pa, 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 are obscure. [= F, G, K; < *P. canadensis* – RAB, C, FNA, Pa, W; = *P. caroliniana* Poiret – S]

\* *Potentilla inclinata* Villars. Cp (NC): disturbed areas; rare, naturalized from Europe. May-June. [= C, FNA, K; ? *P. canescens* Bess. – RAB, F, G]



- \* ***Potentilla indica*** (Andrews) T. Wolf, Indian-strawberry. Cp (DE, FL, GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): disturbed areas, lawns, gardens; common (uncommon in FL and WV), native of Asia. February-frost. *Duchesnea* is apparently not closely related to *Fragaria*, and is best combined with *Potentilla*, which does have other species with accrescent fruits (Eriksson, Donoghue, & Hibbs 1998). The strawberry-like fruit is not sweet; it can also be distinguished from *Fragaria* by its whitish interior flesh. The leaves are more coarsely toothed than *Fragaria*. [= *Duchesnea indica* (Andrews) Focke – RAB, C, F, G, K, Pa, S, W, WH, WV]
- \* ***Potentilla intermedia*** Linnaeus. Mt (NC, VA), Pd (VA), Cp (VA), {MD}: disturbed areas; rare, naturalized from Europe. May-July. [= RAB, C, F, FNA, G, K, Pa]
- Potentilla norvegica*** Linnaeus, Strawberry-weed, Rough Cinquefoil. Mt (GA, NC, VA, WV), Cp (DE, NC, VA), Pd (DE, GA, NC, SC, VA): pastures, fields, disturbed areas, especially where moist; common (uncommon in GA, NC, SC, and VA Piedmont, uncommon in GA, NC, SC, and VA Coastal Plain). Late May-frost; June-frost. This species is apparently a genetically diverse, circumboreal species complex, with both native and introduced elements now present in NC. [= RAB, C, FNA, G, W, WV; > *P. norvegica* var. *norvegica* – F; > *P. norvegica* ssp. *monspeliensis* (Linnaeus) Ascherson & Graebner – K, Pa; > *P. monspeliensis* Linnaeus – S; > *P. norvegica* ssp. *hirsuta* (Michaux) Hylander]
- \* ***Potentilla recta*** Linnaeus, Sulphur Five-fingers. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): disturbed areas; common (rare in FL), naturalized from Europe. April-July; May-August. [= RAB, C, F, FNA, G, K, Pa, W, WH, WV]
- \* ***Potentilla reptans*** Linnaeus, Creeping Five-fingers. Pd (DE), Mt (WV), Cp (VA): disturbed areas; uncommon (rare in WV), native of Eurasia. May-August. Also reported for VA (Cronquist 1991, Kartesz 1999) and occurs as well in se. PA (Rhoads & Block 2007). [= C, F, FNA, G, K, Pa]
- \* ***Potentilla rivalis*** Nuttall, Brook Five-fingers. Mt (VA, WV), Pd (VA), Cp (VA): {habitat not known}; rare, adventive from farther west. [= C, FNA, G, K; > *P. millegrana* Engelmann ex Lehmann – F; > *P. rivalis* var. *millegrana* (Engelmann ex Lehmann) S. Watson]
- Potentilla simplex*** Michaux, Old-field Five-fingers. Cp (DE, FL, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA): woodlands, fields, disturbed areas; common (rare in FL). April-June; April-July. NL (Newfoundland) and MN south to Panhandle FL, AL, and TX. [= RAB, C, FNA, G, K, Pa, W, WV; > *P. simplex* var. *simplex* – F; > *P. simplex* var. *argyrisma* Fernald – F; > *P. simplex* var. *calvescens* Fernald – F; > *P. simplex* – S; > *P. canadensis* – S, misapplied]

### 10. *Aphanes* Linnaeus 1753 (Parsley-piert)

A genus of about 20 species, herbs, of tropical and temperate Old World. *Aphanes* has usually been accepted by Europeans as distinct from *Alchemilla*, but Kalkman (in Kubitzki 2004) retains it (with some doubt) in *Alchemilla*, as a subgenus and Eriksson et al. (2003) and Gehrke et al. (2008) include it in *Alchemilla* based on molecular evidence. *Aphanes* appears to be monophyletic and is morphologically distinctive; Gehrke et al. (2008) prefer a broad circumscription of *Alchemilla* to naming an additional monophyletic clade of African species as a separate genus. References: McNeill & Erter in FNA (in press); Robertson (1974)=Z; Kalkman in Kubitzki (2004); Eriksson et al. (2003).

- 1 Fruiting hypanthium > 2 mm long; leaf blades 7-10 mm long and wide..... ***A. arvensis***  
 1 Fruiting hypanthium < 2 mm long; leaf blades 3-5 mm long and wide..... ***A. australis***

- \* ***Aphanes arvensis*** Linnaeus. Cp (DE) disturbed areas; rare, native of Europe. April-June. Also reported for SC and TN by Kartesz (1999), but the only documentation consists of generalized range maps published in Hultén & Fries (1986); rejected as a component of those state's flora without additional documentation. [= C, FNA, K; = *Alchemilla arvensis* (Linnaeus) Scopoli – F, G]
- \* ***Aphanes australis*** Rydberg, Parsley-piert. Pd (GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA), Mt (NC, SC, VA, WV): lawns, fields, pastures, roadsides; common (uncommon in Piedmont of VA and Mountains of NC and VA, rare in DE, FL, and WV), native of Europe. Late March-May. This plant is inconspicuous and often overlooked. [= FNA, S; = *Aphanes microcarpa* (Boissier & Reuter) Rothmaler – C, K, WH, misapplied; = *Alchemilla microcarpa* Boissier & Reuter – RAB, F, G, W, Z, misapplied; = *Aphanes inexpectatus* W. Lippert]

### 11. *Dasiphora* Rafinesque 1840 (Shrubby-cinquefoil)

Molecular phylogenetic studies indicate that this genus is more closely related to *Alchemilla*, *Aphanes*, *Drymocallis*, *Fragaria*, *Sibbaldiopsis*, and other genera outside our area than to *Potentilla* (Eriksson et al. 2003). References: Robertson (1974)=Z; Eriksson et al. (2003); Kalkman in Kubitzki (2004); Erter (2007).

*Dasiphora fruticosa* (Linnaeus) Rydberg ssp. *floribunda* (Pursh) Kartesz, Shrubby-cinquefoil, Golden-hardhack. Calcareous swamps. June-August. This species is widespread in the western and northern parts of North America, south to n. NJ, e. and n. PA, s. OH, IN, IL, IA, SD, NM, AZ, and CA. It was reported for western NC ("near Ducktown, in Turtletown, Cherokee County, N.C.") by Gattinger (1901), but corroborating specimen documentation is lacking. [= K; < *Potentilla fruticosa* Linnaeus – C, G, Pa, Z; > *Potentilla fruticosa* var. *fruticosa* – F; = *Pentaphylloides floribunda* (Pursh) A. Löve]

**12. *Drymocallis* Fourrier ex Rydberg 1908 (*Drymocallis*, Wood-beauty)**

A genus of about 30 species, best segregated from *Potentilla*. Molecular phylogenetic studies indicate that this genus is more closely related to *Alchemilla*, *Aphanes*, *Dasiphora*, *Fragaria*, *Sibbaldiopsis*, and other genera outside our area than to *Potentilla* (Eriksson et al. 2003). References: Erter in FNA (in press); Erter (2007)=Z; Eriksson, Donoghue, & Hibbs (1998); Eriksson et al. (2003); Kalkman in Kubitzki (2004).

***Drymocallis arguta*** (Pursh) Rydberg, Tall *Drymocallis*, Tall Wood-beauty. Greenstone barrens, other barrens. May-July. QC west to NT, south to w. VA, IN, MO, and AZ. Reported for e. TN by Gattinger (1901); the documentation unknown. [= FNA, Z; = *Potentilla arguta* Pursh – F, G, Pa, WV; > *P. arguta* var. *arguta* – C; > *P. arguta* ssp. *arguta* – K]

**13. *Fragaria* Linnaeus 1753 (Strawberry)**

A genus of about 10 species, herbs, of temperate Eurasia, North America, and South America. References: Staudt in FNA (in press); Kalkman in Kubitzki (2004).

- 1 Fruit (at least the larger on a plant) usually > 1.5 cm thick; petals 10-15 mm long; leaves evergreen; [cultivated, rarely persistent] ..... *F. ~~xananassa~~*
- 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 > 1/2 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 < 1/2 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 xananassa*** (Weston) Duchesne ex Rozier (pro sp.) [*chiloensis* × *virginiana*], Garden Strawberry, Cultivated Strawberry. Gardens, persistent on garden edges, commonly cultivated. An octoploid garden hybrid of the two octoploid species, *F. chiloensis* and *F. virginiana*. [= RAB, F, FNA; = *F. xananassa* var. *xananassa* – K; = *F. xananassa* – C, WV; = *F. chiloensis* Duchesne var. *xananassa* – G]

***Fragaria vesca* Linnaeus var. *americana*** Porter. Woods, fields, roadsides. April-June. NL (Newfoundland) and BC south to e. VA, w. NC, TN, MO, NE, CO, NM, and AZ. [= C, F, G; < *F. vesca* – RAB; = *F. vesca* ssp. *americana* (Porter) Staudt – FNA, K, Pa, W; = *F. americana* (Porter) Britton – S; > *F. vesca* var. *americana* – WV; > *F. vesca* var. *alba* (Ehrhart) Rydberg – F]

***Fragaria vesca* Linnaeus var. *vesca***. NL (Newfoundland), QC and MI south to PA, WV (?), KY, and IL. [= C, F, G; = *F. vesca* ssp. *vesca* – FNA, K, Pa]

***Fragaria virginiana*** P. Miller, Wild Strawberry. Grasslands, roadsides, pastures, woodlands, grassy balds. April-June. NL (Newfoundland) west to MB, south to FL and TX. [= RAB, C, Pa, W, WH; > *F. virginiana* var. *virginiana* – F, G; > *F. virginiana* var. *illinoensis* (Prince) Gray – F, G; > *F. virginiana* var. *australis* Rydberg – G; > *F. virginiana* ssp. *virginiana* – FNA, K; > *F. virginiana* ssp. *grayana* (Vilmorin ex J. Gay) Staudt – FNA, K; > *F. virginiana* – S; > *F. australis* (Rydberg) Rydberg – S; > *F. grayana* Vilmorin ex J. Gay – S]



**14. *Sibbaldia* Linnaeus 1753 (*Sibbaldia*, Mountain-cinquefoil)**

A genus of 5-7 species, subshrubs, circumboreal, of n. Eurasia and n. North America. Our single species, has been variously also treated in *Potentilla* and *Sibbaldiopsis*. Many recent studies (see references) have shown that it is not closely related to *Potentilla*, and falls into a group of genera including *Sibbaldia*, *Comarum*, *Alchemilla*, *Aphanes*, *Drymocallis*, *Dasiphora*, and *Fragaria* (Lundberg et al. 2009; Potter et al. 2007; Eriksson et al. 2003). I here follow Lundberg et al. (2009) and Paule & Soják (2009), who further demonstrate that *Sibbaldiopsis* is embedded in *Sibbaldia* and is best transferred there. References: Paule &

Soják (2009)=Z; Lundberg et al. (2009); Potter et al. (2006); Eriksson, Donoghue, & Hibbs (1998); Eriksson et al. (2003); Kalkman in Kubitzki (2004).

***Sibbaldia tridentata*** (Aiton) Paule & Soják, Mountain-cinquefoil, Three-toothed Cinquefoil, Mountain White Potentilla, Wine-leaf Cinquefoil, White Sibbaldia. Mt (GA, NC, TN, VA, WV): grassy balds, crevices of rock outcrops at high (rarely moderate) elevations, high elevation glades; rare (though sometimes very locally abundant). June-August; July-September. Greenland and NL (Newfoundland) west to NT, south to ND, IA, WI, MI, s. ON, and 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. Bresawar & Walker (2011) discuss the genetic structure of populations in e. United States. [= Z; = *Sibbaldiopsis tridentata* (Aiton) Rydberg - K, S; = *Potentilla tridentata* Aiton - RAB, C, F, G, Pa, W, WV]

15. *Geum* Linnaeus 1753 (Avens)

A genus of 40-60 species, herbs, mainly of north temperate areas. Many researchers have advocated breaking *Geum* into varying numbers of segregate genera; even the most conservative divisions place *G. radiatum* in a genus separate from our other species (such as *Parageum*; see synonymy) and some would place *G. vernum* in *Stylipus*. Molecular studies (Smedmark & Eriksson 2006; Smedmark & Eriksson 2002) make a strong case for a broad circumscription of *Geum*, including *Waldsteinia*, as many of the segregates are complexly and reticulately interrelated. References: Rohrer in FNA (in press); Phipps in FNA (in press); Robertson (1974)=Z, Bolle (1933)=Y; Král (1966)=X; Smedmark (2006)=V; Weakley & Gandhi (2008)=Q; Smedmark & Eriksson (2002); Kalkman in Kubitzki (2004). [including *Parageum* and *Waldsteinia*]

- 1 Style deciduous; leaves 3-foliolate or 3-lobed, lacking small leaflets toward the base; [subgenus or genus *Waldsteinia*]
  - 2 Leaves trilobed (the sinuses cleft 1/4 to 3/4 the way to the midrib); leaves rather densely pubescent with stiff hairs, these distributed on the veins and on the intervein surfaces; [of a small area at the southern terminus of the Southern Appalachians in n. GA, nw. SC, and sw. NC] ..... *G. lobatum*
  - 2 Leaves trifoliolate (fully divided), and also typically additionally lobed; leaves sparsely pubescent with stiff hairs, these distributed mostly or strictly on the veins, the intervein surfaces glabrous to very sparsely pubescent; [more widespread].
    - 3 Petals 2.5-4 mm long (about as long as the sepals), 1-1.5 mm wide; [of VA and KY southward] ..... *G. donianum*
    - 3 Petals 4-10 mm (longer than the sepals), 2-6 mm wide; [of VA and KY northward] ..... *G. fragarioides*
- 1 Style persistent; leaves various (see below).
  - 4 Style straight or slightly sinuous, neither jointed nor tightly twisted, the tip straight; basal leaves with a cordate or reniform terminal lobe 7-15 cm wide and 1-several lateral lobes generally < 1 cm long (rarely to 2 cm long); cauline leaves much reduced, flabellate, with clasping base and rounded apex; leaves thick, subcoriaceous, the upper surface dark green and glossy; petals 13-20 mm long, bright yellow; [of crevices and ledges on high elevation cliffs (less commonly grassy balds)]; [subgenus *Micracomastylis*; genus *Parageum*] ..... *G. radiatum*
  - 4 Style with a tight kink or twist, the straight portion above the kink more-or-less deciduous, leaving a hook; basal leaves variable, trifoliolate, pinnatifid, simple or with a large terminal lobe (to 8 cm wide) and much smaller lateral lobes; cauline leaves trifoliolate to simple, mostly sessile or petiolate base, with acute or acuminate apex; leaves herbaceous, the upper surface medium green, not notably glossy; petals 1-10 mm long, white, cream, pale yellow, bright yellow, lavender, maroon, or purple; [of mesic to boggy forests, or less commonly, grassy balds (*G. geniculatum*)].
    - 5 Calyx lobes 2-4 mm long, lacking bractlets between the lobes; head of achenes elevated above the calyx on a 1-2 mm stipe; flowering April-May; fruiting May-June; [subgenus or genus *Stylipus*] ..... *G. vernum*
    - 5 Calyx lobes 3-15 mm long, with bractlets between the lobes; head of achenes more-or-less sessile; flowering May-August; fruiting late May-September; [subgenus or genus *Geum*].
      - 6 Portion of the style above the kink 3-7 mm long; calyx campanulate, cup-like in flower and fruit (sometimes becoming slightly and irregularly reflexed late in fruit), the calyx lobes 5-10 mm long, green to purple; petals yellow or often with a substantial suffusion of rose, lavender, or purple; lower portion of style with long, gland-tipped hairs.
        - 7 Portion of the style above the kink 4-7 mm long; calyx lobes 5-10 mm long, green or purple-darkened; [of nw. NC and adjacent TN] ..... *G. geniculatum*
        - 7 Portion of the style above the kink 3-4 mm long; calyx lobes 9-15 mm long, purple; [of ne. WV northward] ..... *G. rivale*
    - 6 Portion of the style above the kink 1-2 mm long; calyx reflexed soon after anthesis, the calyx lobes 3-9 mm long, green; petals white, cream, or yellow; lower portion of style glabrous or with long, eglandular hairs.
      - 8 Larger stipules > 10 mm wide, coarsely toothed or even lobed; mid-cauline leaves very coarsely toothed, with 1-5 teeth per cm of margin ..... *G. virginianum*
      - 8 Larger stipules 2-10 (-12) mm wide, entire to toothed; mid-cauline leaves less coarsely toothed, with 3-7 teeth per cm of margin.
        - 9 Plant in flower.
          - 10 Petals bright yellow, 5-9 mm long ..... *G. aleppicum*
          - 10 Petals white or cream (often drying pale yellow), 2-7 (-7.5) mm long.
            - 11 Petals (3-) 4-7 (-7.5) mm long; pedicels puberulent (sometimes also slightly hirsute); [of moist to dry forests] ..... *G. canadense*
            - 11 Petals (2-) 2.5-4 (-5.5) mm long; pedicels densely hirsute with spreading or slightly reflexed hairs, and also puberulent; [of wetlands] ..... *G. laciniatum*
        - 9 Plant in fruit.
          - 12 Pedicel predominantly puberulent, also sometimes with scattered longer hairs; cauline leaves mostly 3-foliolate or simple; receptacle densely hispid with yellowish, stiff hairs (best seen by removing a several achenes to expose the receptacle surface); [widespread and common in our area, primarily occurring in moist to wet forests] ..... *G. canadense*

- 12 Pedicel moderately to densely hirsute with spreading to reflexed hairs 1-2.5 mm long, and also puberulent; cauline leaves mostly pinnately compound, the leaflets mostly elongate and often also laciniately divided; receptacle glabrous or sparsely to densely hispid; [rare in our area, primarily northern and/or montane, primarily in bogs and boggy meadows].
- 13 Hairs on the achene extending upward onto the lower portion of the style; pedicel sparsely hirsute with spreading hairs; receptacle densely hispid ..... *G. aleppicum*
- 13 Hairs on the achene absent or at least not extending upward onto the lower portion of the style; pedicel densely hirsute with spreading to reflexed hairs; receptacle glabrous to sparsely hispid ..... *G. laciniatum*

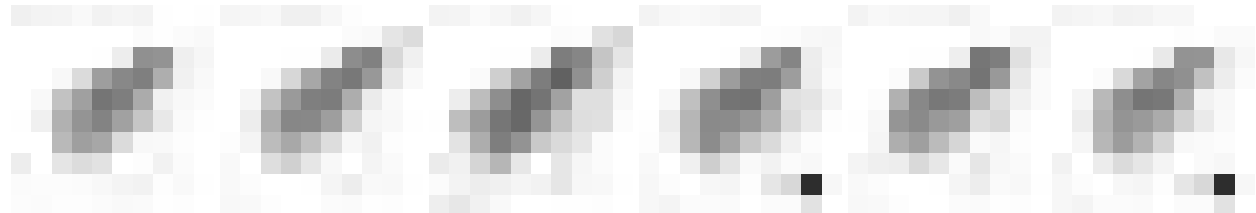
*Geum aleppicum* Jacquin, Yellow Avens. Mt (NC, VA, WV), Pd (VA): bogs and boggy meadows; rare. June-July; July-August. Circumboreal, in North America south to NJ, w. NC, ne. TN (Chester, Wofford, & Kral 1997), IN, IL, IA, and NM. The report for GA (Jones & Coile 1988) is in error. American plants are sometimes separated from Eurasian ones as var. *strictum* (Aiton) Fernald. [= RAB, FNA, GW, K, Pa, W, Y, Z; > *G. aleppicum* var. *strictum* (Aiton) Fernald - C, F, G]

*Geum canadense* Jacquin. Moist slope forests, bottomland forests, swamp forests. May-July; July-November. NS west to ND, south to c. GA and TX. Some authors have recognized a number of varieties in *G. canadense* (see synonymy); some (at least) of these may warrant recognition. [= RAB, C, FNA, G, GW, Pa, S, W, Z; > *G. canadense* var. *canadense* - F, K, WV, Y; > *G. canadense* var. *brevipes* Fernald - F, Y; > *G. canadense* var. *camporum* (Rydberg) Fernald & Weatherby - F, Y; > *G. canadense* var. *grimesii* Fernald & Weatherby - F, Y]

*Geum donianum* (Trattinick) Weakley & Gandhi, Southern Barren Strawberry. Forests, streambanks. (January-) March-May; May-June. VA and TN south to GA and AL. [= Q; = *Waldsteinia fragarioides* (Michaux) Trattinick var. *parviflora* (Small) Fernald - C, F; = *Waldsteinia fragarioides* ssp. *doniana* (Trattinick) Teppner - K, Z; < *W. fragarioides* - RAB, W, Y; = *W. parviflora* Small - G; = *Waldsteinia doniana* Trattinick - FNA, S; < *Geum fragarioides* (Michaux) Smedmark - V]

*Geum fragarioides* (Michaux) Smedmark, Northern Barren Strawberry. Forests, streambanks. Late March-May; May-June. NB west to MN, south to NC, TN, IN, MO, and AR. [= Q; = *Waldsteinia fragarioides* (Michaux) Trattinick var. *fragarioides* - C, F; < *W. fragarioides* - RAB, W, WV, Y; = *W. fragarioides* ssp. *fragarioides* - K, Z; = *Waldsteinia fragarioides* - FNA, G, Pa, S; < *Geum fragarioides* (Michaux) Smedmark = V]

*Geum geniculatum* Michaux, Bent Avens. 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), locally fairly common. Late June-August; August-September. *G. geniculatum* is apparently restricted to the few highest peaks in nw. NC and ne. TN: the Roan Mountain massif (Roan High Knob, Roan High Bluff, Round Bald, Jane Bald, Grassy Ridge, Little Hump Mountain, Big Yellow Mountain, and Big Hump Mountain), Grandfather Mountain, and Rich Mountain. It may be found on a few other peaks, such as Snake Mountain. The distribution of this species is peculiar. While limited to the several highest and coldest mountains in the Southern Appalachians, it extends downslope on Roan Mountain and Grandfather Mountain nearly to their bases, in environmental situations that are apparently duplicated on many other Southern Appalachian peaks. Perhaps *G. geniculatum* was more widespread in the Southern Appalachians in the cooler, moister conditions of the post-Pleistocene, but became restricted to the few coldest peaks during the warmer, drier conditions of the Hypsithermal Interval (7000-2000 B.C.). Following climatic cooling, it was able to disperse downslope from its several refugia, but has not dispersed successfully to other peaks. *G. geniculatum* is most closely related to the circumboreal *G. rivale*, with which it shares such characteristics as purplish, non-reflexed sepals, a relatively long terminal style segment, upper pedicel with long glandular hairs, and basal style segment with long glandular hairs. [= RAB, FNA, K, S, W, Y, Z]



*Geum laciniatum* Murray, Rough Avens. Bogs and wet meadows. June-July; July-August. Two varieties are sometimes recognized: var. *laciniatum* has glabrous achenes and is generally more northern and more restricted in distribution than var. *trichocarpum*, which has achenes sparsely to densely pubescent with long stiff trichomes, and ranges from NS west to s. ON, south to MD, VA, w. NC, TN, OH, IL, MO, and KS. The difference appears to be that of a single trait, uncorrelated with other traits, and with largely overlapping geographic distributions; the varieties are not recognized here. [= RAB, C, FNA, GW, Pa, W, Y; > *G. laciniatum* var. *laciniatum* - F, G, K, WV, Z; > *G. laciniatum* var. *trichocarpum* Fernald - F, G, K, Z]

*Geum lobatum* (Baldwin ex Elliott) Smedmark, Lobed Barren Strawberry. Forests, streambanks. March-May; May-June. Sw. NC south to nw. SC and n. and c. GA. Some populations appear to be morphologically intermediate between *G. lobatum* and *G. donianum*; further study is needed. [= Q, V; = *Waldsteinia lobata* (Baldwin ex Elliott) Torrey & A. Gray - FNA, K, S, Y, Z]

*Geum radiatum* Michaux, Spreading Avens, Cliff Avens. 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). June-August; July-September. Ranging from Ashe County, NC (Phoenix Mountain) south and west to Sevier County, TN (Mount Leconte) and Transylvania County, NC (the Devil's Courthouse), restricted to "pseudo-alpine" rock outcrops and grassy meadows near the summits of the higher peaks of the Southern Blue Ridge, notably Bluff Mountain,

Three Top Mountain, Phoenix Mountain, and The Peak (Ashe County, NC), Grandfather Mountain (Watauga and Avery counties, NC), Grassy Ridge (Avery County, NC), Roan High Bluff (Mitchell County, NC), Mount Craig in the Black Mountains (Yancey County, NC), Craggy Pinnacle, Craggy Dome, and Craggy Gardens (Buncombe County), the Devil's Courthouse (Transylvania County, NC), and Mount Leconte (Sevier County, TN). *G. radiatum* is closely related to three other taxa, these siblings also restricted in range and endemic to mountainous areas, collectively showing a relictual distribution: *G. peckii* Pursh (of alpine meadows and moist, rocky slopes of NS and the higher peaks of NH and ME), *G. calthifolium* Menzies ex Smith var. *calthifolium* (of wet snow-melt meadows of w. BC, w. YT, s. AK, and the Aleutians), and *G. calthifolium* var. *nipponicum* (of wet snow-melt meadows of s. Kamchatka and Japan). It is illegal to collect *G. radiatum* without federal and state permits, and there is no justification (scientific or otherwise) for additional collections from known sites. This is one of the few plant species that has been seriously depleted by collection by scientists (several hundred herbarium sheets from Roan Mountain alone!), though recreational over-use of its habitats, and possibly also pollution and break-up of adjoining spruce-fir forests, are the more critical threats to its continued existence. [= RAB, FNA, K, W, Z; = *Sieversia radiata* (Michaux) Greene – S; = *Parageum radiatum* (Michaux) H. Hara – X; = *Acomastylis radiata* (Michaux) Bolle – Y]

***Geum rivale*** Linnaeus, Water Avens, Purple Avens. Calcareous bogs, swamps, seepages, and wet meadows. May-June. Circumboreal, in North America from NL (Labrador), Keewatin, and BC south to NJ, MD, WV (Pocahontas, Preston, Randolph, and Tucker counties), OH, IN, IL, MN, SD, NM, and WA. It is most closely related (in our area) to *G. geniculatum*. [= C, F, FNA, G, K, Pa, WV, Y]

***Geum vernum*** (Rafinesque) Torrey & A. Gray, Spring Avens. Seepages, swamps, roadsides, disturbed areas, probably both native and introduced in our area, the native occurrences now being supplemented by its spread along roads from farther west. April-May; May-June. [= RAB, C, F, G, GW, K, Pa, W, WV, Y, Z; = *Stylpus vernus* Rafinesque – S]

***Geum virginianum*** Linnaeus, Cream Avens. Bottomland forests, moist slope forests, swamp forests, and extending upslope to mesic or even dry sites, especially over mafic rocks. June-August; July-November. MA and NY west to IN, south to SC and TN. [= RAB, C, F, FNA, G, GW, K, Pa, W, WV, Y, Z; > *G. virginianum* – S; > *G. hirsutum* Muhlenberg ex Link – S]



**16. *Prunus*** Linnaeus 1753 (Plum, Cherry, Sloe, Peach, Apricot)

A genus of about 200 species, trees and shrubs, nearly cosmopolitan, but especially in north temperate regions. References: Rohrer in FNA (in press); Robertson (1974)=Z; McVaugh (1951)= Y; Catling, McKay-Kuja, & Mitrow (1999)=X; Shaw & Small (2004); Kalkman in Kubitzki (2004).

- 1 Flowers in elongate racemes of (12-) 20-many flowers.
- 2 Leaves evergreen, entire or serrate with few or rather many (but widely spaced) prominent teeth; petioles lacking 2 glands near junction with leaf blade; [native in maritime situations from e. NC southward, but cultivated and escaped inland]; [**laurel cherries**, subgenus *Laurocerasus*] ..... ***P. caroliniana***
- 2 Leaves deciduous, regularly and rather finely toothed; petioles with 2 glands near the junction with the leaf blade; [collectively widespread, native and alien]; [**black cherries**, subgenus *Padus*]..... **Key A**
- 1 Flowers solitary, in fascicles, in umbellate or corymbose inflorescences, or in short racemes (*P. mahaleb*) of 1-12 flowers.
- 3 Flowers and fruit pedicellate, the pedicel > 4 mm long; fruit glabrous, ovary glabrous or pubescent initially.
- 4 Stones globose, not 2-edged; sepals hairy or not; inflorescences subtended by leafy bracts arising from the same bud as the flowers (except *P. pensylvanica*, *P. susquehanae*, and *P. pumila* var. *depressa*); **cherries** ..... **Key B**
- 4 Stones somewhat to strongly flattened, 2-edged; sepals hairy on the upper surface (except *P. domestica*, *P. insititia*, and *P. cerasifera*); inflorescences without leafy bracts arising from the same bud as the flower; **plums**..... **Key C**
- 3 Flowers and fruit sessile or on a pedicel < 2 mm long
- 5 Fruit scarlet-red, 1 cm in diameter; twigs densely tomentose; fruit and ovary glabrous or somewhat pubescent (but not velvety); leaves < 5 (-7) cm long; petals white (pink in bud), < 13 mm long; [subgenus *Lithocerasus*, section *Armeniaco-cerasus*]..... [***P. tomentosa***]
- 5 Fruit yellow, peach, or orange-colored, > 2 cm in diameter; twigs glabrous; fruit and ovary velvety pubescent; leaves > 5 cm long; petals white or pink, > 11 mm long.
- 6 Leaves 8-15 cm long, > 4× as long as wide, falcate; fruit peach-colored, > 5 cm in diameter; [**peach**; subgenus *Amygdalus*] ..... ***P. persica***
- 6 Leaves 5-10 cm long, 1-1.5× as long as wide, not falcate; fruit yellow to orange, 3-5 cm in diameter; [**apricots**; subgenus *Prunus*, section *Armeniaca*]
- 7 Twigs reddish-brown; fruits 3-5 cm in diameter, the flesh sweet when ripe ..... ***P. armeniaca***
- 7 Twigs bright green; fruits 2-3 cm in diameter, the flesh sour and/or bitter when ripe ..... ***P. mume***

**KEY A – BLACK-CHERRIES, subgenus *Padus***

- 1 Petals 6-10 mm long; hypanthium pubescent within; stone sculptured; [alien, rarely naturalizing]..... ***P. padus***

- 1 Petals 4-7 mm long; hypanthium glabrous within; stone smooth; [native].
- 2 Leaf teeth triangular, pointing outward; leaves dull above; sepals conspicuously glandular-eroded on the margin, not persistent on the fruit; colonial, thicket-forming shrub from rhizomes; [montane in our area] ..... *P. virginiana* var. *virginiana*
- 2 Leaf teeth curved, appressed; leaves shiny above; sepals entire or slightly glandular-eroded on the margin, persistent on the fruit; small to large tree, not clonal; [collectively widespread].
- 3 Leaves mostly 1.5-2× as long as wide, often blunt-tipped (except in shoot leaves); lower leaf surface rather uniformly pubescent, the midrib lacking conspicuous tufts or fringes; branchlets reddish hairy..... *P. alabamensis*
- 3 Leaves mostly 2-2.5× as long as wide, slightly acuminate; lower leaf surface glabrous except for tufts or fringes along the midrib; branchlets glabrous ..... *P. serotina* var. *serotina*

**Key B – CHERRIES, subgenera *Cerasus* and *Lithocerasus***

- 1 Plants shrubs, to 1.5 (-3) m tall; [subgenus *Lithocerasus*; section *Microcerasus*].
- 2 Inflorescences of 1-2 flowers; [exotic, persistent from cultivation] ..... *P. glandulosa*
- 2 Inflorescences of 2-4 flowers; [native].
- 3 Youngest twigs glabrous; leaf blades (1.6-) 3-4× as long as wide; plants decumbent; stones fusiform, (5.5-) 7.3-9.5 (-10.2) mm long; [plants of calcareous shores and gravel bars] ..... *P. pumila* var. *depressa*
- 3 Youngest twigs minutely pubescent; leaf blades mostly 1.7-2.5× as long as wide; plants erect, stones mostly orbicular, (5.3-) 5.8-7.8 (-9.2) mm long; [plants of acid sandy or rocky upland sites] ..... *P. susquehanae*
- 1 Plants trees, well over 3 m tall when mature; [subgenus *Cerasus*].
- 4 Leaf serrations single to double, the tips of the serrations acuminate to attenuate.
- 5 Leaf serrations attenuate; tree with upright form; [section *Sargentiella*] ..... *P. serrulata*
- 5 Leaf serrations acuminate; tree usually with weeping form; [section *Microcalymma*] ..... *P. subhirtella*
- 4 Leaf serrations small and obscure or well-developed but rounded to acute.
- 6 Petals 4-7.5 mm long; fruit < 1 cm in diameter; [section *Phyllomahaleb*].
- 7 Inflorescence with a central axis, thus nearly or actually racemose; fruit blackish; leaves 1-1.5× as long as wide; [exotic tree] ..... *P. mahaleb*
- 7 Inflorescence umbellate to corymbose, the central axis absent or poorly developed; fruit red; leaves 2-5× as long as wide; [native tree] ..... *P. pensylvanica*
- 6 Petals 9-15 mm long; fruit 1.3-2.5 cm in diameter; [section *Eucerasus*].
- 8 Leaves 7-15 cm long, persistently hairy beneath, at least along the midrib and veins; pair of petiolar glands on the petiole near the blade; fruit sweet when ripe..... *P. avium*
- 8 Leaves 4-8 cm long, glabrous beneath once fully-expanded; pair of petiolar glands on the base of the leaf blade; fruit sour when ripe. .... *P. cerasus*

**KEY C – PLUMS, subgenus *Prunus***

- 1 Flowers 1-2 (-3) per inflorescence; stone somewhat sculptured; [exotic]; [section *Prunus*].
- 2 Leaves 4-6 cm long; fruits 2-3 cm long, yellow to red when ripe; inflorescence of a solitary flower ..... *P. cerasifera*
- 2 Leaves 5-10 cm long; fruits 3-7 cm long, blue-black, yellow, or greenish when ripe; inflorescence of (1-) 2-3 flowers.
- 3 Fruit 5-7 cm long; single-trunked small to medium tree, usually thornless ..... *P. domestica* var. *domestica*
- 3 Fruit 3-4 cm long; thicket-forming shrub to small tree, often thorny ..... *P. domestica* var. *insititia*
- 1 Flowers (3-) 4-5 per inflorescence; stone nearly smooth; [native]; [section *Prunocerasus*].
- 4 Leaf teeth gland-tipped (or with a scar where the gland has fallen); sepals with marginal glands (except *P. angustifolia*); fruit yellow to red when ripe.
- 5 Leaves 3-6 cm long, often folded longitudinally; sepals lacking marginal glands ..... *P. angustifolia*
- 5 Leaves 5-13 cm long, not folded; sepals with marginal glands.
- 6 Leaves < 2× as long as wide; petals 10-15 mm long; [of w. VA northward] ..... *P. nigra*
- 6 Leaves > 2× as long as wide; petals 4-7 mm long; [of mw. United States, eastward into KY, TN, MS, and present as an introduction still farther eastward in NC, SC, VA, and GA].
- 7 Leaf teeth triangular, ascending, the gland terminal; flowers opening with the leaves ..... *P. hortulana*
- 7 Leaf teeth depressed, the gland near the sinus; flowers opening before the leaves ..... *P. munsoniana*
- 4 Leaf teeth glandless; sepals without marginal glands; fruit yellow, red, purple-red, purple, or black when ripe
- 8 Petals 10-15 mm long; leaves 6-10 cm long, acuminate; fruit 2-2.5 cm long, red or yellow.
- 9 Leaves narrowly to broadly cuneate at the base; petiole usually lacking glands near its junction with the leaf blade; sepals glabrous on the lower side ..... *P. americana*
- 9 Leaves broadly rounded at the base; petiole usually with glands near its junction with the leaf blade; sepals pubescent on the lower side ..... *P. mexicana*
- 8 Petals 4-9 mm long; leaves 4-8 cm long, obtuse, acute, or slightly acuminate; fruit 1.0-1.5 cm long, dark purple, black (rarely yellow or red).
- 10 Twigs and pedicels pubescent, often densely so; leaf apices acute to obtuse, rarely rounded; leaf blades mostly < 2× as long as wide; shrubs to 2.5 m tall; [Coastal Plain of e. VA, and northward] ..... *P. maritima*
- 10 Twigs and pedicels usually glabrous, but occasionally pubescent; leaf apices acute, sometimes acuminate; leaf blades mostly > 2× as long as wide; shrubs or small trees, 2-6 m tall; [either inland in the Mountains and Piedmont from nw. NC northward, or Coastal Plain, Piedmont, and Mountains of s. NC, SC, GA, FL, AL, MS, LA, and westward].
- 11 Plants often suckering and forming thickets, less often single plants, shrubs or less often trees; leaf apices short acuminate (to merely acute); pedicels usually < 10 mm long; [Mountains and Piedmont from nw. NC and e. TN northward] ..... *P. alleghaniensis* var. *alleghaniensis*

- 11 Plants usually not suckering, often single plants but sometimes in small colonies, generally trees; leaf apices mostly acute; pedicels usually > 10 mm long; [Coastal Plain, Piedmont, and Mountains of s. NC, SC, GA, FL, AL, MS, LA, and westward] .....  
 .....*P. umbellata*

*Prunus alabamensis* C. Mohr, Alabama Black Cherry. Sandhills, other xeric sandy or rocky forests and woodlands, often associated with *Pinus palustris* (even in the Piedmont and Mountains). April-May; July-August. C. SC, nw. GA, n. AL south to Panhandle FL and s. AL; the NC record is based on a misidentified specimen. [= K; = *Prunus serotina* Ehrhart var. *alabamensis* (C. Mohr) Little – RAB, WH; > *Padus alabamensis* (C. Mohr) Small – S; > *Padus cuthbertii* Small – S; > *Padus australis* Beadle – S; = *Prunus serotina* ssp. *hirsuta* (Elliott) McVaugh – FNA, Y, Z]

*Prunus alleghaniensis* Porter var. *alleghaniensis*, Allegheny Plum, Allegheny Sloe. Dry rocky woodlands, shale barrens, primarily over calcareous or mafic rocks. Broadly Appalachian: MA and NY south to w. VA, w. NC, and e. TN. Var. *davisii* (W. Wight) Sargent is endemic to MI. Generally considered difficult to distinguish from *P. umbellata* other than by distribution. [= K; < *Prunus alleghaniensis* – C, F, G, Pa, W, WV; = *Prunus umbellata* Elliott var. *alleghaniensis* {in press} – FNA]

*Prunus americana* Marshall, Wild Plum. Upland forests, bottomland forests, fencerows. March-April; July-August. ME to SK, south to n. peninsular FL, LA, OK, NM, and AZ. [= C, FNA, K, Pa, S, W, WH, WV, Z; = *Prunus americana* var. *americana* – RAB, F, G]

*Prunus angustifolia* Marshall, Chickasaw Plum. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, VA, WV): roadsides, fencerows, abandoned fields, especially sandy; common (uncommon in DE and FL, rare in WV). March-April; May-early July. NJ, PA, IN, IL, MO, NE, and CO, south to FL, TX, and e. NM. The original native distribution is unclear; much of its eastern distribution may be the result of early spread by native Americans. [= RAB, C, FNA, G, Pa, S, W, WH, WV, Z; > *Prunus angustifolia* var. *angustifolia* – F, K]

\* *Prunus armeniaca* Linnaeus, Apricot. Cp (VA): persistent around old home sites; rare, native of n. China. April-May; June-July. [= C, FNA, K, Pa; = *Armeniaca vulgaris* Lamarck]

\* *Prunus avium* Linnaeus, Sweet Cherry, Mazzard Cherry, Bing Cherry. Pd (DE, NC, VA), Mt (VA, WV), Cp (VA), {NC, SC}: common (uncommon in DE Piedmont, rare in DE Coastal Plain), native of Eurasia. May; June-July. [= RAB, C, F, FNA, G, K, Pa, S, W, WV, Z; = *Cerasus avium* (Linnaeus) Moench]

*Prunus campanulata* Maximowicz, Taiwan Cherry, Formosan Cherry. Suburban woodlands, native of Taiwan. Reported as naturalized in suburban woodlands in the Tallahassee (Leon Co., FL) area by Clewell & Tobe (2011). {not yet keyed}

*Prunus caroliniana* (P. Miller) Aiton, Carolina Laurel Cherry. Cp (FL, GA, NC, SC), Pd\* (GA\*), Mt\* (GA\*): native in maritime forests and sandy hammocks near the coast, escaped from cultivation to fencerows and suburban forests and thickets in more inland areas; common (uncommon in GA, NC, SC). March-April; September-October. Se. NC south to FL, west to TX, near the coast. [= RAB, FNA, K, WH, Z; = *Laurocerasus caroliniana* (P. Miller) M. Roemer – S]

\* *Prunus cerasifera* Ehrhart, Cherry Plum, Flowering Plum, Purpleleaf Plum. Suburban woodlands; native of Asia. Introduced at scattered locations; reported for TN, PA, NJ (Kartesz 1999). [= F, FNA, K]

\* *Prunus cerasus* Linnaeus, Sour Cherry, Pie Cherry. Mt (NC, VA, WV), Pd (DE, VA), Cp (VA), {GA}: commonly cultivated, disturbed areas; fencerows, suburban forests; rare, native of Eurasia. April-May; June. [= RAB, C, F, FNA, G, K, Pa, S, W, WV, Z; = *Cerasus vulgaris* P. Miller]

\* *Prunus domestica* Linnaeus var. *domestica*, European Plum. Pd (VA): suburban forests; rare, native of Europe. Introduced at scattered locations; reported for Manassas National Battlefield Park (Virginia Botanical Associates 2005); also reported for MD, PA, NJ. Depypere et al. (2009) found that *P. domestica* and *P. insititia* were genetically very similar, but generally separable morphologically; they favored combining the two into a single species based on their similarity, variability and likely origin from complicated hybridization and domestication by man. [= K; = *Prunus domestica* ssp. *domestica* – C; < *Prunus domestica* – FNA]

\* *Prunus domestica* Linnaeus var. *insititia* (Linnaeus) Fiori & Paoletti, Damson, Bullace. Cp (DE), Pd (VA): uncommonly cultivated, suburban woodlands; rare, native of Europe. [= K; = *P. insititia* Linnaeus – F, G, Z; = *Prunus domestica* ssp. *insititia* (Linnaeus) C.K. Schneider – C; = *Prunus domestica* Linnaeus var. *insititia* (Linnaeus) Fiori & Paoletti – K; < *Prunus domestica* – FNA]

\* *Prunus glandulosa* Thunberg, Dwarf Flowering Almond. Cp (NC), Mt (WV): persisting at abandoned homesites; rare, native of c. and n. China and Japan. [= FNA, K; = *Cerasus glandulosa* (Thunberg) Sokolov]

\* *Prunus hortulana* L.H. Bailey, Wild-goose Plum. Mt (VA, WV), Pd (VA), Cp (VA): disturbed areas; rare, presumably introduced only, native from s. OH, n. IN, n. IL, se. IA, and e. KS south to n. KY, n. AR, and ne. OK. [= C, F, FNA, G, K, S, WV, Z]

\* *Prunus mahaleb* Linnaeus, Mahaleb Cherry, Perfumed Cherry, St. Lucie Cherry, Rock Cherry. Mt (NC, VA, WV), Pd (DE, NC, VA): roadsides, old homesites; rare, native of Europe. April-May; July. [= RAB, C, F, FNA, G, K, Pa, W, WV, Z; = *Cerasus mahaleb* (Linnaeus) P. Miller]

*Prunus maritima* Marshall, Beach Plum. Cp (DE, MD, VA\*?): ocean dunes and sandy coastal soils (from e. MD northward), disturbed dune-like area on shore of Chesapeake Bay (in e. VA); uncommon (rare in MD and VA). Late April; August. Native from NB south to e. MD, along the coast; somewhat disjunct in e. VA in an ambiguously native occurrence. [= C, FNA, Pa; > *Prunus maritima* var. *maritima* – K; > *Prunus maritima* – F, G]

*Prunus mexicana* S. Watson, Big-tree Plum, Mexican Plum. Streamsides, upland forests, fencerows. IN, IL, and IA, south to AL, MS, LA, TX, and Mexico; reports from farther east are apparently in error and based on pubescent material of *P. americana*. [= C, FNA, G, K, S, Z; = *Prunus americana* Marshall var. *lanata* – F]

\* *Prunus mume* (Siebold) Siebold & Zuccarini, Japanese Apricot. Suburban forests; native of s. Japan. April-March. Documented as naturalizing in Battle Park, University of North Carolina, Chapel Hill, where apparently spread from cultivation and reproducing as early as 1939. [= *Armeniaca mume* Siebold]



\*? *Prunus munsoniana* W. Wight & Hedrick, Munson Plum. Pd (GA, NC, VA), Mt (VA): roadsides; rare. OH, IL, MO, and KS, south to MS and TX; disjunct (introduced?) in GA, NC, VA, and NJ. [= C, F, G, K, S, Z]

*Prunus nigra* Aiton, Canada Plum. Mt (VA, WV), Pd (VA): old fields, hedgerows, forest edges; uncommon. May; June. NL (Newfoundland) west to MB, south to NY, OH, IN, IL, and IA; apparently disjunct in VA and WV. [= C, F, FNA, G, K, WV]

\* *Prunus padus* Linnaeus, European Bird Cherry. Pd (DE): suburban woodlands; rare, native of Europe. April-May; June-July. Cultivated and rarely escaped at least as far south as se. PA (Rhoads & Klein 1993; Rhoads & Block 2007) and DE (Kartesz 1999). [= C, FNA, K, Pa]

*Prunus pensylvanica* Linnaeus f., Fire Cherry, Pin Cherry. Mt (GA, NC, VA, WV): high elevation forests, thickets at high elevations resulting from fire or logging; common (rare in GA). April-May; August-September. NL (Newfoundland) west to BC, south to w. NC, n. GA, e. TN, IN, IL, IA, SD, and CO. [= RAB, C, F, FNA, G, Pa, W, WV, Z; > *Prunus pensylvanica* var. *pensylvanica* – K; = *Prunus pennsylvanica* – S (an orthographic variant)]

\* *Prunus persica* (Linnaeus) Batsch, Peach. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (VA, WV): roadsides, trash-heaps, disturbed thickets; commonly cultivated, commonly escaped or persistent (rare in FL), native of China. March-April; June-July. [= RAB, C, F, FNA, G, K, Pa, W, WH, WV, Z; = *Amygdalus persica* Linnaeus – S]

*Prunus pumila* Linnaeus var. *depressa* (Pursh) Gleason, Prostrate Dwarf-cherry, Northern Sand Cherry. Mt (WV): sandy or gravelly shores and islands; rare. April-May; August. NL (Labrador) west to ON, south to NJ, s. PA (Rhoads & Klein 1993; Rhoads & Block 2007; Kartesz 2010), c. WV, and TN. [= C, G, FNA, K, Pa, X; = *Prunus depressa* Pursh – F; < *Prunus pumila* – WV]

\* *Prunus sargentii* Rehder, Sargent Cherry, North Japanese Hill Cherry. Mt (WV): disturbed areas, rare, native of e. Asia. {not yet keyed}

*Prunus serotina* Ehrhart var. *serotina*, Black Cherry. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): rich coves, bottomlands, northern hardwood forests, and in a wide variety of lower elevation habitats from dry to mesic, and weedy in fencerows; common. April-May; July-August. NS west to ND, south to c. peninsular FL and e. TX. Several other varieties occur in sc. and sw. North America, from c. TX westward. In the Piedmont and Coastal Plain, *P. serotina* is generally a small, scrubby tree of fencerows and an understory tree in forests and woodlands, but in the Mountains reaching large sizes and full canopy stature. [= K, WH; < *Prunus serotina* var. *serotina* – RAB; < *Prunus serotina* – C, F, G, Pa, W; < *Padus virginiana* – S, misapplied; = *Prunus serotina* ssp. *serotina* – FNA, Y, Z]

\* *Prunus serrulata* Lindley, Japanese Flowering Cherry. Pd (NC): suburban forests; rare, native of Japan. [= FNA, K; = *Cerasus serrulata* (Lindley) Loudon]

\* *Prunus subhirtella* Miquel, Higan Cherry, Weeping Higan Cherry, Winter-flowering Cherry. Pd (VA), Mt (NC), Cp (FL): floodplain forests in suburban areas, other disturbed areas; rare, native of e. Asia, commonly planted, rarely escaped, but locally invasive. [= FNA, K; > *Prunus subhirtella* var. *pendula* (Maximowicz); = *Cerasus subhirtella* (Miquel) S.Y. Sokolov]

*Prunus susquehanae* Willdenow, Appalachian Dwarf-cherry, Appalachian Sand Cherry, Susquehanna Cherry. Pd (NC, VA), Mt (NC, VA): open rocky or sandy sites; rare. April-May; August. Sw. ME and sw. QC west to MB, south to nc. and sw. NC, sc. TN (the Barrens region of the Eastern Highland Rim), and IL. Catling (1997) supports species status, based on the greater distinctions of this entity from the other three in the complex. [= F, X; = *Prunus pumila* Linnaeus var. *susquehanae* (Willdenow) H. Jaeger – RAB, FNA, K, Pa; = *Prunus pumila* var. *cuneata* (Rafinesque) L.H. Bailey – C, G; = *Prunus cuneata* Rafinesque – S; < *Prunus pumila* – W, Z]

\* *Prunus tomentosa* Thunberg, Nanking Cherry, Korean Cherry. Disturbed areas, suburban forests and woodlands. April. Naturalized at least as far south as MD Piedmont and PA; native of Asia. April. [= FNA, K, Pa]

*Prunus umbellata* Elliott, Hog Plum, Flatwoods Plum. Cp (FL, GA, NC, SC), Pd (GA, NC, SC): upland, usually xeric, sandy or rocky forests and woodlands; common. March-April; August-September. S. NC, TN, and AR south to c. peninsular FL and TX. Fox, Godfrey, & Blomquist (1952) report *Prunus mitis* for s. NC (Cleveland County). It is presently unclear how best to treat variation in this complex. [> *Prunus umbellata* Elliott var. *umbellata* – K; > *Prunus umbellata* Elliott var. *injuncunda* (Small) Sargent – K; = *Prunus umbellata* – RAB, WH, Z; > *Prunus umbellata* – S; > *Prunus mitis* Beadle – S; > *Prunus injuncunda* Small – S; = *Prunus umbellata* var. *umbellata* – FNA]

*Prunus virginiana* Linnaeus var. *virginiana*, Choke Cherry. Forming clonal thickets in oak and northern hardwood forests. Late April-June; July-August. NL (Newfoundland) and NL (Labrador) west to MB, south to w. NC, n. GA, AR, and OK. Other varieties occur in w. North America. [= FNA, K, Z; < *Prunus virginiana* – RAB, C, F, G, Pa, W, WV; = *Padus nana* (Du Roi) Roemer – S]



**17. *Neillia*** D. Don 1825 (Lace Shrub)

A genus of about 3 species, shrubs, of e. Asia. Oh & Potter (2005) present strong evidence for the inclusion of *Stephanandra* in *Neillia*. References: Weakley & Wright in FNA (in press); Oh (2006)=Z; Oh & Potter (2005); Kalkman in Kubitzki (2004).

\* *Neillia incisa* (Thunberg) S.H. Oh, Lace Shrub. Suburban woodlands, establishing from horticultural plantings; native of Japan and Korea. [= FNA, Z; = *Stephanandra incisa* (Thunberg) Zabel – K1, K2]

**18. *Physocarpus*** (Cambessèdes) Rafinesque 1838 (Ninebark)

A genus of 3-5 species, shrubs, of North America and ne. Asia. References: Alexander in FNA (in press); Robertson (1974)=Z; Kalkman in Kubitzki (2004).

- 1 Follicles stellate-pubescent.....*P. opulifolius* var. *intermedius*
- 1 Follicles glabrous.....*P. opulifolius* var. *opulifolius*

*Physocarpus opulifolius* (Linnaeus) Maximowicz var. *intermedius* (Rydberg) B.L. Robinson, Midwestern Ninebark. Limestone river bluffs, mesic hammocks, streambanks; rock outcrops. W. NY west to MN and CO, south to SC, FL, AL, and AR. It is unclear whether the southern species recognized by Small (1933) are best allied with this taxon. Recently collected from limestone bluffs on the Buffalo River, Wayne County, TN (D. Estes, pers. comm., 2012). Additional study is needed. [= C, F, G, K, Z; < *P. opulifolius* – RAB, W, WH; = *P. intermedius* (Rydberg) C.K. Schneider – FNA; > *Opulaster alabamensis* Rydberg – S; > *Opulaster stellatus* Rydberg – S; > *Opulaster intermedius* Rydberg]

*Physocarpus opulifolius* (Linnaeus) Maximowicz var. *opulifolius*, Eastern Ninebark. Stream banks, riverside thickets, rock outcrops, cliffs, especially over mafic or calcareous rocks. May-July. QC west to WI, south to SC, TN, and n. IL. [= C, F, G, K, Z; < *P. opulifolius* – Pa, RAB, W, WV; = *P. opulifolius* – FNA; > *Opulaster opulifolius* (Linnaeus) Kuntze – S; > *Opulaster australis* Rydberg – S]

**19. *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. Disturbed areas; native of Asia. June-July. Cultivated and naturalized at least as far south as s. PA (Rhoads & Klein 1993; Rhoads & Block 2007), MD, and WV; reports for VA (Massey 1961, repeated in Kartesz 1999) are apparently based only on cultivated plants. [= C, F, G, K, Pa]

**20. *Aruncus*** Linnaeus 1758 (Goat's-beard)

A genus of 2-3 species, perennial herbs, of temperate North America and Europe. References: Mellichamp in FNA (in press); Robertson (1974)=Z; Kalkman in Kubitzki (2004).

**Identification notes:** *Aruncus dioicus* can be distinguished from the superficially closely similar *Astilbe biternata* by the following characteristics: trichomes of foliage not glandular (vs. glandular in *Astilbe*), stamens 20 (vs. 10), carpels 3-4 (vs. 2), seeds < 1.5-2 mm long (vs. ca. 4 mm long), terminal leaflets usually unlobed (vs. terminal leaflets usually trilobed).

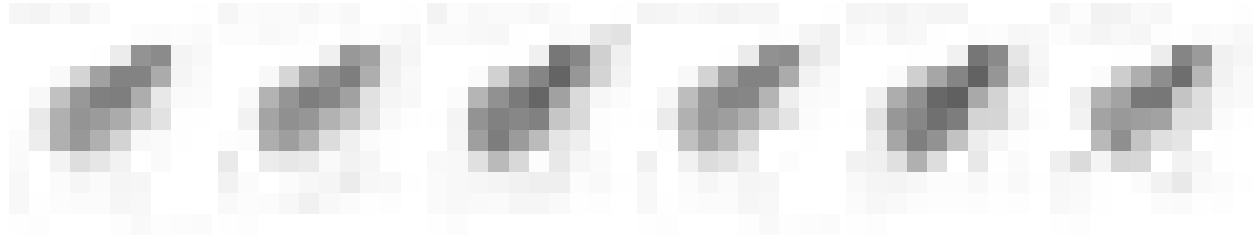
- 1 Follicles 2.5-3.5 mm long.....[*A. sylvester*]

- 1 Follicles 1.5-2 mm long.
- 2 Follicles semi-ovoid, strongly convex on the back, about 1/2 as thick (measured radially) as long; leaves somewhat lustrous, the lower surface glabrous to sparsely pubescent..... *A. dioicus* var. *dioicus*
- 2 Follicles nearly cylindrical, 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. Moist, nutrient-rich forests and woodland borders. May-June; June-September. NY (?) and PA west to IN, south to NC, SC, GA, and AL. [= C, F, FNA, K, Z; < *A. dioicus* - Pa, RAB, W; = *A. allegheniensis* Rydberg - S]

*Aruncus dioicus* (Walter) Fernald var. *pubescens* (Rydberg) Fernald, Midwestern Goat's-beard. Moist, nutrient-rich forests and woodland borders. May-June; June-September. W. VA, KY, and IL west to IA, south to n. MS, AR, and ne. OK. The validity of this variety and its attribution to our area (by G, K, and S) need further evaluation. Robertson (1974) states that the "two varieties intergrade completely, and it is questionable whether they should be maintained." [= C, F, FNA, K, Z; < *A. dioicus* - W; = *A. pubescens* Rydberg - S]

\* *Aruncus sylvestris* Kosteletzky ex Maximowicz is attributed to our area by Small (1933). This European species is occasionally cultivated in e. North America. [= C, G; = *A. dioicus* var. *vulgaris* (Maximowicz) Hara - FNA, K; = *A. aruncus* (Linnaeus) Karsten - S] {no definite evidence of naturalization in our area; rejected}



**21. *Spiraea* Linnaeus 1753 (*Spiraea*, Meadowsweet, Hardhack)**

A genus of about 80-120 species, shrubs, of north temperate areas (especially Asia). Many species and hybrids are cultivated, and additional taxa to those treated below may be encountered as persistent or escaped. References: Lis in FNA (in press); Robertson (1974)=Z; Rehder (1940); Uttal (1974); Kalkman in Kubitzki (2004).

- 1 Inflorescence a simple umbel; flowers white; [section *Chamaedryon*]; [alien].
  - 2 Flowers 10-15 mm in diameter.
    - 3 Leaves 2-7 cm long, coarsely serrate and sometimes also slightly 3-lobed; inflorescences with > 6 flowers.....*S. cantoniensis*
    - 3 Leaves 1-4 (-5) cm long, finely serrulate, not lobed; inflorescences with 3-6 flowers .....*S. prunifolia*
  - 2 Flowers 6-10 mm in diameter.
    - 4 Leaf blades linear to lanceolate, 2.5-4 cm x 0.3-1 cm, > 4x as long as wide; flowers 6-8 mm in diameter.....*S. thunbergii*
    - 4 Leaf blades ovate to obovate, 3-5 cm x 2-3 cm, < 2x as long as wide; flowers 7-10 mm in diameter .....*S. xvanhouttei*
- 1 Inflorescence a compound corymb or panicle; flowers white, pink, or red; [native or alien].
  - 5 Inflorescence a corymb, flat-topped or rounded, broader than long; [section *Calospyra*].
    - 6 Leaves rounded, obtuse, or acute at the apex; petals white (rarely pink); [native].
      - 7 Follicle 2-3 mm long; leaves 1-2x as long as wide, rounded or obtuse at apex, rounded at base; plants 3-8 (-10) dm tall; [of dry or moist forested slopes, or thin soil on rock outcrops, rarely of streambanks].....*S. corymbosa*
      - 7 Follicle 1-2 mm long; leaves 2-4x as long as wide, acute at apex, cuneate at base; plants 4-25 dm tall; [of rocky riverbanks].....*S. virginiana*
    - 6 Leaves long-acuminate at the apex; petals pink (rarely white or red); [alien].
      - 8 Leaves glabrous; flowers usually white (rarely pink); shrub to 8 dm tall .....*S. xbumalda*
      - 8 Leaves pubescent on the veins beneath; flowers usually pink (rarely white); shrub to 15 dm tall .....*S. japonica*
  - 3 Inflorescence a panicle, longer than broad; [section *Spiraea*].
    - 9 Lower leaf surface densely tomentose with white, tawny, or rusty tomentum which obscures the surface.
      - 10 Follicles glabrous; [alien, rare] .....*S. xbilliardii*
      - 10 Follicles pubescent; [native, common in boggy wetlands] .....*S. tomentosa*
    - 9 Lower leaf surface glabrous or with a few scattered hairs that do not obscure the surface.
      - 11 Leaves lanceolate to oblong-lanceolate, widest at or below the middle; flowers pink; [alien, rarely escaped or persisting].....*S. salicifolia*
      - 11 Leaves oblanceolate to obovate or oblong, widest above or at the middle; flowers white (rarely slightly pink); [native, of bogs, stream-banks, swampy areas, or moist to dry rocky areas].
        - 12 Leaves 3-5 (-8)x as long as wide, finely and sharply toothed; inflorescence, hypanthium, and sepals pubescent; sepals usually obtuse; twigs yellow-brown to brown .....*S. alba*
        - 12 Leaves 2-3x as long as wide, coarsely and bluntly toothed; inflorescence, hypanthium, and sepals usually glabrous or nearly so; sepals usually acute; twigs red-brown to purple-brown..... *S. latifolia*

*Spiraea alba* Du Roi, Narrowleaf Meadowsweet, Pipestem. Mt (NC, VA, WV), Pd (DE, VA): bogs, boggy streambanks, seepages; uncommon (rare in DE and NC). June-September; August-October. QC west to AB, south to NC, IN, and MO. There is considerable disagreement over whether *S. alba* and *S. latifolia* represent two species with some introgression in areas of overlap, two varieties, or a variable or clinal species. [= F, FNA, G, Pa, S, W, WV, Z; = *S. alba* var. *alba* - RAB, C, GW, K]

\* *Spiraea ×billiardii* Herincq [*S. douglassii* × *salicifolia*]. Mt (NC, VA, WV): cultivated, escaped or persisting; rare, introduced from cultivation, one parent from w. North America, one from Eurasia. Also present in KY and TN (D. Estes, pers. comm.). [= K; = *S. ×billardii* – Pa, orthographic variant]

\* *Spiraea ×bumalda* Burven [*S. albiflora* × *japonica*]. Pd (VA): cultivated, escaped or persisting; rare, native of cultivation, both parents from Asia. [= FNA, K]

\* *Spiraea cantoniensis* Loureiro. Cp (AL, GA, LA, NC): roadsides; rare, native of Asia. *S. cantoniensis* has been collected twice on Fort Bragg, NC, by Phil Crutchfield (specimen at Fort Bragg) (Sorrie, pers. comm.). Also reported for other scattered states in e. North America (AL, AR, LA, NY (Kartesz 1999, FNA). [= FNA, K]

*Spiraea corymbosa* Rafinesque, Dwarf Spiraea, Rock Spiraea. Mt (NC, VA, WV), Pd (NC, VA), {GA?}: rocky forests and woodlands, granitic domes, dry slopes of Piedmont monadnocks, rocky slopes in partial sun; common (rare in NC and WV). June–August; August–October. A Southern and Central Appalachian endemic: sc. PA and w. MD south through w. VA, e. WV, to nw. NC, and perhaps also to e. TN (?), to n. AL(?), apparently fairly common only in w. VA. The species is limited to only a few counties each of NC and WV (Franklin 2004, Strausbaugh & Core 1978), and is not listed for TN in Chester, Wofford, & Kral (1997). Although Mohr (1901) listed the species for AL, it is not listed as a part of the state's woody flora by Clark (1971). *S. corymbosa* is related to *S. lucida* Douglas ex Greene [= *S. betulifolia* var. *lucida* (Douglas ex Greene) C.L. Hitchcock] of the Rocky Mountains, *S. betulifolia* [= *S. betulifolia* var. *betulifolia*] of ne. Asia (Japan, e. Siberia, ne. China, Sakhalin, and the Kurile Islands, and *S. aemiliana* Schneider [= *S. betulifolia* var. *aemiliana* (Schneider) Koidz.]. The group is often treated as 4 varieties or subspecies of *S. betulifolia*, but the morphological differences and strongly disjunct distribution seem to warrant treatment as a relictual complex of related species. See Uttal (1974), Greene (1892), and others listed in Robertson (1974) for additional discussion and a range of conclusions. [= F, FNA, S, WV; < *S. betulifolia* – RAB; = *S. betulifolia* Pallas var. *corymbosa* (Rafinesque) Maximowicz – C, G, K, Pa, W, Z; = *S. betulifolia* ssp. *corymbosa* (Rafinesque) Taylor & MacBryde]

\* *Spiraea japonica* Linnaeus f., Japanese Spiraea. Mt (AL, GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE): roadsides, woodland borders, old home-sites; common (uncommon in DE, GA, NC, SC, and VA), native of Japan and China. June–July; July–August. [= RAB, C, F, FNA, G, Pa, W, WV, Z; > *S. japonica* var. *fortunei* (Planchon) Rehder – K]

\* *Spiraea latifolia* (Aiton) Burkhart, Broadleaf Meadowsweet. Mt (NC, VA, WV), Pd (DE, VA), Cp (DE, VA): bogs, seeps, and rock outcrops (glades) over amphibolite, greenstone, olivine, and granite; uncommon (rare in DE, GA, and NC, rare in Piedmont and Coastal Plain). June–September; August–October. NL (Newfoundland) west to MI, south to e. VA and w. NC. [= FNA, G, Pa, S, W, WV, Z; = *S. alba* var. *latifolia* (Aiton) H.E. Ahles – RAB, C, GW, K; = *S. latifolia* var. *latifolia* – F]

\* *Spiraea prunifolia* Siebold & Zuccarini, Bridal-wreath Spiraea. Cultivated, escaped or persisting; native of China, Korea, and Taiwan. [= C, FNA, G, K, Pa]

\* *Spiraea salicifolia* Linnaeus, Willowleaf Spiraea. Mt (GA, NC, VA), Pd (VA), Cp (MS, VA): cultivated, escaped or persisting; rare, native of Eurasia. [= C, FNA, K]

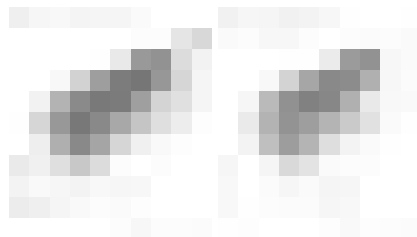
\* *Spiraea thunbergii* Siebold ex Blume. Mt (GA), Cp (AL, LA, MS, NC): roadsides; rare, native of Asia. *S. thunbergii* has been collected from roadside at Fort Bragg, NC, by Phil Crutchfield (specimen at Fort Bragg) (Sorrie, pers. comm.). Also GA, MS, and MD (FNA). [= C, FNA, K]

\* *Spiraea tomentosa* Linnaeus, Hardhack, Steeplebush. Mt (GA, NC, SC, VA, WV), Pd (NC, SC, VA), Cp (DE, NC, SC, VA): bogs, wet meadows; common (rare in Piedmont, rare in GA). July–September; September–October. NS west to MN, south to SC, ne. GA, c. TN, and AR. [= RAB, GW, K, Pa, S, W, WV; > *S. tomentosa* var. *rosea* (Rafinesque) Fernald – C, F, FNA, G, Z; > *S. tomentosa* var. *tomentosa* – C, F, FNA, G, Z; ? *S. subcanescens* Rydberg]

\* *Spiraea trilobata* Linnaeus var. *trilobata*, Asian Meadowsweet, Three-lobed Spiraea. Disturbed areas; native of e. Asia. Reported by Will Cook from Wake County, NC (Cook, pers. comm. 2011). [] {not yet keyed}

\* *Spiraea ×vanhouttei* (C. Briot) Carrière [*S. cantoniensis* × *trilobata*], Bridal-wreath Spiraea. Pd (NC), Mt (WV): cultivated, escaped or persisting; rare, introduced from cultivation, the two parents both from Asia. [= FNA, K, Z; = *C. vanhouttei* – C, G]

\* *Spiraea virginiana* Britton, Virginia Spiraea, Appalachian Spiraea. Mt (GA, NC, VA, WV): riverbanks, riverside shrub thickets, where occasionally flood-scoured; rare. June–July; August–September. A Southern Appalachian endemic: sw. PA, WV, and sw. VA south through w. NC and e. TN to nw. GA. Ogle (1991a, 1991b) presents an excellent discussion of the taxonomy, history, and biology of this interesting species. [= RAB, C, F, FNA, G, K, Pa, S, W, WV, Z; > *S. virginiana* var. *serrulata* Rehder]



## 22. *Exochorda* Lindley 1858 (Pearlbush)

A genus of about 4 species, shrubs, of e. Asia. References: Haines in FNA (in press); Kalkman in Kubitzki (2004).

\* *Exochorda racemosa* (Lindley) Rehder, Pearlbrush. Disturbed areas, woodland borders, suburban woodlands; native of China. First reported for South Carolina by Hill & Horn (1997). [= C, FNA, G, K]

**23. *Kerria* A.P. de Candolle 1818 (Kerria)**

A monotypic genus, a shrub, of China and Japan. References: Henrickson & Weakley in FNA (in press); Kalkman in Kubitzki (2004).

\* *Kerria japonica* (Linnaeus) A.P. de Candolle, Kerria, Japanese-rose. Woodland borders, suburban woodlands; native of China. April-June. Single and "doubled" forms are cultivated. [= C, F, FNA, G, K, Pa]

**24. *Neviusia* A. Gray 1858 (Snow-wreath)**

A genus of 2 species, shrubs, of se. North America and California. References: Kalkman in Kubitzki (2004).

*Neviusia alabamensis* A. Gray, Alabama Snow-wreath. Limestone woodlands, where there is seasonal moisture. Sc. TN (Chester, Wofford, & Kral 1997), nw. GA (Jones & Coile 1988), and n. AL; disjunct in AR and MO. [= K, S]

**25. *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, beadlike fruits.

\* *Rhodotypos scandens* (Thunberg) Makino, Jetbead. Suburban woodlands, disturbed areas, roadsides, old house sites, well established locally; native of e. Asia. Late March-May. [= C, F, G, K, Pa, WV; ? *R. tetrapetalus* (Siebold) Makino]

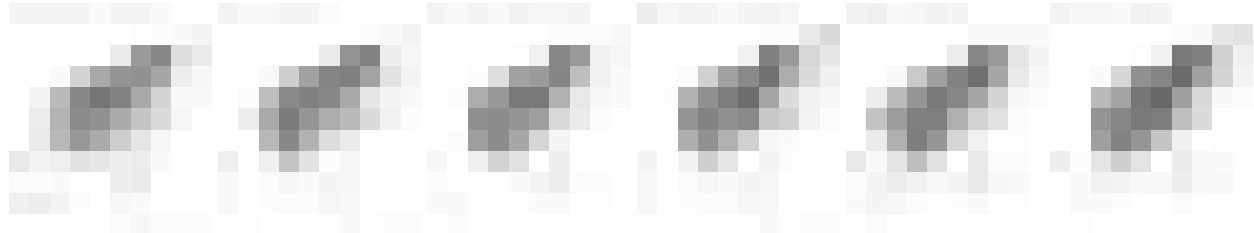
**26. *Gillenia* Moench 1802 (Indian-physic, Bowman's-root)**

A genus of 2 species, herbs, of e. North America. The contention that *Gillenia* is a later homonym of *Gillena* and must therefore be rejected for the later name *Porteranthus* has been ruled against (Robertson 1974; Brummitt 1988; Parkinson 1988). References: Nesom in FNA (in press); Robertson (1974)=Z; Kalkman in Kubitzki (2004).

- 1 Stipules ovate, 10-20 (125) mm long; lower leaf surface densely glandular; leaves trifoliate, the leaflets of the lower leaves lacinate-toothed to divided..... *G. stipulata*
- 1 Stipules linear, 6-8 mm long; lower leaf surface glabrous or sparsely glandular; leaves trifoliate, the leaflets of the lower leaves merely toothed, like the upper leaves..... *G. trifoliata*

*Gillenia stipulata* (Muhlenberg ex Willdenow) Nuttall, Midwestern Indian-physic. Dry to mesic woodlands and forests, especially over circumneutral soils derived from diabase (in NC) or greenstone (in VA). May-June; July-October. NY to KS, south to nw. GA and TX, and disjunct east of the Blue Ridge in sc. VA, c. NC, and c. GA. [= RAB, F, FNA, G, WV; = *Porteranthus stipulatus* (Muhlenberg ex Willdenow) Britton – C, K, S, W, Z]

*Gillenia trifoliata* (Linnaeus) Moench, Mountain Indian-physic. Moist forests, roadbanks, forest edges. April-June; August-October. ON west to MI, south to SC, AL, nc. GA, and MO. [= RAB, F, FNA, G, Pa, WV; = *Porteranthus trifoliatus* (Linnaeus) Britton – C, K, S, W, Z]



**27. Amelanchier Medikus 1789  
(Serviceberry, Sarvis, Shadbush, Juneberry, "May Cherry", "Currant")**

A genus of about 20-40 species, shrubs and trees, north temperate. References: Campbell, Dibble, Frye, & Burgess in FNA (in press); Robertson (1974)=Z; Kalkman in Kubitzki (2004). Key adapted from FNA.

- 1 Inflorescences 1-3 (-4)-flowered; leaves imbricate in bud, bases cuneate; petioles 2-10 (-15) mm; [WV northward]..... *A. bartramiana*

- 1 Inflorescences usually 4-many-flowered; leaves conduplicate in bud, bases truncate or rounded to cordate (rarely cuneate); petioles usually at least 10 mm; [collectively widespreading].
- 2 Margins of mature leaves with 2-6 teeth per cm; lateral leaf veins or their forks usually extending into teeth (as readily visible without magnification); ovary summit densely lanuginose.
  - 3 Petals 6-10 mm; hypanthia campanulate..... *A. humilis*
  - 3 Petals 11-18 mm; hypanthia saucer-shaped ..... *A. sanguinea*
- 2 Margins of mature leaves with 4-6 (-10) teeth per cm; lateral leaf veins mostly becoming indistinct near margin and not entering teeth; ovary summit glabrous, sparsely pubescent, or densely lanuginose.
  - 4 Ovary summit densely lanuginose; expanding leaves densely tomentose below.
    - 5 Petals 2.6-5.8 mm long, 1-3 mm wide, sometimes andropetalous; plants caespitose; primary stems tending to be stiffly erect..... *A. nantucketensis*
    - 5 Petals 6-10 mm long, 2.5-4 (-5) mm wide, not andropetalous; plants rhizomatous and in loosely scattered colonies; stems straggling-ascending..... *A. spicata*
  - 4 Ovary summit glabrous or sparsely pubescent; expanding leaves glabrous to densely tomentose below.
    - 6 Plants rhizomatous, shrubs 0.2-2.5 m tall; petals 2.6-7.7 mm long.
      - 7 Petals 2.6-5.8 mm long, 1-3 mm wide, sometimes andropetalous; leaves elliptic to oblanceolate or oblong-elliptic; sepals ± recurving..... *A. nantucketensis*
      - 7 Petals 5.9-7.7 mm long, 2.6-3.6 mm wide, rarely andropetalous and much narrower than sterile stamens; leaves elliptic or oval to oblong or often obovate; sepals spreading ..... *A. obovalis*
    - 6 Plants not rhizomatous, shrubs to 8 m tall or trees to 20 m tall; petals (6-) 8-20 mm long.
      - 8 Inflorescences erect; petals 6-12 mm.
        - 9 Young leaves at flowering less than half-expanded and unfolded, green, densely tomentose on the lower surface; proximal flowering pedicels 0.5-2 cm long; sepals erect or loosely spreading..... *A. canadensis*
        - 9 Young leaves at flowering half-expanded or more and unfolding, often reddish, and sparsely pubescent or glabrescent on the lower surface; proximal flowering pedicels 1-1.5 cm long; sepals ascending to recurving..... *A. intermedia*
      - 8 Inflorescences drooping; petals 10-20 mm long.
        - 10 Young leaves at flowering folded, green or brownish, and densely tomentose below; proximal flowering pedicels 0.8-1.7 cm long; pomes maroon-purple, insipid ..... *A. arborea*
        - 10 Young leaves at flowering unfolding, reddish, and glabrous (or nearly so) below; proximal flowering pedicels 1.5-3 cm long; pomes blackish purple, sweet ..... *A. laevis*

*Amelanchier arborea* (Michaux f.) Fernald, Downy Serviceberry. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): dry to moist forests; common (uncommon in NC and SC Coastal Plain). March-May; May-August. NS west to MN, south to Panhandle FL and e. TX. [= C, F, FNA, G, Pa, 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) H.E. Ahles – RAB, K, Z; > *A. canadensis* – S, misapplied; > *A. alabamensis* Britton – S; < *A. arborea* – WH]

*Amelanchier bartramiana* (Tausch) M.J. Roemer, Oblong-fruited Serviceberry. Mt (WV): bogs, sphagnum thickets; rare. April-May; June-July. NL (Labrador) west to MN, south to PA, WV, WI, and MI. [= C, F, FNA, G, K, Pa]

*Amelanchier canadensis* (Linnaeus) Medikus, Eastern Serviceberry. Cp (DE, GA, NC, SC, VA), Pd (DE, NC, SC, VA), Mt (VA): pocosins, acidic wetlands; common (uncommon in NC, SC, and VA Piedmont, rare in VA Mountains). March-April; May-June. NS and NB south to GA, mainly on the Coastal Plain. [= RAB, C, FNA, GW, K, Pa, W; > *A. canadensis* var. *canadensis* – F, Z; > *A. canadensis* var. *subintegra* Fernald – F, Z; < *A. canadensis* – G; = *A. oblongifolia* (Torrey & A. Gray) Roemer – S]

*Amelanchier humilis* Wiegand. Mt (WV): rocky, calcareous areas; rare. QC west to ND, south to montane MD, WV, WI, and MI. [= FNA, K, Pa; < *A. sanguinea* var. *sanguinea* – C, G; > *A. humilis* var. *humilis* – F]

*Amelanchier intermedia* Spach. Mt (NC), {VA}: moist to wet areas; rare. May-June; June-August. NL (Newfoundland) west to MN, south to VA, w. NC, and MI. [= F, FNA; < *A. canadensis* (Linnaeus) Medikus – C, G; = *A. ×intermedia* – K]

*Amelanchier laevis* Wiegand, Smooth Serviceberry. Mt (GA, MD, NC, SC, TN, VA, WV), Pd (DE, NC, VA), Cp (DE, MD, VA), Ip (AL, KY, TN): forests, balds; common (uncommon in DE, rare in Coastal Plain of VA, rare in Piedmont of NC). April-May; June-July. NS west to MN, south to e. VA, w. NC, w. SC, AL, w. TN, and IA. [= C, FNA, G, K, Pa, W, S, Z; = *A. arborea* var. *laevis* – RAB; > *A. laevis* var. *laevis* – F]

*Amelanchier nantucketensis* Bicknell, Nantucket Serviceberry. Cliff ledges, rock outcrops. March-April; June. NS and ME south disjunctly to the Potomac River Gorge, n. VA and sc. MD (Knapp et al. 2011). See Dibble & Campbell (1995) and Steury, Fleming, & Strong (2008). [= F, FNA, K; ? *A. canadensis* × *spicata* – C; > *A. micropetala* (Robinson) W.W. Ashe]

*Amelanchier obovalis* (Michaux) Ashe, Coastal Plain Serviceberry. Cp (DE, GA, NC, SC, VA), Pd (SC): pocosins, pine savannas; common (rare in SC Piedmont). March-April; May-June. NJ, DE, and PA south to GA. [= RAB, C, F, FNA, G, GW, K, Pa, Z]

*Amelanchier sanguinea* (Pursh) A.P. de Candolle, Roundleaf Serviceberry, New England Serviceberry. Mt (GA, NC, VA, WV), Pd (VA), Cp (VA): uncommon (rare in GA and NC Mountains, rare in VA Piedmont, rare in VA Coastal Plain). April-May; May-June. ME west to MN, south to w. NC, TN, n. AL, and IA. [= RAB, F, FNA, Pa, S, W, Z; = *A. sanguinea* var. *sanguinea* – C, G, K]

*Amelanchier spicata* (Lamarck) K. Koch, Dwarf Serviceberry. Cp (NC, SC, VA), Pd (NC, VA), Mt (VA, WV), {GA}: dry, acidic, rocky sites; uncommon. March-April; May-June. NL (Newfoundland) west to ND, south to w. NC, w. SC, GA, AL, WI, and MI. [= RAB, C, FNA, G; = *A. stolonifera* Wiegand – F, K, Pa, S, W, Z]



28. *Crataegus* Linnaeus 1753 (Hawthorn, Haw, Thornapple)  
(contributed by R. Lance)

A genus of 100-500 species, shrubs and small trees, north temperate and Central America, most in e. North America. References: Lance (in prep.)=X; Phipps (1988)=Z; Beadle in Small (1913)=Q; Phipps, O'Kennon, & Lance (2003)= V ; Phipps (1998)=Y; Phipps, Lance, & Dvorsky (2006)=U; Phipps, O'Kennon, & Dvorsky (2006)= N; Lance (1995); Kalkman in Kubitzki (2004).

**Identification notes:** SUBSTANTIAL CHANGES TO THIS TREATMENT ARE PENDING. All references to leaves and petioles pertain to foliage on short shoots (floreale 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 lacinate; 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 on the lower surface, 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 the lower surface, espially when young; fruit 10-15mm diameter ..... *C. aemula*
            - 14 Leaves firm, glossy or bright green, with hair tufts in the main vein axils on the lower surface; 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 on the lower surface; pedicels tomentose..... *C. calpodendron*
      - 6 Leaves firm, dark green or lustrous, glabrous or slightly hairy on the lower surface, 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. brachycantha*
        - 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. margaretae*
            - 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 on the lower surface; branches dark gray; fruit usually <12 mm; calyx and fruit stem hairy.....*C. collina*
                  - 14 Leaves sparsely hairy to glabrous on the lower surface 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 on the lower surface.
            - 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 on the upper surface; fruit calyx deeply glandular-serrate; petiole conspicuously glandular..... *C. ashei*



- 20 Leaf veins distinctly impressed on the upper surface; 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 1/2 its length; fruit often 10 mm or more in diameter ..... *C. pallens*
        - 24 Twigs elongate; petiole winged 1/3 or less of length; fruit usually < 10 mm in diameter.....*C. pulcherrima*

***Crataegus aemula*** Beadle, Rome Hawthorn. Cp, Pd (GA, SC): upland hardwood and pine-hardwood forests, over sandstone, calcareous rock or circumneutral clay soils; uncommon (but may be locally abundant). April; September. Nw. GA and ne. AL principally, disjunct in McCormick Co, SC. Related to *C. iracunda* Beadle, but foliage of *C. aemula* differs in having frequent rounded bases, thin texture, yellow-green coloration. Fruits are lustrous light red, 12-18 mm diameter. *C. aemula* has been shown to be triploid, possibly apomictic, producing a high percentage of fertile seed with little seedling variation. The possibility of its being of hybrid origin between *C. iracunda* Beadle and *C. collina* Chapman has been suggested. [= K, Q, X; < *C. macrocarpa* – S]

***Crataegus aestivalis*** (Walter)Torrey & A. Gray, Mayhaw, Eastern Mayhaw. Cp (GA, NC, SC): swamp forests, generally where flooded for much of the year, often flowering and fruiting while standing in water, often associated with *Taxodium distichum*, *Nyssa aquatica*, *Nyssa biflora*, and *Planera aquatica*; uncommon but sometimes locally abundant; occasionally growing as groves or stands in ‘mayhaw flats’. March-April; June-July. Se. NC south to n. FL and se. AL. A historic record of *C. aestivalis* in VA appears to be based on a single specimen collected 22 July 1934 by M.L. Fernald & B. Long, in Princess Anne County; this specimen is actually *C. crus-galli*. A related species, *C. opaca* Hooker & Arnott, occurs west of the range of *C. aestivalis*, in similar habitats. Plants with copious growth of reddish pubescence on the leaf undersides are included under *C. rufula*. The fruits of all three species are traditionally gathered for preserves, pies, and jelly. See Phipps (1988) for extensive additional discussion of *C. aestivalis* and relatives. [= RAB, K, X, Z; < *C. aestivalis* – S]

***Crataegus alabamensis*** Beadle, Alabama Hawthorn. Pd (GA, SC), Cp (GA, NC, SC): sandhills, upland pine and pine-oak forests, rocky woodlands, xeric or subxeric habitats with sandy or well-drained clay soils; uncommon. April; August-September. E. NC, c. SC south to n. FL, west to c. MS. Often reaching treelike proportions (4-8 m tall, trunk 10-30 cm diameter). Some local genotypes may produce palatable fruit to 22 mm in diameter. The typical form of *C. alabamensis* has pubescent foliage and tomentose inflorescence parts, but the similar *C. florens*, *C. atrita*, and *C. teres* are progressively more glabrate, in this order; they may be interpreted as separate species as in Phipps & Dvorsky (2008). [= X; < *C. flava* Aiton – RAB, K, S; > *C. adunca* Beadle - Q; > *C. atrita* Beadle - Q; > *C. florens* Beadle - Q; > *C. fortis* Beadle - Q; > *C. teres* Beadle – Q]

***Crataegus allegheniensis*** Beadle, Allegheny Hawthorn. Mt, Pd (GA, NC, SC), Cp (GA, SC); upland pine and pine-oak forests, disturbed woodlands, rocky bluffs and slopes; uncommon. April; August-September. W. and sc. NC to c. SC, c. GA, west to c. AL, ne. MS, e. TN. A variable species if broadly considered, displaying leaf and flower characters which suggest intermediacy between members of series *Intricatae* and *Apricae*. The stamen counts can vary from 10 in typical *C. allegheniensis*, 12-17 in *C. ignava* and *C. extraria*, and 20 in *C. cullasagensis*, *C. agrestina*, and *C. frugiferans*. A narrower view might hold some of this synonymy to specific levels. [= X; < *C. flava* Aiton – RAB; > *C. allegheniensis* – Q; > *C. ignava* Beadle – K, Q; > *C. extraria* Beadle – K, Q; > *C. impar* Beadle – K, Q; > *C. cullasagensis* Ashe – Q; > *C. agrestina* Beadle – Q; > *C. mira* Beadle – Q; > *C. frugiferans* Beadle (= *C. rigens* Beadle) – Q]

***Crataegus anisophylla*** Beadle. Cp (GA): upland pine forests, pine-oak scrub, sandhills, disturbed woodlands, roadsides, abandoned fields; uncommon. Late March-April; late August-September. Se GA to c. peninsular FL, west to s. AL. This is a poorly understood taxon among the group of hawthorns often categorized under *C. flava* Aiton in many earlier floral treatments. Related to *C. lassa* Beadle. [= X; > *C. anisophylla* – Q; > *C. viaria* Beadle – Q; > *C. cirrata* Beadle – Q; > *C. versuta* Beadle – K, Q; > *C. resima* Beadle – K, Q < *C. flava* – S]

***Crataegus aprica*** Beadle, Sunny Hawthorn Mtn, Pd, Cp (GA, NC, SC) {VA?}: upland pine forests, pine-oak forests, mixed hardwood forests over rocky or sandy substrates, abandoned fields, roadsides; common. Late March-April; September. NC south to s. GA and n. FL, west to e. AL and e. TN. This species is most common in the southern Appalachians of NC and SC and extending to the sandhills region of SC. The 10 stamens separate this species from the closely related and similar *C. sororia*, and both these taxa have long been included under the collective name of *C. flava* Aiton in many earlier treatments (see discussion of *C. flava*) [=W, X, Phipps 2007; < *C. flava* Aiton – RAB; > *C. aprica* – Q; > *C. shallotte* Ashe]

***Crataegus berberifolia*** Torrey & Gray var. ***berberifolia***, Barberry Hawthorn. Pd, Cp (GA, NC, SC, VA): mixed hardwood and pine forests of uplands, usually in subxeric to xeric habitats, especially over basic to calcareous soils; common. April-May; August-October. C. VA south to n. FL, west to TX, MO; most common in LA, s. AR. Closely related to *C. crus-galli* and differing primarily from that species by the consistent pubescence or stiff hairs on foliage, twigs, floral and fruit parts. 10-stamened forms of the normally 20-stamened *C. berberifolia* have been called *C. engelmannii* Sargent, which see below. [= C, K, Q, S, X]

***Crataegus berberifolia*** Torrey & Gray var. ***engelmannii*** (Sargent) Eggleston Pd, Cp (GA, NC, SC): mixed hardwood and pine forests of uplands, usually in subxeric to xeric habitats, especially over basic to calcareous soils; common. April-May; August-October. Similar to the typical variety in most respects except for the presence of 10 stamens. Appears most common in MO and AR, mixed sporadically with the species eastward to e. TN, c. NC. [> *C. engelmannii* Sargent - Q; > *C. berberifolia* var. *engelmannii* (Sargent) Eggleston; > *C. torva* Beadle - Q; > *C. sinistra* Beadle - Q]

***Crataegus boyntonii*** Beadle, Boynton Hawthorn. Mt, Pd (GA, NC, SC, VA): upland forest understories, pastures, rock outcrops, shrubby thickets; uncommon. W. VA south to c. GA, west to n. MS, n. to IL, KY, and WV. April-May; September-October. Related to *C. intricata* Lange, from which *C. boyntonii* differs chiefly in having an abundance of broadly ovate to deltoid leaves 5-8 cm long and 3-5 cm wide, more robust thorns, and more treelike habit (4-6 m tall, less prone to develop root suckering and multiple stems). [= Q, X; < *C. flabellata* - RAB; = *C. boyntoni* - F, G, orthographic variant; < *C. intricata* Lange - C, K]

***Crataegus brachyacantha*** Sargent & Engelm., Blueberry Hawthorn. Cp (GA): open pinelands; rare (GA Special Concern). April; September. In sw. GA, one historic record, disjunct from a main range farther west (primarily LA and e. TX). The only eastern hawthorn bearing black fruit, appearing blue due to an exterior waxy bloom. [= K, Q, S, Y, X]

***Crataegus buckleyi*** Beadle, Buckley Hawthorn. Mt, Pd (GA, NC, SC): upland pine and hardwood forests, rock outcrops; uncommon. April-May; August-October. W. NC, w. SC, n. GA west to n. AL, north to e. TN (and perhaps WV and VA). Most similar to *C. boyntonii* Beadle, but with purplish anthers, more glandular-serrate calyx lobes, russet fruit, and smaller leaves (3-6 cm long × 2-4 cm wide). [= Q, X; < *C. flabellata* - RAB; < *C. intricata* Lange - C, K]

***Crataegus calpodendron*** (Ehrhart) Medikus, Pear Hawthorn. Mt (VA, NC), Pd (GA, NC, SC): mixed hardwood forests, open slopes, wooded ravines, streamsides, especially over basic or calcareous rocks; uncommon. May-early June; September-October. From a generally northern range, the southern limits extend down the Appalachian region and adjacent Piedmont of VA to n. GA, c. AL, n. MS and AR. Often found as a solitary specimen, or in very small local populations. One of the latest hawthorns in our area to flower. Fruit production appears scant in its southern range. [= RAB, C, K, Pa, S, W, X; > *C. calpodendron* var. *calpodendron* - F, G; > *C. calpodendron* var. *microcarpa* (Chapman) Palmer - F, G; > *C. calpodendron* var. *globosa* (Sargent) Palmer - F, G; > *C. chapmanii* Beadle - Q; > *C. tomentosa* Du Roi]

***Crataegus coccinea*** Linnaeus, Scarlet Hawthorn. Mt, Pd (NC, VA): deciduous forest understories, pastures, upland thickets; rare. May; October. Distributed southward along the Appalachian Plateau from a predominately northern range. The combination of large, pubescent leaves (9-12 cm long) on terminal shoots, evenly toothed calyx lobes, and 5-10 stamens per flower are distinctive. *C. coccinea* may attain treelike proportions, to 10 m tall. [= RAB, C, X; > *C. pennsylvanica* W.W. Ashe - F, G, Pa; > *C. coccinea* - Pa; > *C. pedicellata* Sargent - K, W]

***Crataegus collina*** Chapman, Hillside Hawthorn. Mt (GA, NC, SC, VA), Pd (GA, NC, SC): hillside forests and young woodlands, especially over calcareous rocks; uncommon. March-April; August-October. Sw. VA west to KS, south to c. GA, s. AL, c. MS, AR and OK. Closely allied to *C. punctata* Jacquin, but more widespread in range and habitat tolerance across the Southeast. The fruits rarely reach 12 mm in diameter, whereas those of *C. punctata* often range from 12-23 mm. *C. collina* occupies sub-xeric uplands in the Appalachian Region and is tolerant of lowland floodplains in GA, AL, TN. It is one of the earliest hawthorns to flower in spring. Foliage may be conspicuously pubescent in some local genotypes. [= S, W, X; > *C. collina* var. *collina* - F, G; > *C. collina* var. *collicola* (W.W. Ashe) - F, G; > *C. collina* - Q; > *C. ingens* Beadle - Q; > *C. amnicola* Beadle - Q; < *C. punctata* Jacquin - RAB, C]

***Crataegus colonica*** Beadle. Cp, Pd (GA, NC, SC): scrublands, roadsides, xeric woodlands with sandy soils; uncommon. Late March-April; August-September. Se. & sc. NC south and west to e. GA, perhaps to n. FL. A poorly understood taxon, appearing closely related to *C. integra* Beadle, but with smaller flowers and fruit and an abundance of long thorns (2-5 cm). The thorniness of the plants combined with the obovate, nearly entire-margined leaves and pyriform-shaped fruit is usually diagnostic. A similarly thorny entity but with leaves distinctly serrated is *C. pexa* Beadle (see *C. munda* Beadle).

***Crataegus craytonii*** Beadle, Crayton Hawthorn. Mt (GA, NC, VA): wooded slopes, roadsides, streamsides; rare. Late April-May; September. Sw. VA, w. NC to n. GA, n. AL, possibly e. TN. A poorly known taxon, appearing most closely related to *C. intricata* Lange, but unique in its combination of 20 stamens and distinctly pubescent foliage and inflorescence parts. Alternatively, this hawthorn could be assigned varietal status within *C. intricata*, but it has not been published as such in any floral treatments. [= Q]

***Crataegus crus-galli*** Linnaeus var. *crus-galli*, Cockspur Hawthorn. Mt, Pd, Cp (GA, NC, SC, VA): pastures, thickets, disturbed woodlands and forests, fencerows; common. April-May; September-October. Ranges throughout the eastern US, except c. and s. peninsular FL. *C. crus-galli* sometimes forms extensive local colonies and likely apomictic clonal populations. Variation occurring in this wide-ranging species, mostly in size and shape of leaves and minor flower and fruit characters, has accounted for an extensive synonymy, with most earlier names applied by Charles Sargent. Plants having 3 to 5 styles and as many pyrenes have been alternatively placed under *C. reverchonii* Sargent, these also exhibiting a tendency to have smaller, more often suborbicular leaves (see *C. reverchonii*). Typical forms of *C. crus-galli* tend to have 1 to 2 styles and pyrenes, and with a range of leaf shapes from narrow to nearly suborbiculate. [= C, W, X; < *C. crus-galli* - Pa, RAB; > *C. crus-galli* - K; > *C. macra* Beadle - Q; > *C. regalis* Beadle var. *regalis* - F; > *C. algens* Beadle - Q; > *C. arborea* Beadle - K; > *C. canbyi* Sargent; > *C. crus-galli* var. *crus-galli* - F, G; > *C. crus-galli* var. *exigua* (Sargent) Eggleston - G; > *C. crus-galli* var. *macra* (Beadle) Palmer - F, G; ? *C. crus-galli* - S]

***Crataegus crus-galli*** Linnaeus var. *pyracanthifolia* (Aiton) Sargent. Cp (GA, NC, SC, VA): bottomland forests, swamp borders, lowlands; uncommon though at times locally abundant. April-May; October. DE south to n. FL, west to MO, e. TX. The narrow leaves may be glabrous or pubescent on the lower surface, varying as local genotypes. [= > *C. crus-galli* var. *pyracanthifolia* (Aiton) Sargent - F, G; > *C. limnophylla* Sargent - K; > *C. pyracanthoides* Beadle var. *arborea* (Beadle) Palmer - G; > *C. pyracanthoides* Beadle - Q]

***Crataegus dispar*** Beadle, Aiken Hawthorn. Cp (FL, GA, SC), Pd (GA, SC): upland pine or pine-oak forests, usually of sub-xeric to xeric conditions, in well-drained clay or sandy soils; uncommon. Late March-April; September. Nc & sc SC and adjacent e. GA; single sporadic collections known from Panhandle FL and ne. AL. A distinctive species with its deeply cut and serrated, tomentose leaves, often pale bluish-green in color. [= K, Q, X]

***Crataegus disperma*** Ashe, Two-seed Hawthorn. Mt (VA) {NC?}: upland forests, pastures, brushy hillsides; uncommon. May; September-October. PA west to IN, south in the Appalachians to VA, e. KY. *C. disperma* is of presumed hybrid origin between *C. crus-galli* and *C. punctata*, since characters appear intermediate. It sometimes appears in mixed populations of the

putative parent species, but its reproductive biology is poorly known. Similar to other hawthorns of presumed hybrid origin, it may be apomictic, but no large local populations are known. It is keyed here due to its persistent inclusion in several floral treatments in the past. [= F, K; > *C. ×disperma* Ashe – K]

***Crataegus dodgei*** Ashe, Dodge Hawthorn. Mt (NC) {VA ?}: mesic hardwood forests, streamside thickets, pastures; rare. May; September-October. A northern species predominately of the Great Lakes Region, east to CT, sporadic southward in the Appalachians to WV and possibly e. TN, w. VA, with one collection in Ashe Co, NC. [= Pa; = *C. mercerensis* Sargent]

***Crataegus flava*** Aiton, Yellow Hawthorn. Cp (FL, GA, SC), Pd (SC, GA): dry woodlands; rare. A problematic taxon, originally described from a plant under cultivation in Europe, and assumed native from central SC s. to n. FL; few naturally-occurring plants have been located in the Southeastern US which match closely the type specimen. The likelihood of the type of *C. flava* being of hybrid origin, involving members of the *Apricae* or *Intricatae* series seems probable. Unfortunately, the name *C. flava* Aiton and the ambiguous taxon which it historically represents has been widely misapplied and confused for more than a century. It is included here primarily due to historical significance, since no recent authentic field collections are known. [= Q, X; < *C. flava* Aiton – RAB, K, S; > *C. elliptica* Aiton]

***Crataegus incilis*** Beadle. Cp (FL, GA): mixed pine and hardwood forests, wooded hills, rocky woods; uncommon. Late March-April; August-September. Sw. GA and Panhandle FL, west to s. MS, north to ne. AL. *C. incilis* is usually a shrubby relative of *C. pulcherrima* with a strong suckering habit and slender shoots exhibiting thin, distinctly lacinate-lobed leaves. The 4 or 5 pairs of lobes per leaf, acute or cuneate leaf base and 5-8mm fruit are also characteristic. It has been collected most extensively in the vicinity of Little River Canyon, AL and sporadically elsewhere in the known range. [> *C. concinna* Beadle - Q]

***Crataegus integra*** Beadle. Cp (GA, SC): pine forests, sandy scrublands, xeric woodlands with deep sandy soils; uncommon. Late March-April; August-September. C. SC south to peninsular FL throughout the Lake Wales Ridge, west to sw & c. AL SC, n. GA, wc. AL. *C. integra* Beadle is only marginally distinct from the range of variation seen in *C. lassa* Beadle, the major distinction being in foliage; *C. integra* having a proportionally wider leaf shape, shorter petioles, and a tendency to have nearly entire leaf margins. There are, however, graduations of leaf morphology toward the synonymy included under *C. lassa* Beadle, so that an alternative taxonomic option might be to include *C. integra* within a broader view of *C. lassa*. It is pertinent to note that the inclusion of *C. integra* under the name of *C. flava* Aiton became affiliated as early as 1895 by Nash, as *C. flava* var. *integra* (Aiton) Nash. [= X; < *C. flava* Aiton – RAB; >> *C. flava* Aiton – K; > *C. dolosa* Beadle – Q; > *C. sodalis* Beadle – Q; > *C. constans* Beadle – Q; > *C. audens* Beadle - Q]

***Crataegus intricata*** Lange var. *boyntonii* (Beadle) Kruschke, Boynton Hawthorn. Mt, Pd (GA, NC, SC, VA): upland forest understories, pastures, rock outcrops, shrubby thickets; uncommon. W. VA south to c. GA, west to n. MS, n. to IL, KY, and WV. April-May; September-October. *C. boyntonii* differs from typical *C. intricata* by having an abundance of broadly ovate to deltoid leaves 5-8 cm long × 3-5 cm wide, and more robust thorns. [= Q, X; < *C. flabellata* – RAB; = *C. boyntonii* – F, G, orthographic variant; < *C. intricata* Lange; > *C. intricata* var. *boyntonii* (Beadle) Kruschke – C, K]

***Crataegus intricata*** Lange var. *intricata*, Entangled Hawthorn. Mt, Pd (GA, NC, SC, VA): pastures, wooded hills, rock outcrops, thickets; common. Late April-May; August-October. Widespread range from northern states s. to c. SC, c. GA, c. AL, n. MS, west to AR and OK. Broadly defined, a variable species incorporating many minor forms and potentially apomictic local clones. The basic defining characters are the presence of 10 stamens with pale anthers, hard greenish or ruddy-blushed fruits with an elevated calyx, and glabrous, slightly glandular foliage. Leaf shape is highly variable. Some variants commonly having yellow fruits are *C. fortunata* Sargent and *C. straminea* Beadle, conspicuous pubescence is seen in *C. biltmoreana* Beadle and *C. craytonii* Beadle, and shallowly lobed leaves often occur in *C. rubella* Beadle; these have been treated as varieties here (except for *C. craytonii*), but have been variously interpreted in other floras. Typically, *C. intricata* exhibits a shrubby habit, and may form colonies by root sprouts. It is most common in the Appalachian region. [= C, K, S, W, X; < *C. flabellata* – RAB; > *C. intricata* var. *intricata* – F, G; < *C. intricata* – Pa; > *C. foetida* Ashe]

***Crataegus intricata*** Lange var. *biltmoreana* (Beadle), Biltmore Hawthorn. Mt, Pd (GA, NC, SC, VA): wooded hills, rock outcrops, thickets; uncommon. Late April-May; September-October. VT south to c. GA, west to AR, MO. The leaf shape is variable, but the hairiness of its vegetative and floral parts, as well as the normally deeply glandular-serrate calyx lobes make this taxon fairly distinctive among the *Intricatae* series. [> *C. biltmoreana* Beadle – F, G, Q; > *C. confusa* Sargent – F; *C. villicarpa* Sargent – F]

***Crataegus iracunda*** Beadle, Red Hawthorn. Cp, Pd (GA, NC, SC, VA): swamps, bottomlands, moist slopes; wooded hills; uncommon (though locally abundant). April-May; September-October. Southern range limits appear to extend south to c. SC, GA, AL (and possibly MS). A difficult species to distinguish vegetatively, appearing most closely allied to *C. macrosperma* Ashe. The typically scabrous young leaves, 10 pink to purplish stamens, and firm-textured fruit with sessile calyx can vary among some local populations of *C. iracunda* to the extent that it may be confused with *C. schuettei*, *C. pruinosa*, or *C. boyntonii*. [= K, X; < *C. flabellata* (Bosc) K. Koch – RAB, C; > *C. iracunda* var. *iracunda* – F, G; > *C. iracunda* var. *silvicola* (Beadle) Palmer – F, G; > *C. iracunda* – Q; > *C. silvicola* Beadle – Q; > *C. dryophila* 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, Pa, 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, Pa, misapplied to material in our area; > *C. roanensis* Ashe – Q; < *C. macrosperma* – S]

***Crataegus margarettae*** Ashe. Mt (VA): mesic hardwood forests, streamside thickets, pastures; rare. April-May; September-October. WV {TN, w. VA} west to MO, IO, north to WI and MI. *C. margarettae* is related to the wide-ranging *C. chrysocarpa* Ashe, but is distinctive in its widely obovate to nearly orbicular leaves, rounded or obtuse lobes, cuneate base, and petioles often as long as the blade. [= *C. margarettae* – Q, S, X; > *C. margarettae* var. *margarettae* – F, G; > *C. margarettae* var. *brownii* (Britton) Sargent – F; > *C. margarettae* var. *brownei* – G (orthographic variant); < *C. chrysocarpa* Ashe – C, Pa; > *C. chrysocarpa* – K; = *C. margarettae* – 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. pulcherrima* Ashe, and perhaps only a variety of it, *C. mendosa* is distributed well northward and eastward beyond the bulk of the range of *C. pulcherrima*. Related *C. venusta* Beadle and *C. austrina* Beadle occur in central AL. [= K, N, Q, S, X]

***Crataegus mollis*** Scheele, Downy Hawthorn. Mt (VA), Pd (GA): mesic forests, alluvial forests, wooded uplands over basic or calcareous soils; rare in our area. Late March-April; September-October. The unusual occurrence of this species in the Mountains of VA is atypical of the majority of the range, which is north and west of VA and AL; ME to ND, s to s.TX, e. to nw. GA. *C. mollis* shows wide variability 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, Pa, S, X; > *C. mollis* var. *mollis* – F, G; > *C. mollis* – K, Q; > *C. cibaria* Beadle – Q; > *C. graviora* 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 synonymy 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, Pa, 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, Pa, S, W, X; < *C. flabellata* – RAB; > *C. pruinosa* var. *pruinosa* – F, G; > *C. pruinosa* var. *delawarensis* (Sargent) Palmer – F, G; > *C. rugosa* – F, G; > *C. pruinosa* – K; > *C. arcana* Beadle – K, Q; > *C. rustica* Beadle – Q; > *C. vicinalis* Beadle – Q; > *C. gattingeri* Ashe – F; > *C. gattingeri* var. *gattingeri* – G; > *C. gattingeri* var. *rigida* Palmer – G; > *C. georgiana* Sargent – Q]

***Crataegus pulcherrima*** Ashe, Beautiful Hawthorn. Cp (GA), Mt (GA): upland hardwood forests and hardwood-pine mixtures, ravines, mesic slopes, especially over iron-rich soils and rolling terrain with soils high in clay or loam content; uncommon (though locally abundant). Se. GA, c. Panhandle FL, west to LA (and perhaps e. TX), north to c. MS and n. AL. April; September-October. Defined broadly, *C. pulcherrima* includes many closely related species described by Beadle, most not

clearly distinct and here considered synonymous. Some may deserve varietal status following further study. Foliage of *C. pulcherrima* display a consistency of evenly-lobed leaves with straight, parallel primary veins and obscure secondary venation. The inflorescences are compound, with 20 stamens per flower; fruits are usually small (5-10 mm diameter), with dense flesh; bark of main trunk brown, furrowed. [= X; > *C. pulcherrima* – K, N, Q; > *C. macilenta* Beadle – Q; > *C. lenis* Beadle – Q; > *C. ancisa* Beadle – K, Q; > *C. opima* Beadle – N, Q; > *C. inanis* Beadle – K, Q; > *C. illustris* Beadle – Q; > *C. incilis* Beadle – N, Q; < *C. intricata* Lange – S]

***Crataegus punctata*** Jacquin, Dotted Hawthorn. Mt. (VA, NC): high elevation forests, balds, rock outcrops; uncommon (though locally abundant). The majority of range is north of our area, with southern limits along the higher Appalachian elevations of NC, TN, (perhaps n. GA), and west to KY, MO, and IL. May; September-October. *C. punctata* is considered here distinct from *C. collina*, which has a wider Southeastern range and habitat tolerance. *C. punctata*, often in company with *C. macrosperma*, comprises the majority of hawthorn forests, "orchards," and thickets seen in the high elevations of the North Carolina Blue Ridge, in openings and disturbed *Picea rubens* and *Abies fraseri* forests. [= K, Pa, 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. *pauisiaca* (W.W. Ashe) Palmer – F, G; ? *C. punctata* – S]

***Crataegus sargentii*** Beadle, Sargent's Hawthorn. Pd (GA): mesic upland forests over calcareous or circumneutral substrates; rare. W. GA, c. and n. AL (and perhaps se. TN). April; September. *C. sargentii* displays intermediate characteristics between the range of variation seen in *C. intricata* and that of *C. pulcherrima*. It is also on the northern range limits of the latter group. Although this might suggest hybrid origin, the genetics of *C. sargentii* has not been carefully investigated. Fruit production is usually scant in *C. sargentii*, and seed viability appears to be very low. [= K, X; > *C. sargentii* – N, Q; > *C. eximia* Beadle – N, Q; > *C. gilva* Beadle – N, Q; < *C. intricata* Lange – S]

***Crataegus schuettei*** W.W. Ashe, Schuette's Hawthorn. Mt (VA, NC): mesic hardwood forests; uncommon (though may be locally abundant). April-May; September-October. *C. schuettei* occupies a range predominately north of our area, in NH, NY, WI, n. IL, n. WV; known to extend s. to w. NC (and perhaps also to e. TN and n. GA), but the extent of distribution is poorly understood. Closely related to *C. macrosperma*. Foliage of juvenile shoots of *C. schuettei* in w. NC often are lacinate, with deep, acute sinuses nearly reaching the midrib. [= K, Pa, 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 spatulata*** Michaux, Littlehip Hawthorn. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, NC, SC): bottomland forests, extending upslope to drier sites especially on mafic or calcareous substrates; uncommon in NC, common southward. April-May; September-October. E. NC south to Panhandle FL, west to e. TX, north in the interior to w. NC, c. TN, s. MO, and e. OK (Phipps 1988). This species is distinctive for its small spatulate leaves (tending to be trilobed) and thin, flaking bark (multicolored green, brown, and brownish gray). [= RAB, C, F, G, K, Q, S, W, X, Y]

***Crataegus succulenta*** Schrader ex Link, Fleshy Hawthorn. Mt (NC, VA): high elevation rocky summits, mesic forests, high pastures, especially over basic soil or mafic substrates; rare. May; October. Widespread across the northern U.S. states, extending s. along the Appalachians to WV, w. VA, w. NC, and s. in the interior to MO. An attractive species, with bright red fruit, obovate to orbicular leaves with reticulate venation, widely spreading branches, and numerous long thorns (5-9 cm long). [= RAB, C, K, Pa, S, W, X; > *C. succulenta* var. *succulenta* – F, G; > *C. succulenta* var. *neofluvialis* (Ashe) Palmer – F, G; > *C. neofluvialis* Ashe – Q; > *C. vernans* Ashe]

***Crataegus triflora*** Chapman, Threeflower Hawthorn. Mt, Pd, Cp (GA): wooded ravines and slopes under mesic forests, limestone outcrops, flatwoods, prairies; rare. April-May; September-October. Nw. and wc. GA, west to AL, MS, LA; (possibly in TN?). Usually a multi-stemmed shrub 1-3 m tall, but occasionally to 6 m. *C. triflora* produces some of the largest flowers in the genus (to 3 cm diameter), though frequently only 3 flowers borne per inflorescence; occasional vigorous plants may bear 3-6 flowers per inflorescence. The orange-red, soft fruit is palatable and may reach 22 mm diameter. [= K, W, X; > *C. triflora* – Q, U; > *C. austrorontana* Beadle – Q, U]

***Crataegus uniflora*** Muenchhausen, Oneflower Hawthorn. Mt, Pd, Cp (GA, NC, SC, VA): upland forests, disturbed lands, roadsides, rock outcrops, often in xeric or sub-xeric conditions; common. April-May; September-October. PA and NJ south to n. FL, w. to e. TX, OK, and MO. Normally a shrubby species, 0.5-2 m in height, though local forms may reach 4 m, particularly in n. FL. Among minor variations in foliage, consistent are the slender thorns (2-7 cm long) and foliaceous calyx lobes persistent on the fruit. [= RAB, C, F, G, K, Pa, 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. valsa* Beadle – K, Q; > *C. penita* Beadle – K, Q]

***Crataegus visenda*** Beadle. Pd, Cp (GA, NC, SC): upland pine and pine-oak forests, disturbed lands, wooded hills with clay or sandy soils, often in xeric or sub-xeric conditions; uncommon. April; late August-September. Central & upper Coastal Plain of NC south to n. FL, west to s. & e. MS, n. AL, and nw. GA. *C. visenda* is related closely to *C. aprica* Beadle, but the foliage tends to have a higher percentage of nearly orbicular blades and branches are more recurved or drooping. Often attaining

the dimensions of a small tree (4-8 m tall and with a trunk 7-20 cm diameter). [= X; < *C. flava* Aiton – RAB, S; >> *C. flava* – K; > *C. visenda* – Q; > *C. tristis* Beadle – K, Q; > *C. segnis* Beadle – Q; > *C. arrogans* Beadle – K, Q; > *C. sodalis* Beadle – Q]

*Crataegus ashei* Beadle, Ashe Hawthorn. Cp (AL): prairies, hardwood forests, pine-hardwood flats, especially over calcareous clay soils; rare. C. and s. AL west to c. and s. MS and e. LA (s. TN?). April; September. Related to *C. triflora* Chapman and *C. harbisonii* Beadle. [= Q, U, X; < *C. harbisonii* Beadle – K]

*Crataegus austrina* Beadle. C. AL. [= Q, X; =? *C. tecta* Beadle – N]

*Crataegus dilatata* Sargent, Broadleaf Hawthorn. Reported from a single county in WV, otherwise bulk of range is in PA & areas northward. May; October. Related to *C. coccinioides*, which is occasionally cultivated but restricted in natural range to the lower Midwest. [= C, Pa, X]

*Crataegus harbisonii* Beadle, Harbison Hawthorn. Rare, endemic to c. and w. TN and currently known only from Davidson Co, TN: hardwood forests understories, over limestone; very rare. Late April-May; Sept.-Oct. Related species *C. ashei* Beadle has a more southern distribution in AL, MS, and LA. *C. harbisonii* appears to be extirpated from nearly all of its former range, even though once described as common in the Nashville area. [= Q, S, U, X; < *C. harbisonii* Beadle – K]

*Crataegus lacrimata* Small, Weeping Hawthorn. Xeric, sandy soils, in scrublands and in association with sparse stands of *Pinus clausa* or *Pinus palustris*. Endemic to the western FL Panhandle; perhaps in adjacent sandhill scrub of AL. Late March-April; August-September. The combination of conspicuously slender weeping branches, small spatulate leaves, glabrous character, and treelike habit in *C. lacrimata* is unique among a large group of related hawthorns which occupy sandy habitats in the Coastal Plain. [= Q, X]

\* *Crataegus monogyna* Jacquin, English Hawthorn. Reported for VA in W. [= C, F, G, K, Pa] {not yet keyed}

*Crataegus opaca* Hooker & Arnott, Western Mayhaw. Cp (FL): swamp forests, and cultivated as single trees or in plantations for the fruit. February-March; April-May. FL (Escambia and Santa Rosa counties) (Kunzer et al. 2009) west to e. TX. [= K, X]

*Crataegus pinetorum* Beadle. In AL and TN. [= K, N, Q, X]

*Crataegus rufula* Sargent, Florida Mayhaw. Cp (GA): flatwoods ponds, river swamps; uncommon. [= K, Z; > *C. maloides* Sargent – S] {not yet keyed; synonymy incomplete}

*Crataegus venusta* Beadle. C. AL. [= N, Q, X; < *C. sargentii* Beadle – K]



**29. *Pyracantha* M.J. Roemer 1847 (Firethorn, *Pyracantha*)**

A genus of about 10 species, shrubs, of s. Europe east to e. Asia. References: Lance in FNA (in press); Nesom (2010)=Y; Robertson (1974)=Z; Kalkman in Kubitzki (2004). Key based on FNA.

- 1 Leaf blades ovate to lanceolate or oblanceolate, margins finely crenulate-serrulate, apices acute; young twigs grayish pubescent....*P. coccinea*
- 1 Leaf blades obovate, oblong-obovate, oblong, or elliptic, margins remotely serrulate-crenulate or entire, apices obtuse, notched, or apiculate; young twigs brownish or rusty pubescent.
- 2 Pedicels and hypanthia glabrate at flowering .....*P. fortuneana*
- 2 Pedicels and hypanthia pubescent.
- 3 Leaf apices obtuse, apiculate, or aristate.....*P. atalantioides*
- 3 Leaf apices notched or truncate.....*P. koidzumii*

\* *Pyracantha atalantioides* (Hance) Stapf. {AL, GA}; rarely escaped or persistent, native of China. [= Y]

\* *Pyracantha coccinea* M.J. Roemer, Scarlet Firethorn. Cp (AL, GA, LA, MS, NC, SC, VA), Mt (WV): planted, persistent around old homesites, and rarely escaped to woodlands; rare, native of se. Europe and Asia Minor. Reported for AL, LA, OK, SC, TN, and TX (Nesom 2010a). [= K, Y, Z; = *Cotoneaster pyracantha* (Linnaeus) Spach – F, S; = *Crataegus pyracantha* Linnaeus]

\* *Pyracantha fortuneana* (Maximowicz) H.L. Li, Chinese Firethorn. Cp (AL, FL), Pd (AL), Mt (SC), {GA, NC}: planted, rarely escaped or persistent, native of China. May-July; October-December. Reported for AL, SC, and TX (Nesom (2010a). [= K, WH, Y; > *P. crenatiserrata* (Hance) Rehder]

\* *Pyracantha koidzumii* (Hayata) Rehder, Formosan Firethorn. Cp (AL, FL), Pd (AL, GA, NC, SC), Mt (AL): planted, rarely escaped to woodlands, uncommon (rare in GA, NC, and SC), native of Taiwan. Reported for AL, AR, FL, GA, LA, MS, OK, SC, TX (Nesom 2010a). [= K, WH, Y, Z]

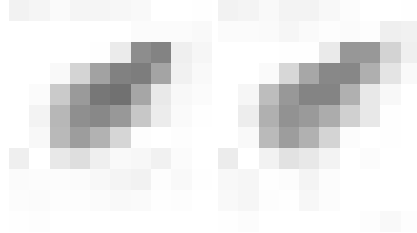
**30. *Sorbus* Linnaeus 1753 (Mountain-ash, Rowan)**

A genus of about 150-250 species, trees and shrubs, of mainly temperate Northern Hemisphere. References: McAllister (2005)=Y; Jones (1939)=Z; Aldasoro et al. (2004); Kalkman in Kubitzki (2004). [also see *Aronia*]

- 1 Branches and lower leaf surfaces glabrous (or inconspicuously and sparsely pubescent); winter buds glutinous; [native tree].....*S. americana*
- 1 Branches and lower leaf surfaces densely white-villous; winter buds white-villous; [introduced tree].....*S. aucuparia ssp. aucuparia*

***Sorbus americana*** Marshall, Mountain-ash, American Rowan. High elevation forests, balds, and high elevation rock outcrops, often with *Picea*, *Abies*, and/or *Betula alleghaniensis*. June-July; September-October (persisting well into winter). NL (Newfoundland) west to MN, south to PA, w. NC, e. TN, ne. GA, and n. IL. This small-to-medium tree is showy in most seasons; in the summer its creamy-white corymbs are attractive, the leaves turn a bright orange-red in fall, and the red berries persist well into winter. [= RAB, C, G, K, Pa, S, W, Y, Z; = *Pyrus americana* (Marshall) A.P. de Candolle – F, WV]

\* ***Sorbus aucuparia*** Linnaeus *spp. aucuparia*, Rowan, European Mountain-ash. Disturbed areas, rarely cultivated; native of n. Europe. May; September. A planted tree and escape (sometimes appearing naturalized), south to s. PA (Rhoads & Klein 1993), MD, DE, WV (Kartesz 1999), and DC (Jones 1939). Also reported for SC by Kartesz (1999), supposedly based on Jones (1939), but Jones (1939) does not mention SC in his account of *S. aucuparia*. [= Y; < *S. aucuparia* – C, G, K, Pa, Z; < *Pyrus aucuparia* (Linnaeus) Gaertner – F, WV]



**31. *Pyrus* Linnaeus 1753 (Pear)**

A genus of 10-20 species, trees and shrubs, of Eurasia and n. Africa. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004). [also see *Aronia*, *Malus*, and *Sorbus*]

- 1 Fruit pyriform (pear-shaped!); 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. Commonly planted and persistent, becoming an aggressive naturalizer in fields, roadsides, and disturbed areas from NC northward; common (uncommon in GA, SC, and WV, rare in FL), native of China. March-April. This species has become an aggressive naturalizer in much of our area (see Nesom 2000c, Vincent 2005, Culley & Hardiman 2007). [= K, Pa, WH]

\* ***Pyrus communis*** Linnaeus, Common Pear. Planted, persistent around old houses and in orchards; uncommon (rare in FL), native of Europe. April; August-October. [= RAB, C, F, G, K, Pa, S, WH, WV, Z]

\* ***Pyrus pyrifolia*** (Burmans f.) Nakai, Oriental Pear, Japanese Pear, Chinese Pear. Planted, persistent around old houses and in orchards; uncommon, native of Asia. April; August-October. [= F, K, Z]



**32. *Rhaphiolepis* Lindley 1820 (Asian-hawthorn)**

A genus of about 5-15 species, shrubs, of e. Asia. References: Kalkman in Kubitzki (2004).

\* ***Rhaphiolepis umbellata*** (Thunberg) Makino, Japanese-hawthorn, Yedda-hawthorn. Widely planted, not yet demonstrated to naturalize, but seems very likely to.

**33 *Eriobotrya* Lindley 1821 (Loquat)**

A genus of about 15-30 species, trees and shrubs, native to e. Asia. References: Phipps in FNA (in press); Kalkman in Kubitzki (2004).

\* ***Eriobotrya japonica*** (Thunberg) Lindley, Loquat, Japanese-medlar. Suburban woodlands, uncommonly cultivated, rarely naturalized; native of ec. China. Reported for Lowndes County, GA (Carter, Baker, & Morris 2009). Also reported for LA. [= FNA, K, WH]

**34. *Pseudocydonia* C.K. Schneider 1906 (Chinese Quince)**

A monotypic genus, a shrub or small tree, of e. Asia. References: Kalkman in Kubitzki (2004).

\* *Pseudocydonia sinensis* (Thouin) C.K. Schneider, Chinese-quince. Suburban woodlands; native of China. Reported for suburban woodlands near Tallahassee (Leon Co., FL) by Clewell & Tobe (2011). [= K2]

**35. *Chaenomeles* Lindley 1821 (Flowering Quince)**

A genus of 3-4 species, shrubs, of montane, temperate e. Asia. References: Catling & Mitrow in FNA (in press); Kalkman in Kubitzki (2004).

- 1 Branches scabrous, becoming warty in age; leaf margins crenate; fruit 2.3-4 cm in diameter .....*C. japonica*
- 1 Branches smooth, not becoming warty in age; leaf margins serrate; fruit 4-6 cm in diameter .....*C. speciosa*

\* *Chaenomeles japonica* (Thunberg) Lindley ex Spach, Japanese Flowering Quince. Rarely persisting or spreading from horticultural plantings; native of Japan. April-May; August-October. [= FNA, K2]

\* *Chaenomeles speciosa* (Sweet) Nakai, Common Flowering Quince. Frequently persisting and rarely spreading from horticultural plantings to suburban woodlands; native of China. January-April. [= C, FNA, K1, K2, Pa]

**36. *Photinia* Lindley 1821 (Photinia, Redtip)**

A genus of about 40 species, trees and shrubs, of Asia and Central America. References: Nesom in FNA (in press); Kalkman in Kubitzki (2004). [also see *Aronia* and *Pourthiaea*]

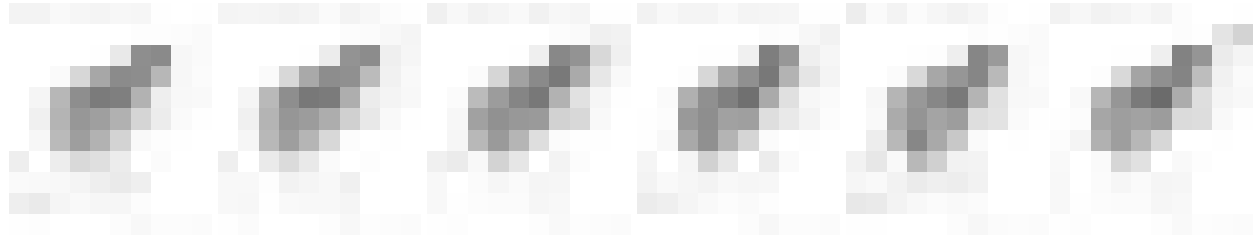
- 1 Leaves evergreen, coriaceous, (6-) 9-20 cm; inflorescences 4-18 cm wide; pedicels without lenticels .....*P. serratifolia*
- 1 Leaves deciduous, herbaceous, 4-9 cm long; inflorescences 3-6 cm wide, pedicels with warty lenticels .....[see *Pourthiaea*]

\* *Photinia serratifolia* (Desfontaines) Kalkman, Taiwanese Redtip. Suburban woodlands; uncommonly cultivated and rarely naturalizing; native of e. Asia. Also reported from MS and LA as long-persistent and weakly naturalizing. [= FNA, K]

**37. *Pourthiaea* Decaisne 1874 (Photinia)**

A genus of about 25 species, shrubs, of e. Asia. Guo et al. (2011) indicate that *Pourthiaea* should be separated from both *Photinia* and *Aronia*. References: Guo et al. (2011); Kalkman in Kubitzki (2004).

\* *Pourthiaea villosa* (Thunberg) Decaisne, Oriental Photinia. Uncommonly cultivated, sometimes escaping to suburban woodlands; native of e. Asia. May-June. [= Z; = *Photinia villosa* (Thunberg) A.P. de Candolle – FNA, K, Pa]



**38. *Aronia* Medikus 1789 (Chokeberry)**

A genus of 3 species, of e. North America (south into Central America). In North American floristic literature, *Aronia* has sometimes been treated as a component of *Sorbus* or *Pyrus* (see synonymy below). Robertson et al. (1991) have included *Aronia* in *Photinia*. Kalkman in Kubitzki (2004) agrees that *Aronia* and *Photinia* should be combined, but points out that *Aronia* is the older name and therefore must be used for the combined genus. Guo et al. (2011) separate *Photinia*, *Aronia*, and *Pourthiaea*. References: Guo et al. (2011)=V; Pankhurst in FNA (in press); Hardin (1973)=Y; Robertson (1974)=Z; Robertson et al. 1991=X; Kalkman in Kubitzki (2004).

**Identification notes:** All our species of *Aronia* can be distinguished from other shrubs in our flora by the presence of several dark (usually purplish-black) glandular 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. Bogs, pocosins, wet savannas, swamps, other wet habitats. March-May; September-November. NL (Newfoundland) south to c. peninsular FL and west to TX, mainly in the Coastal Plain, but extending inland in the south to WV and KY. [= C, FNA, G, GW, S, V, W; = *Sorbus arbutifolia* (Linnaeus) Heynhold var. *arbutifolia* – RAB; = *Pyrus arbutifolia* (Linnaeus) Linnaeus f. – F, Z; = *Photinia pyrifolia* (Lamarck) K. Robertson & J.B. Phipps – K, Pa, WH, WV, X]

***Aronia melanocarpa*** (Michaux) Elliott, Black Chokeberry. Balds, forests, and openings and exposed rock outcrops at high elevations, bogs in the Mountains. May-June; August-September. NL west to ON and MN, extending south to n. GA, n. AL, MS, and MO. [= C, FNA, G, GW, S, V; = *Sorbus melanocarpa* (Michaux) Heynhold – RAB; = *Pyrus melanocarpa* (Michaux) Willdenow – F, WV, Z; < *A. melanocarpa* – W (also see *A. prunifolia*); = *Photinia melanocarpa* (Michaux) J.B. Phipps – K, Pa, X]

***Aronia prunifolia*** (Marshall) Rehder, Purple Chokeberry. Balds, bogs, seepages, swamp forests. April-May; September-October. NL and ON south to NC, KY, IN, and IL. While apparently originating as a hybrid between our other two species, *A. prunifolia* exists in populations independent of the two parent species, apparently reproducing successfully. It seems best to treat a now independent lineage such as this as a separate taxon. [= C, G, GW, V; = *Sorbus arbutifolia* var. *atropurpurea* (Britton) Schneider – RAB; = *Aronia* × *floribunda* (Marshall) Rehder – FNA; = *Pyrus floribunda* Lindley – F, WV, Z; = *Aronia atropurpurea* Britton – S; < *A. melanocarpa* – W; = *Photinia floribunda* (Lindley) J.B. Phipps – K, X]

**39. *Cydonia*** P. Miller 1754 (Quince)

A monotypic genus, a shrub, probably native of the Caucasus. References: Catling & Mitrow in FNA (in press); Kalkman in Kubitzki (2004)=Z.

\* ***Cydonia oblonga*** P. Miller, Edible Quince, Common Quince, “Fruiting” Quince. Suburban woodlands; native of Europe. May-June. Reported for MD (FNA, Kartesz 1999). Widely cultivated in Europe and formerly in e. North America; in our area it has fallen out of favor, and is now rarely cultivated. [= FNA, K, Pa, Z; = *Pyrus cydonia* Linnaeus]



**40. *Malus*** P. Miller 1754 (Apple, Crabapple)

A genus of 30-50 species, trees and shrubs, north temperate. References: Robertson (1974)=Z; Kalkman in Kubitzki (2004).

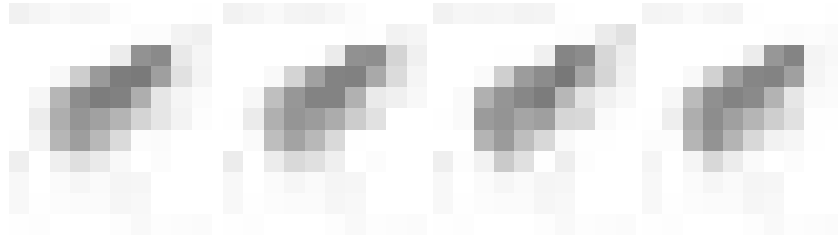
- 1 Twigs thorny; leaves folded (conduplicate) in bud; leaves often lobed; [native, sometimes weedy]; [subgenus *Chloromeles*].
  - 2 Leaves permanently pubescent beneath; pedicels and hypanthium pubescent; [western, disjunct east to KY and MS] ..... *M. ioensis*
  - 2 Leaves glabrous or nearly so; pedicels and hypanthium glabrous or with scattered long hairs; [widespread in our area].
    - 3 Leaves elliptic to elliptic-lanceolate, 2.5-8 cm long, 1-4 cm wide, mostly > 2× as long as wide, subacute to obtuse at the tip..... *M. angustifolia*
    - 3 Leaves ovate to ovate lanceolate, 4-10 cm long, 2-7 cm wide, mostly < 2× as long as wide, acute to acuminate at the tip ..... *M. coronaria*
- 1 Twigs not thorny; leaves involute or convolute in bud; leaves unlobed; [cultivated and persistent or escaping]; [subgenus *Malus*].
  - 4 Leaves densely pubescent in bud, permanently pubescent beneath; fruits large, > 5 cm in diameter (“apples”)..... *M. pumila*
  - 4 Leaves glabrous or nearly so; fruits small, < 3 cm in diameter (“crabapples”).
    - 5 Twigs glabrous; calyx deciduous; fruit ca. 1 cm in diameter ..... *M. baccata*
    - 5 Twigs pubescent; calyx persistent; fruit ca. 2 cm in diameter..... *M. prunifolia*

***Malus angustifolia*** (Aiton) Michaux, Wild Crabapple. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): forests, woodlands, fence-rows, dry hammocks; common (uncommon in Piedmont and Mountains, uncommon in FL, rare in WV). April-May; August-September. NJ, PA, OH, s. IL, and se. MO, south to n. peninsular FL, Panhandle FL and e. TX. [= RAB, S, W, WH; = *Pyrus angustifolia* Aiton – C, G, WV, Z; > *Pyrus angustifolia* var. *angustifolia* – F; > *Pyrus angustifolia* var. *spinosa* (Rehder) L.H. Bailey – F; > *M. angustifolia* var. *angustifolia* – K; > *M. angustifolia* var. *puberula* Rehder – K]

\* ***Malus baccata*** (Linnaeus) Borkhausen, Siberian Crabapple. Suburban woodlands; native of e. Asia. [= Pa; = *Pyrus baccata* Linnaeus – C]

***Malus coronaria*** (Linnaeus) P. Miller, Wild Crabapple. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC): forests, woodlands, fencerows; common. May; September-October. NY, ON and WI south to GA, AL, and AR. [= RAB, K, Pa, W; = *Pyrus coronaria* Linnaeus – C, Z; > *Pyrus coronaria* Linnaeus var. *coronaria* – F, WV; > *Pyrus coronaria* Linnaeus var. *elongata* Rehder – F; > *Pyrus coronaria* Linnaeus var. *dasycalyx* (Rehder) Fernald – F; > *Pyrus coronaria* Linnaeus var. *lancifolia* (Rehder) Fernald – F, WV; = *Pyrus lancifolia* L.H. Bailey – G; > *Malus bracteata* L.H. Bailey – S; > *Malus coronaria* (Linnaeus) P. Miller – S; > *Malus lancifolia* Rehder – S; > *Malus coronaria* (Linnaeus) P. Miller var. *dasycalyx* Rehder]

- \* *Malus floribunda* Siebold ex Van Houtte, Japanese Flowering Crabapple. Disturbed areas, suburban woodlands; rare, native of Japan. [= K, Pa] {not yet keyed}
- \* *Malus ioensis* (Wood) Britton var. *ioensis*, Prairie Crabapple. Mt (WV): forests, woodlands, fence-rows; rare. MI, MN, e. SD, and w. NE, south to w. WV, KY, s. MS, se. LA, and c. TX. [= K; < *Pyrus ioensis* (Wood) L.H. Bailey – C, F, G; < *M. ioensis* – WV]
- \* *Malus prunifolia* (Willdenow) Burkhardt, Chinese Crabapple. Disturbed areas, suburban woodlands; native of e. Asia. [= K, Pa; = *Pyrus prunifolia* Willdenow – C]
- \* *Malus pumila* P. Miller, Common Apple. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, NC, SC, VA): commonly cultivated throughout, especially in the Mountains and Piedmont, and long persistent; uncommon, native of Asia. April-May; July-October. [= RAB, K, Pa, W; = *Pyrus malus* Linnaeus – C, F, G, WV, Z; = *Malus malus* (Linnaeus) Britton – S; = *Malus domestica* Burkhardt]
- \* *Malus toringo* (Siebold) Siebold ex de Vriese, Toringo Crabapple. Reported, as *M. sieboldii*, for Fairfax County, VA (Steury 2011). [< *M. sieboldii* (Regel) Rehder – K2] {not yet keyed}



150. ELAEAGNACEAE A.L. de Jussieu 1789 (Oleaster Family) [in ROSALES]

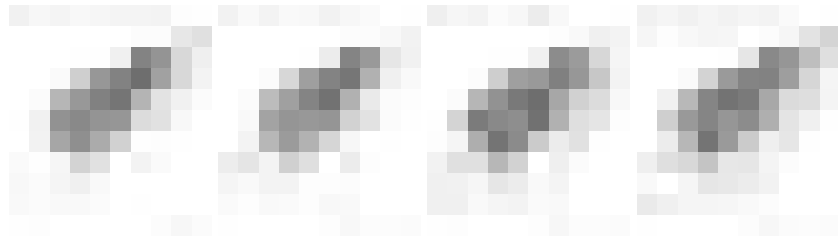
A family of 3 genera and 30-50 species, shrubs, small trees, and lianas, of temperate Eurasia and North America, and tropical Asia and Australia. References: Bartish & Swenson in Kubitzki (2004).

*Elaeagnus* Linnaeus 1753 (Silverberry, Oleaster, Russian-olive)

A genus of 20-45 species, shrubs and small trees, of Asia (mostly) and North America. References: Bartish & Swenson in Kubitzki (2004).

- 1 Flowering in the fall (October-November) and fruiting in the spring (March-April); leaves evergreen; branches usually spiny .....*E. pungens*
- 1 Flowering in the spring and fruiting in the fall; leaves deciduous (somewhat coriaceous in texture and semi-persistent); branches spiny or not.
- 2 Fruit yellow, lepidote with silver scales; leaves with silver scales beneath .....*E. angustifolia*
- 2 Fruit reddish-brown or pinkish, lepidote with silver and brown scales; leaves with a mixture of silver and bronze scales beneath.
- 3 Fruit 10-15 mm long, bright red; fruiting pedicel 15-25 mm long; hypanthium tube about as long as the separate calyx lobes .....*E. multiflora*
- 3 Fruit 6-8 mm long, silvery red; fruiting pedicel 8-12 mm long; hypanthium tube about 2× as long as the separate calyx lobes .....*E. umbellata* var. *parvifolia*

- \* *Elaeagnus angustifolia* Linnaeus, Russian Olive, Oleaster. Disturbed areas; native of Eurasia. May-July; September. [= C, F, G, K, Pa]
- \* *Elaeagnus multiflora* Thunberg, Cherry Elaeagnus, Cherry Silverberry. Disturbed areas; native of Japan and China. April. First reported for NC by Leonard (1971b). [= C, F, G, K; = *E. multiflorus* – S, orthographic variant]
- \* *Elaeagnus pungens* Thunberg, Thorny-olive, Autumn Silverberry. Forests and woodlands in suburban areas, spread by birds; native of Japan. October-November; March-April. [= RAB, K]
- \* *Elaeagnus umbellata* Thunberg var. *parvifolia* (Royle) Schneider, Autumn-olive, Spring Silverberry. Forests and woodlands, spread by birds; native of Japan and China. April-May; August-September. This species has rapidly become a noxious weed shrub, still unfortunately sometimes promoted for "wildlife plantings." The rapidity of its increase may be judged by its treatment in Strausbaugh & Core (1978) as not definitely naturalized in WV; Harmon, Ford-Werntz, & Grafton (2006) map it for every county of WV. [= K; < *E. umbellata* – RAB, C, F, G, Pa, W, WV; < *E. umbellatus* – S, orthographic variant]



HALORAGACEAE

151. RHAMNACEAE A.L. de Jussieu 1789 (Buckthorn Family) [in ROSALES]

A family of about 50-52 genera and 900-925 species, mostly trees, shrubs, and lianas, cosmopolitan in distribution. References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Richardson et al. (2000a, 2000b); Medan & Schirarend in Kubitzki (2004).

- 1 Plant a woody vine.
2 Leaf margins entire; tendrils absent; [widespread in our area]; [tribe Rhamneae].....Berchemia
2 Leaf margins serrate to crenate; tendrils present; [of ne. FL southward]; [tribe Gouanieae].....Gouania
1 Plant a shrub or small tree.
3 Leaves with 3 prominent veins from near the base.
4 Plants not spiny; fruit dry, capsular; [native]; [tribal placement uncertain].....Ceanothus
4 Plants armed with stipular spines; fruit pulpy; [alien, cultivated and escaped]; [tribe Paliureae].....Ziziphus
3 Leaves with prominently pinnate venation, the lowermost lateral veins no more prominent than others.
5 Leaves opposite, 2-4 cm long; [of shell middens and shell hammocks in the outer Coastal Plain of NC and SC]; [tribe Rhamneae].....Sageretia
5 Leaves alternate (or opposite in some Frangula and Rhamnus), 3-15 cm long; [of various habitats in the Piedmont and Mountains (rarely Coastal Plain) of VA, NC, and SC].
6 Inflorescence repeatedly branched dichotomously; peduncles fleshy and reddish in fruit; nectariferous disc pubescent; [tribe Paliureae].....Hovenia
6 Inflorescence not repeatedly branched dichotomously; peduncles not fleshy; nectariferous disc glabrous; [tribe Rhamneae].
7 Winter buds naked, pubescent; flowers perfect, sepals, stamens, and petals 5; style undivided; leaves with 8-10 lateral veins on either side of the midvein.....Frangula
7 Winter buds with bud scales; flowers functionally unisexual, sepals and stamens 4 or 5 (the stamens rudimentary in the pistillate flowers), petals 0 or 4 (never 5); style divided 1/3 to 2/3 its length into 2, 4 or 5 segments; leaves with (2-) 3-9 lateral veins on either side of the midvein.....Rhamnus

Berchemia Necker 1825 (Supplejack)

A genus of about 12 species, vines, of tropical to warm temperate Asia, Africa and se. North America. B. scandens is the only New World species. References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

Identification notes: The young stems are shining and reddish; older stems can reach 10 cm in diameter, with bark medium gray and smooth (though often marred by sap wells drilled by Yellow-bellied Sapsuckers). The smooth bark and neatly pinnately-veined leaves are distinctive.

Berchemia scandens (Hill) K. Koch, Supplejack, American Rattan. Cp (FL, GA, NC, SC, VA), Pd (GA, NC), Mt (GA): swamp forests, bottomlands, streambanks, in mesic to even xeric uplands over calcareous rock or sediment; common (rare in Piedmont). April-May; August-October. Se. VA south to s. FL, west to TX, north in the interior to nc. TN, w. TN, s. IL, and s. MO. Berchemia climbs high into the crowns of swamp trees. [= C, F, FNA, G, GW, K, RAB, S, WH, Z]

Ceanothus Linnaeus 1753 (Redroot, New Jersey Tea)

A genus of ca. 55 species, shrubs, mostly in California. References: Nesom in FNA (in prep.); Fross & Wilken (2006)=X; Coile (1988)=Y; Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

- 1 Leaves 0.2-1.0 cm long, obovate .....C. microphyllus
1 Leaves 2-10 cm long, elliptic to ovate.
2 Inflorescences terminating leafy terminal shoots; leaves mostly obtuse to acute.....C. herbaceus
2 Inflorescences terminating leafless axillary shoots (these sometimes with leafy bracts distinctly smaller than normal leaves); leaves mostly acute to acuminate.
3 Leaves (3-) 4-10 cm long, mostly 2.5-6 cm wide; [of various habitats of the Piedmont, Mountains, and rarely Coastal Plain].....C. americanus var. americanus
3 Leaves 2-4 (-6) cm long, mostly 1-2 cm wide; [primarily of sandy habitats of the Coastal Plain and rarely Piedmont] .....C. americanus var. intermedius

Ceanothus americanus Linnaeus var. americanus, Common New Jersey Tea. Woodland borders, dry woodlands, glady openings, dry ridge forests and woodlands (pine or oak) in the Mountains. May-June; June-July. ME west to s. MB, south to FL Panhandle and TX. [= C, F, G, X, Y, Z; < C. americanus - FNA, K, Pa, RAB, W, WH; = C. americanus - S]

Ceanothus americanus Linnaeus var. intermedius (Pursh) Torrey & A. Gray, Southern New Jersey Tea. Sandhills, dry sandy woodlands and forests, rocky openings around granitic or quartzitic rocks in the Piedmont. May-June; June-July. NJ (or possibly MA) south to c. peninsular FL, west to LA, mostly on the Coastal Plain, but disjunct inland to sandy soils around outcrops of siliceous rocks. The recognition of infraspecific taxa in the variable C. americanus is uncertain; var. intermedius may either represent ecological forms, or the variation may be too clinal to make taxonomic recognition rewarding. However, material from our area (and beyond) sorts relatively easily, with some intermediates from the Piedmont; varietal status seems provisionally appropriate. [= C, F, G, X, Y, Z; < C. americanus - FNA, K, RAB, W, WH; = C. intermedius Pursh - S]

Ceanothus herbaceus Rafinesque, Prairie Redroot. Flood-scoured rocky riverbanks. April-May. Primarily midwestern: MI west to MT, south to nw. IN, AR, TX, and Mexico; disjunct eastward in QC, NH, VT, NY, DC, and n. VA (? - Arlington County). Rafinesque described C. herbaceus from "near the falls of the Potowmack, between the rocks." The holotype not extant, Coile (1988) chose a neotype, collected by Sheldon in 1881 from "Arlington County, Virginia, Chain Bridge, rocky river

bottoms, Potomac River." However, Bartgis, Fleming, & Wiegand (1997) indicate that *C. herbaceus* in the Washington, D.C. area can only be ascribed with certainty to DC. [= FNA, K, X, Y, Z; = *C. ovatus* Desfontaines – F, S, misapplied; = *C. pubescens* (Torrey & A. Gray ex S. Watson) Rydberg ex Small – S]

***Ceanothus microphyllus*** Michaux. Sandhills. E. GA south to c. peninsular FL, west to s. AL, approaching to within a few kilometers of SC (in Screven and Chatham counties, GA), and should be sought in se. SC (except that its outlandish appearance makes it difficult to overlook!). *C. ×serpyllifolius* Nuttall (pro sp.) is apparently a hybrid of *C. americanus* var. *intermedius* and *C. microphyllus* (Coile 1988); it is known from scattered sites in FL and GA. [= FNA, K, S, X, Y, Z]



***Frangula*** P. Miller 1754 (Buckthorn)

A genus of ca. 50 species, shrubs and small trees, of the northern hemisphere. The distinctions between *Frangula* and *Rhamnus* are many and meaningful; their separation at the generic level seems warranted based on morphological and molecular analyses (Richardson et al. 2000a; Bolmgren & Oxelman 2004). References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

- 1 Leaves entire; leaves ca. 2× as long as wide ..... ***F. alnus***  
 1 Leaves serrulate; leaves ca. 3× as long as wide ..... ***F. caroliniana***

\* ***Frangula alnus*** P. Miller, European Alder-Buckthorn, Glossy Buckthorn. Forested areas, other disturbed areas; native of Europe. May-June. This species is a seriously invasive weed in ne. United States, south to (at least) NJ, s. PA (Rhoads & Klein 1993; Rhoads & Block 2007), KY, and se. TN (Marion County) (Chester, Wofford, & Kral 1997, Kral 1981), and w. NC (where recently found in a forested area along the Blue Ridge Parkway). [= FNA, K; = *Rhamnus frangula* Linnaeus – C, F, G, Pa]

***Frangula caroliniana*** (Walter) A. Gray, Carolina Buckthorn. Dry to moist barrens, woodlands, and forests, Coastal Plain limestone bluffs and shell middens, especially over mafic or calcareous rocks. May-June. Sw. VA west to s. OH and s. MO, south to c. peninsular FL and TX. [= K; = *Rhamnus caroliniana* Walter – FNA, RAB, S, W, WH; > *Rhamnus caroliniana* Walter var. *caroliniana* – C, F, G, Z]

***Gouania*** Jacquin 1763 (Chewstick)

A genus of ca. 50 species, shrubs, of tropical America. References: Nesom in FNA (in prep.).

***Gouania lupuloides*** (Linnaeus) Urban, Whiteroot, Chewstick. Hammocks. August-March. [= FNA, WH] {add to synonymy}

***Hovenia*** Thunberg 1781 (Raisin-tree)

A genus of 7 species, trees, of e. Asia. References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

\* ***Hovenia dulcis*** Thunberg, Japanese Raisin-tree. Suburban woodlands, escaped from cultivation; native of China. Goldman (1998) presents a discussion of this species' introduction into North America, with a color photograph. Also reported as naturalizing in the Coastal Plain portion of Fairfax County, VA (Steury 2011). [= FNA, K, RAB, Z]

***Rhamnus*** Linnaeus 1753 (Buckthorn)

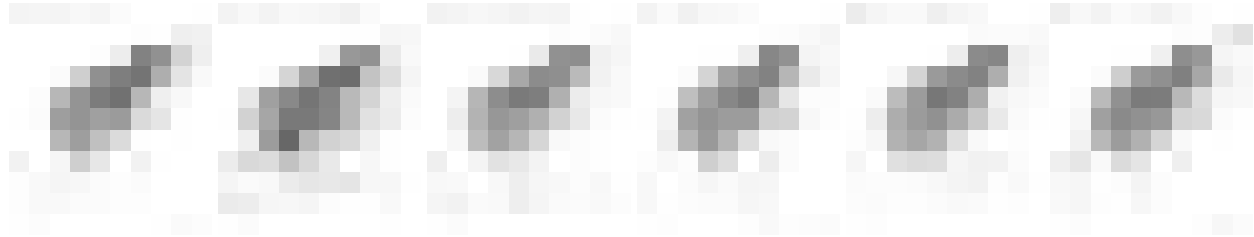
A genus of ca. 150 species, trees and shrubs, of the northern hemisphere. The recognition of *Frangula* as separate from *Rhamnus* is supported by molecular phylogeny (Bolmgren & Oxelman 2004). References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Bolmgren & Oxelman (2004); Medan & Schirarend in Kubitzki (2004). [also see *Frangula*]

- 1 Leaves mostly opposite or subopposite (or some alternate), mostly with (2-) 3-6 lateral veins on either side of the midrib; plant a large shrub or small tree, to 10 m tall; fruit with 4 stones; [aliens, mostly of moist (but not boggy) soils].  
 2 Leaves mostly 1-2× as long as wide, with (2-) 3 (-4) lateral veins on either side of the midrib; style divided ½ its length into 4 segments.....  
 2 Leaves mostly 2-3× as long as wide, with 4-6 lateral veins on either side of the midrib; style divided ⅔ its length into 2 segments..... ***R. cathartica***

- ..... *R. davurica*
- 1 Leaves alternate, mostly with (4-) 6-9 lateral veins on either side of the midrib; plant a shrub to 2 m tall; fruit with 2-3 stones; [natives of various, calcareous habitats].
- 3 Sepals and stamens 5; petals 0; fruit with 3 stones; [of mafic or calcareous peaty wetlands and seeps]..... *R. alnifolia*
- 3 Sepals and stamens 4; petals 4; fruit with 2 stones; [of dry to moist calcareous woodlands and thickets].
- 4 Young leaves and young branches glabrous or with scattered hairs; mature leaves glabrous below ..... *R. lanceolata* var. *glabrata*
- 4 Young leaves and young branches pubescent; mature leaves soft pubescent below ..... *R. lanceolata* var. *lanceolata*

*Rhamnus alnifolia* L'Héritier, Alder-leaved Buckthorn, American Alder-Buckthorn. Mafic or calcareous (dolomitic) seeps, usually with *Parnassia grandifolia*. May-July. NL (Newfoundland) west to BC, south to NJ, PA, w. MD (Knapp et al. 2011), sw. VA, ne. TN (Chester, Wofford, & Kral 1997), OH, n. IN, n. IL, IA, and CA. [= C, F, FNA, G, K, Pa, W, WV, Z]

\* *Rhamnus cathartica* Linnaeus, Common Buckthorn. Disturbed areas; native of Eurasia. April-June. Reported for VA by Harvill et al. (1991), but the report is actually based on specimens of *R. davurica* (Virginia Botanical Associates 2005); now bonafide specimens have been found in Giles and Wythe counties (T.F. Wieboldt, pers. comm. 2009). Reported as "now escaping and widespread near Roaches Run, Arlington County, VA (Steury 2011). [= C, F, FNA, G, K, Pa, Z]



\* *Rhamnus davurica* Pallas, Davurian Buckthorn. Suburban woodlands, rarely naturalized; native of e. Asia (n. China). April-June. Also reported from suburban areas near Louisville, KY, and Knoxville, TN (D. Estes, pers. comm.). [= Pa; > *Rhamnus davurica* ssp. *davurica* – FNA, K; = *R. citrifolia* (Weston) W. Hess & Stearn – C]

*Rhamnus lanceolata* Pursh var. *glabrata* Gleason, Western Lance-leaved Buckthorn. Dry habitats over calcareous rocks. April-May. Var. *glabrata* Gleason ranges from OH west to SD, south to w. VA (Ludwig 1999), KY, c. TN, AR, and KS. [= C, F, G, Z; = *R. lanceolata* ssp. *glabrata* (Gleason) Kartesz & Gandhi – FNA, K; < *R. lanceolata* – S, W]

*Rhamnus lanceolata* Pursh var. *lanceolata*, Eastern Lance-leaved Buckthorn. Dry to moist thickets over calcareous rocks. April-May. Var. *lanceolata* ranges from PA south to AL, mostly in the Appalachians. [= C, F, G, Z; = *R. lanceolata* ssp. *lanceolata* – FNA, K; < *R. lanceolata* – Pa, S, W, WV]

#### *Sageretia* Brongniart 1827 (Small-flowered Buckthorn)

A genus of about 35 species, shrubs and trees, of tropical to warm temperate areas of Africa, Asia, and America. References: Nesom in FNA (in prep.); Nesom (1993c)=Y; Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

**Identification notes:** *S. minutiflora* can appear superficially a bit like *Ilex vomitoria*, with which it typically grows; it can be distinguished from *Ilex vomitoria* by its opposite leaves.

*Sageretia minutiflora* (Michaux) C. Mohr, Small-flowered Buckthorn. Shell middens and shell hammocks, dry calcareous hammocks and maritime forests. August-September; October-November. Se. NC south to s. FL, west to s. MS. *S. minutiflora* is apparently most closely related to *S. elegans* (Kunth) Brongniart, which ranges from s. Mexico south to s. South America. [= FNA, K, RAB, S, WH, Y, Z]

#### *Ziziphus* P. Miller 1754 (Jujube)

A genus of 85-100 species, shrubs and trees, of tropical and warm temperate areas. References: Nesom in FNA (in prep.); Brizicky (1964a)=Z; Medan & Schirarend in Kubitzki (2004).

\* *Ziziphus zizyphus* (Linnaeus) Karsten, Chinese Jujube, Common Jujube, Chinese Date. Disturbed areas; native of Eurasia. Reported from ec. GA (Jones & Coile 1988). Cultivated at least as far north as NC. As of 2010, *Z. jujuba* is proposed for conservation over the nearly tautonymic *Z. zizyphus*. [= K, WH; = *Zizyphus zizyphus* (Linnaeus) Karsten – S, orthographic variant; = *Z. jujuba* P. Miller – FNA, Z]



**152. ULMACEAE** de Mirbel 1815 (Elm Family) [in ROSALES]

As here circumscribed (excluding *Celtis* and relatives), a family of 6-7 genera and about 35 species, of temperate, subtropical, and boreal Northern Hemisphere, rarely extending into the Southern Hemisphere). Zavada & Kim (1996) discuss compelling reasons to recognize the *Celtis* from the Ulmaceae. The distinctiveness of the Celtidaceae from the Cannabaceae and Moraceae is more questionable. References: Sherman-Broyles, Barker, & Schulz in FNA (1997); Zavada & Kim (1996); Todzia in Kubitzki, Rohwer, & Bittrich (1993). [also see *CANNABACEAE*]

- 1 Leaves strongly 3-veined from the base, the venation otherwise pinnate; fruit a drupe with thin flesh..... [*Celtis* – see *CANNABACEAE*]
- 1 Leaf venation pinnate throughout, the venation strictly pinnate; fruit dry, a samara (flat and winged) or nutlike (with numerous fleshy protuberances).
  - 2 Fruit nutlike (with numerous fleshy protuberances); primary lateral veins mostly forking before reaching the margin; [small trees of swamp forests of the Coastal Plain from se. NC and SC southward]..... *Planera*
  - 2 Fruit a samara (flat and winged); primary lateral veins mostly parallel and unforked to the leaf margin; [small to large trees, widespread in our area] ..... *Ulmus*

***Planera*** J.F. Gmelin 1791 (Planer-tree, Water-elm)

A monotypic genus, a tree, of temperate se. North America. References: Barker in FNA (1997); Todzia in Kubitzki, Rohwer, & Bittrich (1993).

***Planera aquatica*** (Walter) J.F. Gmelin, Planer-tree, Water-elm. River swamps where flooded (often to depths of 1-2 m) in the winter. Se. NC (limited to the Waccamaw and Lumber rivers) south to n. FL, west to e. TX, and north in the Mississippi Embayment to w. TN, w. KY, s. IL, and se. MO. [= RAB, C, F, FNA, G, GW, K, S]

***Ulmus*** Linnaeus 1753 (Elm)

A genus of about 25-30 species, trees (rarely shrubs), of temperate and boreal regions of the Northern Hemisphere (most diverse in c. and n. Asia). References: Sherman-Broyles in FNA (1997); Wiegrefe, Sytsma, & Guries (1994); Kurz & Godfrey (1962)=Z; Todzia in Kubitzki, Rohwer, & Bittrich (1993). Key adapted in part from FNA.

- 1 Leaf blades mostly < 7 cm long, the base symmetrical to somewhat oblique.
  - 2 Samaras ciliate-margined; twigs often cork-winged; upper surfaces of leaves glabrous to scabrous; [native trees, sometimes weedy].
    - 3 Leaf apex acute; flowers appearing in the late winter to late spring; calyx lobes 5; upper surfaces of leaves glabrous to somewhat scabrous; [widespread in our area; [subgenus *Oreoptelea*, section *Chaetoptelea*] ..... *U. alata*
    - 3 Leaf apex obtuse; flowers appearing in the late summer to fall; calyx lobes 6-9; upper surfaces of leaves harshly scabrous; [of w. TN, w. MS westward; also disjunct in FL]; [subgenus *Oreoptelea*, section *Trichoptelea*] ..... *U. crassifolia*
  - 2 Samaras with glabrous margins; twigs never cork-winged; upper surfaces of leaves glabrous; [introduced trees, planted and sometimes naturalized or persistent]; [subgenus *Ulmus*, section *Microptelea*].
    - 4 Flowers appearing in the late summer to fall; leaf base generally oblique; leaves 1.5-2.5 cm wide, 5 or more of the lateral veins forked per side ..... *U. parvifolia*
    - 4 Flowers appearing in the late winter to late spring; leaf base generally symmetrical; leaves 2-3.5 cm wide, 3 or fewer of the lateral veins forked per side ..... *U. pumila*
- 1 Leaf blades mostly > 7 cm long, the base moderately to strongly oblique (rarely nearly symmetrical).
  - 5 Leaf uppersurface slightly to very strongly scabrous; leaf undersurface tomentose or villous, with tufts of hairs in the vein axils; flowers and fruits sessile or subsessile (on pedicels 0-2 mm long), in dense non-pendulous 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-ciliate; [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 prominent tufts of hairs in the vein axils (differing from the general pubescence of the surface); branches often developing corky wings; inflorescence a raceme or racemose cyme; [trees of calcareous areas in the western portion of our area]; [subgenus *Oreoptelea*, section *Trichoptelea*].
  - 10 Leaves 7-8 (-14) cm long, lanceolate to ovate, the undersurface with yellowish-gold pubescence; buds and young twigs glabrous; calyx lobes 5-6; seeds thickened..... *U. serotina*
  - 10 Leaves 9-11 (-16) cm long, obovate, the undersurface with whitish pubescence; buds and young twigs pubescent; calyx lobes 7-8; seeds inflated..... *U. thomasii*

*Ulmus alata* Michaux, Winged Elm. Rock outcrops, dry and mesic forests and woodlands, bottomlands, old fields, disturbed areas. February-March; March-April. N. VA west to MO, south to c. peninsular FL and c. TX. [= RAB, C, F, FNA, G, GW, K, S, W, WH, Z]

*Ulmus americana* Linnaeus var. *americana*, American Elm, White Elm. Swamps, bottomland forests, moist slopes, especially on relatively or strongly nutrient-rich substrates. February-March; March-April. NS, NB, and QC west to se. SK, south to n. FL and c. TX. An ascomycetous fungus, *Ceratocystis ulmi*, is the cause of the Dutch Elm disease. In our area, the effects of the disease appear to have been mild or nonexistent, especially in natural areas. [= Z; < *U. americana* – RAB, C, F, FNA, G, GW, K, Pa, W, WV; = *U. americana* – S]

*Ulmus americana* Linnaeus var. *floridana*, Florida Elm. Shell middens, other calcareous forests. January-March; February-April. Se. NC (north at least to Carteret County) south to c. peninsular FL, west to Panhandle FL. [= Z; < *U. americana* – RAB, C, F, FNA, G, GW, K, W; = *U. floridana* Chapman – S]

*Ulmus crassifolia* Nuttall, Cedar Elm. Bottomlands, mesic forests. W. TN, s. MO, and OK south to MS, LA, and TX; disjunct in e. Panhandle FL. [= FNA, K, S, Z]

\* *Ulmus glabra* Hudson, Wych Elm, Scotch Elm. Suburban woodlands; native of Europe. Naturalized in ne. United States; reported from VA and DC (Sherman-Broyles in FNA 1997), but may only be cultivated. [= FNA, C, F, K]

\* *Ulmus parvifolia* Jacquin, Chinese Elm, Lacebark Elm. Disturbed areas; native of China and Japan. August-October; September-November. [= FNA, K, Pa]

\* *Ulmus procera* Salisbury, English Elm, English Cork Elm. Disturbed areas; native of Europe. [= C, FNA, K, Pa; < *U. minor* P. Miller, misapplied]

\* *Ulmus pumila* Linnaeus, Siberian Elm, Dwarf Elm. Disturbed areas; native of Asia. [= C, F, FNA, K, Pa]

*Ulmus rubra* Muhlenberg, Slippery Elm, Red Elm. Moist to fairly dry calcareous forests, rich bottomlands, rich cove forests in the low Mountains. February-March; March-April. ME, QC, and ON west to MN and ND, south to Panhandle FL and c. TX. [= RAB, C, FNA, G, K, Pa, W, WV, Z; = *U. fulva* Michaux – S]

*Ulmus serotina* Sargent, September Elm. Mesic limestone forests. KY, s. IL, and e. OK south to e. TN, nw. GA, AL, and MS. It was collected on the French Broad River by Rugel in 1842, and has been attributed to NC by Mohr. [= C, FNA, F, G, K, S]

*Ulmus thomasii* Sargent, Cork Elm, Rock Elm. Rocky or rich slopes, especially over limestone. April. QC to MN and NE, south to NJ, MD, PA, WV, KY, TN, AR, and KS. [= C, FNA, K; = *U. thomasi* – F, G, WV, orthographic variant]

As circumscribed to include the Celtidaceae, a family of 14 genera and about 120 species, trees, shrubs, woody vines, herbs, and herbaceous vines, of cosmopolitan distribution. Zavada & Kim (1996) discuss compelling reasons to recognize the Celtidaceae as a family distinct from the Ulmaceae. The distinctiveness of the Celtidaceae from the Cannabaceae and Moraceae is more questionable; and Sytsma et al. (2002) conclude that Celtidaceae should be considered a part of Cannabaceae. References: Small in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Sherman-Broyles, Barker, & Schulz in FNA (1997); Zavada & Kim (1996); Todzia in Kubitzki, Rohwer, & Bittrich (1993); Sytsma et al. (2002).

- 1 Tree or shrub; leaves simple and unlobed ..... *Celtis*
- 1 Herb or vine; leaves either compound or lobed.
  - 2 Erect herb; leaves with 3-7 leaflets ..... *Cannabis*
  - 2 Climbing or sprawling vine; leaves simple, with 1-9 lobes ..... *Humulus*

#### *Cannabis* Linnaeus 1753 (Hemp, Marijuana)

A genus of 1-3 species, herbs, originally native to c. Asia. *Cannabis* was formerly widely cultivated nearly worldwide for the fiber hemp; it is now better known as the source of the drug marijuana. References: Small in FNA (1997); Hillig & Mahlberg (2004); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

\* *Cannabis sativa* Linnaeus, Hemp, Marijuana. Disturbed areas and clandestinely cultivated plots; native of Asia. June-October. Though perhaps not truly naturalized or persistent, *Cannabis* is treated here since clandestine cultivated plots are encountered by the field biologist, especially in fairly remote areas in the mountainous parts of our area. [= F, FNA, G, Pa, WH, WV; > *C. sativa* Linnaeus ssp. *sativa* var. *sativa* – C, K]

#### *Celtis* Linnaeus 1753 (Hackberry)

A genus of about 100 species, trees, shrubs, and woody vines, widespread in tropical, subtropical, and temperate regions worldwide. References: Todzia in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Branches armed with short spines ..... *C. iguanaea*
- 1 Branches unarmed.
  - 2 Leaves thick, very glossy above; bark remaining smoothish, lacking protuberances; [rare alien] ..... *C. sinensis*
  - 2 Leaves thin, dull or glossy above (glossy normally only in sun leaves, especially of *C. laevigata*); bark developing wartlike corky protuberances on larger individuals; [collectively common natives]
    - 3 Leaf blades mostly > 2× as long as wide, the tip attenuate and long-acute to long-acuminate, the base cuneate to rounded; leaf margins entire or with a few teeth on each margin; leaves glabrous or nearly so (except the margins often ciliate); [large trees, mostly of floodplains, but also in upland situations over calcareous substrates such as limestone, dolostone, and shell middens] ..... *C. laevigata*
    - 3 Leaf blades mostly < 2× as long as wide, the tip obtuse to short-acuminate, the base slightly to strongly cordate at least on one side; leaf margins entire or with a few teeth on each margin (the plant then a shrub or small tree of rocky places) or distinctly serrate with 10-35 teeth on each margin; leaves scabrous above, at least toward the tip; [shrubs to medium trees, of floodplains, moist slopes, and dry rocky woodlands, barrens, and glades].
      - 4 Leaves 5-12 cm long, toothed well below the middle; fruit 7-14 mm long, ellipsoid or subglobose, dark orange, purple, or black, on a pedicel 7-25 mm long; [small to medium trees of dry to moist habitats] ..... *C. occidentalis*
      - 4 Leaves 2-8 cm long, toothed only near the tip if at all; fruit 5-9 mm long, subglobose or essentially spherical, orange, red, or brown, on a pedicel 3-13 mm long; [shrubs or small twisted trees of dry, rocky habitats] ..... *C. tenuifolia*

*Celtis iguanaea* (Jacquin) Sargent, Iguana Hackberry. Shell-middens and calcareous coastal sites. AL, sw. peninsular FL, West Indies, American tropics. [= K, WH; = *Momisia iguanaea* (Jacquin) Rose & Standley – S]

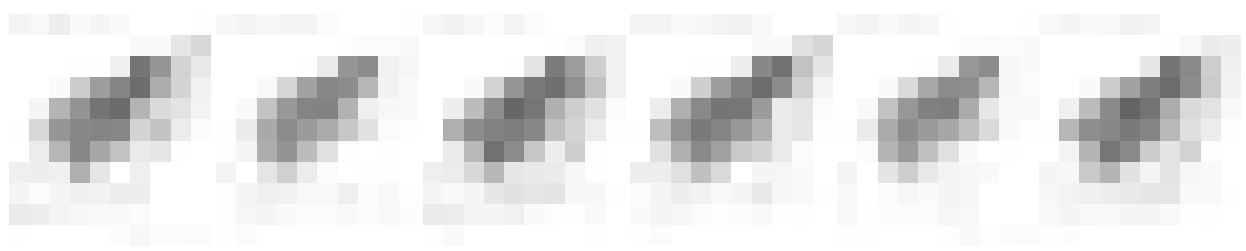
*Celtis laevigata* Willdenow, Southern Hackberry, Sugarberry. Bottomland forests, especially on natural levees, upland calcareous forests and woodlands, shell middens. April-May; August-October. MD, WV, IN, IL, MO and KS south to s. FL and TX. [= RAB, C, FNA, G, GW, W; > *C. laevigata* var. *laevigata* – F; > *C. laevigata* var. *smallii* (Beadle) Sargent – F; = *C. laevigata* var. *laevigata* – K; > *C. mississippiensis* Bosc – S; > *C. smallii* Beadle – S]

*Celtis occidentalis* Linnaeus, Northern Hackberry. Xeric to mesic glades, outcrops, barrens, woodlands, and bottomland forests, usually over calcareous substrate. April-May; August-October. NH, QC, MB, and MT south to Panhandle FL, TX, and NM. [= C, FNA, G, K, Pa, S, W, WV; = *C. occidentalis* var. *occidentalis* – RAB; > *C. occidentalis* var. *canina* (Rafinesque) Sargent – F; > *C. occidentalis* var. *occidentalis* – F; > *C. occidentalis* var. *pumila* (Pursh) A. Gray – F; < *C. occidentalis* – WH]

\* *Celtis sinensis* Willdenow, Chinese Hackberry. Suburban woodlands; native of China, Korea, and Japan. Found naturalizing in Guilford County, NC (W. Cook, pers. comm., 2010). {not yet keyed}

*Celtis tenuifolia* Nuttall, Dwarf Hackberry, Georgia Hackberry. Xeric to mesic glades, outcrops, barrens, woodlands, often over calcareous substrate. April-May; August-October. NJ, PA, IN, IL, and KS south to Panhandle FL and TX. [= C, FNA, G, K, Pa, W, WV; = *C. occidentalis* var. *georgiana* (Small) H.E. Ahles – RAB; > *C. tenuifolia* var. *georgiana* (Small) Fernald & Schubert – F; > *C. tenuifolia* var. *tenuifolia* – F; = *C. georgiana* Small – S; < *C. occidentalis* – WH]





*Humulus* Linnaeus 1753 (Hops)

A genus of 2 species, herbaceous vines, of temperate regions of the Northern Hemisphere. References: Small (1978)=Z; Small in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993). Key adapted from Z.

- 1 Veins on lower surface of leaves armed with rigid, spinulose hairs; bracts of pistillate flowers spinulose-ciliate; most leaves 5-9 lobed..... *H. japonicus*
- 1 Veins on lower surface of leaves more or less pubescent with lax, weak hairs, but lacking rigid, spinulose hairs; bracts of pistillate flowers smooth-margined; most leaves 1-3 lobed.
  - 2 Lower surfaces of leaves (measured on middle lobe of 4-6 cm long leaves of flowering or fruiting branches) usually with < 20 hairs per cm of length of midrib; glands (measured on leaves as above) < 25 per 10 square mm of intervein lower leaf surface; [introduced variety, sometimes showing introgression with native varieties]..... *H. lupulus* var. *lupulus*
  - 2 Lower surfaces of leaves (measured on middle lobe of 4-6 cm long leaves of flowering or fruiting branches) usually with > 20 hairs per cm of length of midrib; glands (measured on leaves as above) > 25 per 10 square mm of intervein lower leaf surface; [native varieties, though often weedy and sometimes showing introgression with var. *lupulus*].
  - 3 Lower surfaces of leaves (measured on middle lobe of 4-6 cm long leaves of flowering or fruiting branches) conspicuously pubescent between the veins and on the veins, with > 100 hairs per cm of length of midrib; smaller leaves unlobed (less commonly 3-lobed)..... *H. lupulus* var. *pubescens*
  - 3 Lower surfaces of leaves (measured on middle lobe of 4-6 cm long leaves of flowering or fruiting branches) not conspicuously pubescent, the pubescence usually limited to the veins, usually with < 100 hairs per cm of length of midrib; smaller leaves generally 3-lobed ..... *H. lupulus* var. *lupuloides*

\* *Humulus japonicus* Siebold & Zuccarini, Japanese Hops. Disturbed areas, particularly in rich, alluvial soils, where it has become a serious weed along major VA rivers; native of Japan, Taiwan, and China. June-October; July-October. [= RAB, C, F, FNA, G, K, Pa, W, WV, Z]

*Humulus lupulus* Linnaeus var. *lupuloides* E. Small, Northeastern Hops. Pd (VA), Mt (VA, WV), Cp (NC, VA): disturbed areas, particularly in rich, alluvial soils; uncommon (rare in NC and WV, rare in VA Coastal Plain). July-August; September-October. NS and NL (Newfoundland) south to VA and NC, west to NE, MT, and AB. It is not clear whether its occurrence in NC is native or native of farther 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, Pa, Z; < *H. lupulus* – RAB, F, G, S, W, WV]

\* *Humulus lupulus* Linnaeus var. *lupulus*, Brewer's Hops, European Hops. Pd (VA), Mt (WV): disturbed areas; rare, native of Europe. July-August; September-October. The European var. *lupulus* is (of course) one of the key ingredients of beer. [= C, FNA, K, Pa, Z; < *H. lupulus* – RAB, F, G, S, W, WV]

*Humulus lupulus* Linnaeus var. *pubescens* E. Small, Midwestern Hops. Mt (GA, NC, VA), Pd (NC, VA), Cp (VA): disturbed areas, particularly in rich, alluvial soils; rare. July-August; September-October. NY and PA south to NC and ne. GA and west to MN, NE, KA, and AR. It is not clear whether the few occurrences east of the Blue Ridge (including those in NC and VA) are native or adventive from farther west. [= C, FNA, K, Pa, Z; < *H. lupulus* – RAB, F, G, S, W]



**154. MORACEAE** Lindley 1847 (Mulberry Family) [in ROSALES]

A family of about 38 genera and 1100 species, trees, shrubs, vines, and herbs, of tropical, subtropical, and (few) warm temperate areas. References: Wunderlin in FNA (1997); Rohwer & Berg in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Herb, 0.3-1.0 m tall; stem without latex; [tribe *Moreae*]..... *Fatoua*
- 1 Shrub or tree, at maturity over 1 m tall, or woody vine growing appressed to masonry; stem bearing translucent to milky-white latex.
  - 2 Stipules connate, the stipule scar encircling the twig; inflorescence a syconium (the flowers borne on the inner walls of the fleshy receptacle); [tribe *Ficeae*] ..... *Ficus*

- 2 Stipules free, the stipule scar not encircling the twig; inflorescence a spike, head, or catkin (the flowers borne exposed on a contracted or elongated axis or receptacle).
- 3 Leaves entire, unlobed or shallowly 3-lobed; stems usually thorny; [tribe *Maclureae*.  
 4 Fruit 2-3 cm in diameter; petioles 5-20 mm long; leaves 3-7 (-10) cm long.....*Cudrania*  
 4 Fruit 10-15 cm in diameter; petioles 30-50 mm long; leaves 6-20 cm long.....*Maclura*
- 3 Leaves serrate, often also 3-15-lobed (the lobes sometimes deep); stems not thorny; [tribe *Moreae*].  
 5 Stems and leaves hirsute; leaves alternate, opposite, and whorled.....*Broussonetia*  
 5 Stems and leaves glabrous to pubescent; leaves alternate.....*Morus*

***Broussonetia*** L'Héritier ex Ventenat 1799 (Paper Mulberry)

A genus of about 8 species, trees, shrubs, and vines, of tropical and subtropical Asia and Madagascar. References: Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

\* ***Broussonetia papyrifera*** (Linnaeus) L'Héritier ex Ventenat, Paper Mulberry. Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): urban lots, disturbed areas, roadsides; common (uncommon in VA and WV Mountains, rare in DE), native of e. Asia. April. [= RAB, C, F, FNA, G, K, Pa, W; = *Papyrius papyrifera* (Linnaeus) Kuntze - S]

***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, 1-10 cm long; [vine, climbing appressed to walls].....*F. pumila*

\* ***Ficus carica*** Linnaeus, Edible Fig, Garden Fig. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC): grown for its fruits, persistent from plantings, persisting and naturalizing particularly on barrier islands, where it sometimes forms thickets on dunes, or otherwise in the outer Coastal Plain, where proximity to the ocean ameliorates cold winter temperatures; rare, native of w. Asia. May-August; July-October. This is the common cultivated fig, grown for its fruit in the Mid-east for millenia. [= RAB, F, FNA, K, S, WH]

\* ***Ficus pumila*** Linnaeus, Climbing Fig. Cp (AL, FL, GA, LA, SC): walls, disturbed urban areas; rare, native of s. Asia. Locally common in Charleston, Savannah, Pensacola, Mobile, New Orleans, and other old seaports, where grown on walls as an ornamental and certainly persisting. [= FNA, K, WH]

***Maclura*** Nuttall 1818 (Osage-orange)

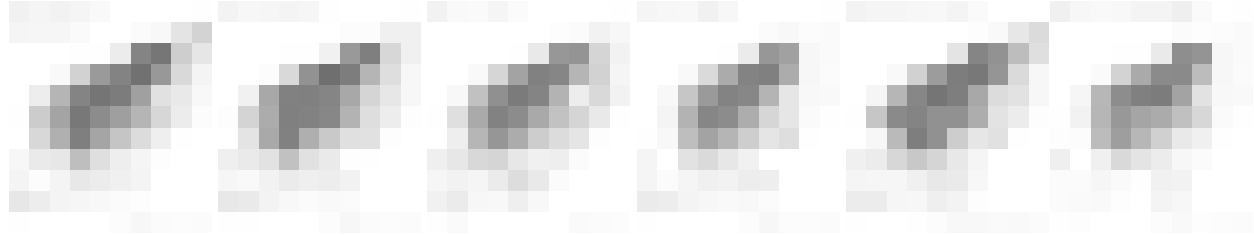
A genus of 3 (or more) species, trees, of sc. North America and e. Asia. References: Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Fruit 10-15 cm in diameter; petioles 30-50 mm long; leaves 6-20 cm long.....*M. pomifera*  
 1 Fruit 2-3 cm in diameter; petioles 5-20 mm long; leaves 3-7 (-10) cm long.....*M. tricuspidata*

\* ***Maclura pomifera*** (Rafinesque) C.K. Schneider, Osage-orange, Bow-wood, Bois-d'arc, Hedge-apple. Fields, hedgerows, forests; common (uncommon in DE Coastal Plain, rare in FL), naturalized from extensive planting in the eighteenth and nineteenth centuries, native of TX, OK, AR, and LA. April-May; October. The large fruits are unmistakable: yellowish-green,

grapefruit-sized, and wrinkled, reminiscent of a giant, spherical mulberry fruit. The wood is extremely heavy, fine-grained, a bright yellow-orange when fresh, but darkening with age, famous for making bows and also used in cabinetry. [= RAB, C, F, FNA, G, K, Pa, W, WH, WV; = *Toxylon pomiferum* Rafinesque ex Sargent – S]

\* ***Maclura tricuspoidata*** Carrière, Cudrania. Escaped and naturalized from plantings; 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 at other widely scattered locations in the South, where recommended as a hedge plant since at least 1940 (Rehder 1940). [= *Cudrania tricuspoidata* (Carrière) Bureau ex Lavallée – FNA, K]



***Morus*** Linnaeus 1753 (Mulberry)

A genus of about 10-15 species, trees, of warm temperate, subtropical, and tropical areas. References: Galla et al. (2009)=Z; Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Upper leaf surface glossy, glabrous or slightly scabrous; lower leaf surface glabrous, or slightly pubescent on the veins and in the vein axils only; ripe fruits black, purple, red, pink, or white ..... ***M. alba***
- 1 Upper leaf surface dull, scabrous; lower leaf surface pubescent on the veins, veinlets, and the surface between the veins; ripe fruits black or purple..... ***M. rubra***

\* ***Morus alba*** Linnaeus, White Mulberry, Silkworm Mulberry, Russian Mulberry. Disturbed areas, vacant lots, roadsides, moist forests; native of e. Asia. March-May; May-June. [= RAB, C, F, FNA, G, GW, K1, K2, Pa, S, W, WV, Z; > *M. alba* – S; > *M. nigra* Linnaeus – S, misapplied as to our material; > *M. alba* var. *tatarica* (Linnaeus) Seringe]

\* ***Morus nigra*** Linnaeus, Black Mulberry. Reported for scattered localities in North America, perhaps only because of confusion with dark-fruited plants of *M. alba*. [= FNA, K2] {add to synonymy; add to key}

***Morus rubra*** Linnaeus, Red Mulberry. Bottomland forests, mesic slopes, disturbed areas, suburban woodlands. April-May; May-June. MA, VT, NY, MI, WI, and se. SD south to s. FL and w. TX, and into Mexico. The fruits are very variable in quality from tree to tree. *M. rubra* is the only member of the Moraceae native to our area. *M. murrayana* D.E. Saar & S.J. Galla has recently been described as distinct from *M. rubra* and occurring widely in eastern North America (KY, TN, MO, IL, IN, MS, LA, VA, NC, and AL) (Galla et al. 2009). It is alleged to differ from *M. rubra* by its leaves to 38 cm long (vs. to 15 cm long), the outer three leaves on branchlets almost always > 15 cm long (vs. < 15 cm long), leaves with caudate apex (vs. acute to acuminate apex), lateral veins curving before reaching margins, only the tiniest veins ending in a tooth (vs. lateral veins above lowest lateral fairly straight and ending in a tooth); mature fruit to 4 cm long and 1.5 cm wide but often thinner, with much size variation on a single individual (vs. mature fruit to 3 cm long). All the alleged characters appear to be highly variable and correlated with vigor. [= RAB, C, F, G, GW, K2, Pa, S, W, WV; > *M. rubra* var. *rubra* – K1; > *M. rubra* – Z; > *M. murrayana* D.E. Saar & S.J. Galla – Z]

### 155. **URTICACEAE** A.L. de Jussieu 1789 (Nettle Family) [in ROSALES]

A family of about 45 genera and 1000 species, herbs, shrubs, vines, and trees, of cosmopolitan distribution in tropical, subtropical, and temperate regions. References: Boufford in FNA (1997); Friis in Kubitzki, Rohwer, & Bittrich (1993); Miller (1971a).

- 1 Leaves alternate.
  - 2 Flowers in axillary spikes; woody herb to 4 m tall; [tribe *Boehmerieae*]..... ***Boehmeria***
  - 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; leaves 3-veined from the base, the 2 main side veins reaching the margin about 2/3s of the way from blade base to blade tip, the midvein with 1-2 or more prominent secondary veins borne near or past the midpoint and at a sharply acute angle to the midvein, these arching to the leaf margin; [tribe *Boehmerieae*]..... ***Boehmeria***
    - 5 Flowers in axillary panicles or fascicles; foliage shiny, bright green; leaves 3-veined from the base, the 2 main side veins extending to the apex of the blade, the midvein with many secondary veins borne along its length at a nearly right angle, and connecting to the 2 main side veins rather than reaching the leaf margin; [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 (upper leaves sometimes alternate); monoecious herb to 1.5 m tall; [subgenus *Duretia*] .....***B. cylindrica***
- 1 Leaves alternate; dioecious herb to 4 m tall; [subgenus *Tilocnide*].....***B. nivea***

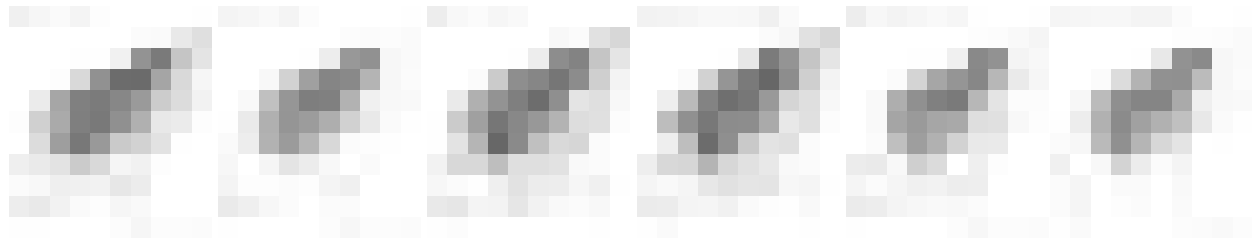
***Boehmeria cylindrica*** (Linnaeus) Swartz, False-nettle. Swamp forests, bottomlands, bogs, marshes, other wetlands. July-August; September-October. QC and MN south to FL and NM. [= RAB, C, FNA, G, GW, K, Pa, W, WH; > *B. cylindrica* var. *cylindrica* – F; > *B. cylindrica* var. *drummondiana* (Weddell) Weddell – F; > *B. cylindrica* – S; > *B. drummondiana* Weddell – S]

\* ***Boehmeria nivea*** (Linnaeus) Gaudichaud-Beaupré, Ramie. Disturbed suburban areas, waste ground; native of Asia. This plant is cultivated for the fiber of its stems, which is extracted and used for fabric in a manner reminiscent of linen (which is made from *Linum usitatissimum*). Reported for Lowndes County, GA (Carter, Baker, & Morris 2009). [= RAB, FNA, K; = *Ramium niveum* (Linnaeus) Small – S]

**Laportea** Gaudichaud-Beaupré 1830 (Wood-nettle)

A genus of about 21 species, shrubs, perennial herbs, and annual herbs, of tropical and warm temperate e. Asia and temperate e. North America. References: Friis in Kubitzki, Rohwer, & Bittrich (1993).

\* *Laportea aestuans* (Linnaeus) Chew, West Indian Wood-nettle. Reported for scattered sites in the se. US (Kartesz 2010). [= K2]



***Laportea canadensis*** (Linnaeus) Weddell, Wood-nettle. Moist, nutrient-rich forests, especially abundant in cove forests in the Mountains and bottomlands in the Piedmont. Late June-August; late July-October. NS and se. MB south to Panhandle FL and OK. By mid-summer, *Laportea* often becomes the aspect dominant in rich, moist cove forests of the mountains (especially those with extensive seepage), visually replacing the diverse spring flora. The stinging hairs can penetrate pants made of lightweight or loosely woven fabrics. [= RAB, C, F, FNA, G, GW, K, Pa, W, WV; ? *Urticastrum divaricatum* (Linnaeus) Kuntze – S]

**Parietaria** Linnaeus 1753 (Pellitory)

A genus of about 20 species, annual and perennial herbs, of nearly cosmopolitan distribution. References: Hinton (1968)=Z; Friis in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Leaves softly pubescent; [alien weed]; [subgenus *Parietaria*].....***P. judaica***
- 1 Leaves glabrescent; [native, sometimes weedy in calcareous or coastal areas]; [subgenus *Freirea*].
  - 2 Main lateral veins diverging from the midvein above the usually narrowly cuneate leaf base; larger leaves 2-5× as long as wide.....***P. pensylvanica* var. *pensylvanica***
  - 2 Main lateral veins diverging from the midvein at the usually truncate, rounded, or broadly cuneate leaf base; larger leaves 1-2× as long as wide.
    - 3 Achene with a flanged stipe, the minute apiculate tip located symmetrically at the pole of the achene, the achene 0.8-1.0 mm long .....***P. floridana***
    - 3 Achene without a flanged stipe, the minute apiculate tip located asymmetrically, the achene usually 1.2 (-1.4) mm long .....***P. praetermissa***

***Parietaria floridana*** Nuttall, Florida Pellitory. Coastal shores, sometimes weedy in calcareous situations. March-frost; April-frost. DE south to FL and west to TX, on the outer Coastal Plain. This species has smaller leaves than *P. praetermissa*. [= FNA, GW, K, WH, Z; = *P. nummularia* Small – C, F, S]

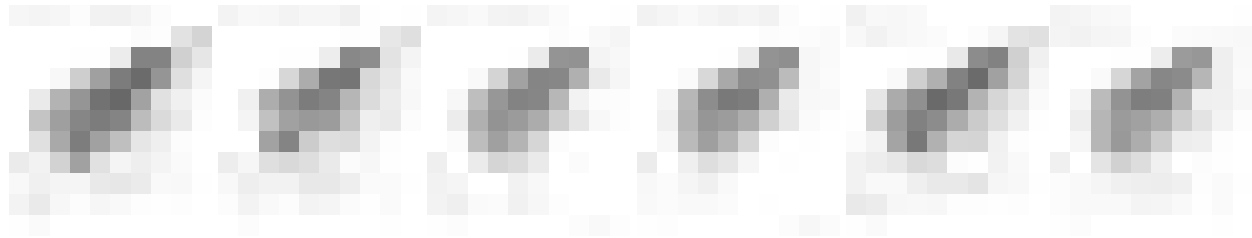
\* ***Parietaria judaica*** Linnaeus, Pellitory-of-the-wall. Disturbed urban areas; native of Europe. [= FNA, K, WH; ? *P. diffusa* Mertens & Koch]

\* *Parietaria officinalis* Linnaeus, Pellitory. Reported as introduced in Mobile County, AL (Kartesz 2010). {investigate} [= K2] {not keyed; add to synonymy}

***Parietaria pensylvanica*** Muhlenberg ex Willdenow, Pennsylvania Pellitory, Rock Pellitory. In circumneutral soils, such as in thin soils at the bases of calcareous or subcalcareous cliffs or on calcareous shale barrens, rich floodplain soils. April-October; May-October. ME west to BC, south to e. NC, w. NC, AL, Panhandle FL, TX, NV, and Mexico. Two varieties are sometimes

delimited, var. *pensylvanica* eastern and northern and var. *obtusa* (Rydberg ex Small) Shinnars southwestern. [= C, FNA, G, GW, K, K2, Pa, RAB, S, W, WH; > *P. pensylvanica* – F, WV (sensu stricto)]

***Parietaria praetermissa*** Hinton, Coastal Pellitory. Shell middens, coastal hammocks. March-frost; April-frost. E. NC south to s. FL and west to w. LA. [= FNA, GW, K, WH, Z; = *P. floridana* Nuttall – RAB, C, F, S, misapplied]



***Pilea*** Lindley 1821 (Clearweed)

A genus of about 250 species, annual and perennial herbs, nearly cosmopolitan in tropical and warm temperate regions of the Old World and the New World. References: Friis in Kubitzki, Rohwer, & Bittrich (1993).

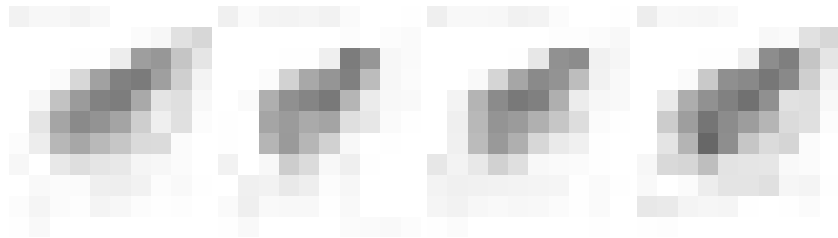
- 1 Leaves 0.5-1.0 (-1.8) cm long..... *P. microphylla*
- 1 Leaves 4-10 cm long.
  - 2 Achene 1-1.5× as long as broad, tuberculate, dark brown or black, the margins slightly paler..... *P. fontana*
  - 2 Achene 1.5-2× as long as broad, smooth, green or light brown, with slightly raised dark to black lines and mottlings..... *P. pumila*

***Pilea fontana*** (Lunell) Rydberg, Blackfruit Clearweed, Lesser Clearweed. Swamp forests, freshwater marshes, calcareous wetlands. August-September; September-November. E. Canada west to MN and ND, south to FL, IN, and NE. Only reliably distinguishable from *P. pumila* using fruits, *P. fontana* is, however, somewhat less shiny and transparent-translucent. [= RAB, C, F, FNA, G, GW, K, Pa, W, WH; < *Adicea pumila* (Linnaeus) Rafinesque – S]

\* *Pilea hermiarioides* (Swartz) Lindley, Caribbean Clearweed. Reported for Mobile County, AL and scattered sites in the FL peninsula (Kartesz 2010). [= K2] {not keyed; add to synonymy}

\* ***Pilea microphylla*** (Linnaeus) Liebmann, Rockweed, Artillery Weed. Old rock and brick walls, urban areas. January-December. Although listed by RAB for the Carolinas as "a weed in and around greenhouses, not established as part of our flora," this species is well-established and weedy in Charleston, SC and Savannah, GA. It is presumably adventive from farther south. [= RAB, FNA, K, S, WH]

***Pilea pumila*** (Linnaeus) A. Gray, Greenfruit Clearweed, Coolwort, Richweed. Swamp forests, bottomlands, freshwater marshes. August-September; September-November. QC west to MN, south to FL, LA, and OK. [= RAB, C, FNA, G, GW, Pa, W, WH, WV; > *P. pumila* var. *pumila* – F, K; > *P. pumila* var. *deamii* (Lunell) Fernald – F, K; < *Adicea pumila* (Linnaeus) Rafinesque – S (including in concept *P. fontana*)]



***Urtica*** Linnaeus 1753 (Stinging Nettle)

A genus of about 80 species, annual and perennial herbs, nearly cosmopolitan, but primarily in temperate regions of the Northern Hemisphere. References: Woodland (1982)=Z; Woodland, Bassett, Crompton, & Forget (1982); Friis in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Tap-rooted annual; stipules 1-3 mm long, spreading or deflexed; inflorescences usually shorter than the subtending leaf petiole, each panicle consisting of a mixture of pistillate and staminate flowers.
  - 2 Flower clusters subglobose; mature achenes ovate, 1-1.5 mm long, < 1 mm wide; leaf teeth generally blunt, the sides of the tooth convex..... *U. chamaedryoides*
  - 2 Flower clusters elongate; mature achenes triangular, 1.5-2.5 mm long, 1-1.5 mm wide; leaf teeth generally sharp, the sides of the tooth straight ..... *U. urens*
- 1 Rhizomatous perennial; stipules 5-15 mm long, erect; inflorescences usually surpassing the subtending leaf petiole, each panicle of either pistillate or staminate flowers.
  - 3 Plants dioecious (male and female flowers always on separate plants); stems usually weak, sprawling, branching; stems strongly hispid with stinging hairs; leaf blades strongly hispid with stinging hairs on both surfaces; leaf teeth commonly 5-6 mm long ..... *U. dioica*
  - 3 Plants mostly monoecious (with male and female flowers in separate inflorescences on the same plant), rarely an entire plant male or female; stems upright, erect, less branched; stems glabrous to puberulent or strigose, lacking (or nearly so) stinging hairs; leaf blades

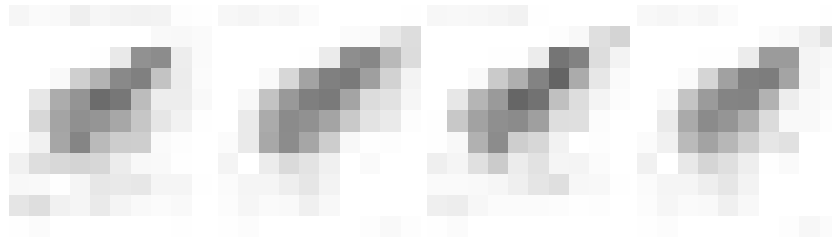
glabrous or glabrescent above (lacking stinging hairs), glabrous to puberulent below (with some stinging hairs); leaf teeth commonly 2-3.5 mm long ..... *U. gracilis*

*Urtica chamaedryoides* Pursh, Dwarf Stinging Nettle. Rich moist soil, usually on floodplains. November-May; May-July. WV, KY, se. MO and OK south to FL, TX, and Mexico; very rare east of the Blue Ridge. Notable locations in our area include Stevens Creek (McCormick County, SC), Congaree Swamp (Richland County, SC), and various sites on very rich levees of the Roanoke River (NC). Gaddy & Rayner (1980) report the common winter flowering of this species in our area. [= RAB, C, F, FNA, G, K, S, WH, Z]

\* *Urtica dioica* Linnaeus, European Stinging Nettle, Great Nettle. Disturbed areas, primarily in calcareous soils; native of Europe. May-July; July-September. See *U. gracilis* for discussion of the two taxa. [= F, S, WV; < *U. dioica* – RAB, W (also see *U. gracilis*); = *U. dioica* var. *dioica* – C, G; = *U. dioica* ssp. *dioica* – FNA, K, Pa, Z]

*Urtica gracilis* Aiton, American Stinging Nettle. Bottomland forests and edges, particularly over limestone. May-July; July-September. NL (Labrador) and NS west to AK, south to sw. VA, w. NC (?), s. OH, s. IL, s. MO, n. TX, s. NM, and se. AZ. The native stinging nettle of e. and c. North America is best treated as specifically distinct from *U. dioica* of Europe. Woodland (1982) and Woodland, Bassett, Crompton, & Forget (1982) showed that *U. gracilis* differs from *U. dioica* in a variety of morphologic characters (see key), chromosome number (2n = 26 for *U. gracilis*, 2n = 52 for *U. dioica*), breeding system (monoecy vs. dioecy), and distribution (North American vs. Eurasian); furthermore, the two taxa could not be crossed. Woodland (1982) chose subspecific status, apparently to emphasize the close relationship of the two (and a third taxa in w. North America). The combination of morphological distinctiveness, allopatry, major differences in species biology, and incompatibility seem adequate to warrant separation as species, however. Until herbaria can be checked, it is uncertain whether *U. gracilis* occurs in NC. F (as *U. procera*), G (as *U. dioica* var. *procera*) and S include NC in the range; Woodland (1982), however, showed the range as extending only south to VA. [= S, WV; < *U. dioica* – RAB, W; = *U. dioica* Linnaeus var. *procera* (Muhlenberg ex Willdenow) Weddell – C, G; > *U. gracilis* Aiton – F; > *U. procera* Muhlenberg – F; = *U. dioica* Linnaeus ssp. *gracilis* (Aiton) Selander – FNA, K, Pa, Z]

\* *Urtica urens* Linnaeus, Burning Nettle, Dog-nettle, Small Nettle. Disturbed areas; native of Eurasia. April-May; May-July. [= RAB, C, F, FNA, G, K, Pa, S, WH, WV, Z]



157. FAGACEAE Dumortier 1829 (Beech Family) [in FAGALES]

A family of about 8 genera and 620-1050 species, trees and shrubs, mostly of the Northern Hemisphere, but extending into se. Asia and Australia. References: Nixon in FNA (1997); Govaerts & Frodin (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Elias (1971a).

- 1 Fruits partially enclosed in a scaly cup; leaves lobed, toothed, crenate, or entire.....*Quercus*
- 1 Fruits enclosed in a spiny or prickly bur; leaves toothed.
  - 2 Nuts rounded or flattened on one or two sides; bur with long, straight spines; winter buds < 1 cm long; leaves elliptic or oblanceolate, some of them usually > 12 cm long.....*Castanea*
  - 2 Nuts sharply triangular; bur with short, recurved prickles; winter buds 1.5-2.5 cm long; leaves ovate, 6-12 cm long .....*Fagus*

*Castanea* P. Miller 1754 (Chestnut, Chinquapin)

A genus of 8-10 species, trees and shrubs, of temperate regions of the Northern Hemisphere. References: Johnson (1988)=Z; Nixon in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Stanford (1998). Key adapted from Z, in part.

- 1 Leaves elliptic, oblanceolate or lanceolate, 8-30 cm long, the apices acuminate, sometimes only shortly so; spine-covered husk of fruit splitting into 4 sections, enclosing (2-) 3 (-5) nuts; nut flattened on at least one side, 18-25 mm in diameter; pistillate dichasia of 3 flowers; leaves usually without stellate trichomes; twigs puberulent or glabrous.
  - 2 Undersurface of leaves densely covered with bulbous-based trichomes when young, essentially glabrous in age; leaves mostly > 15 cm long, generally long-acuminate; twigs glabrous; trees single-trunked; spines of fruit husk weak, easily bent.....*C. dentata*
  - 2 Undersurface of leaves persistently and densely tomentose beneath; leaves mostly < 15 cm long, generally short-acuminate; twigs puberulent; trees multi-trunked from base; spines of fruit husk stiff; nut .....*C. mollissima*
- 1 Leaves elliptic to oblanceolate, mostly < 15 cm long, the apices acute to obtuse; twigs puberulent; spine-covered husk of fruit splitting into 2 sections, enclosing 1 nut; nut circular in cross-section, 7-19 mm in diameter; pistillate dichasia of 1 flower; leaves with stellate trichomes, with few bulbous-based trichomes when young, puberulent, pilose, tomentulose, or tomentose in age (usually rather densely so).
  - 3 Longest spines of the fruit husk usually >10 mm long; young twigs glabrous; petiole 8-10 (-15) mm long; [plants of n. AL and westward].. .....*C. ozarkensis*

- 3 Longest spines of the fruit husk usually <10 mm long; young twigs puberulent; petiole 3-7 (-10) mm long; [plants widespread in our area].  
 ..... *C. pumila*

*Castanea dentata* (Marshall) Borkhausen, American Chestnut. Mesic and xeric forests. June-July; September-October. S. ME, s. ON, MI, c. IN, s. IL, south to c. NC, c. GA, Panhandle FL, and sc. MS. Formerly one of the most important, largest, and most abundant forest trees in the Mountains of our area, *C. dentata* was severely affected by chestnut blight, *Cryphonectria parasitica* (Murrill) Barr, introduced at New York City in 1904 on nursery stock of *C. mollissima*. Blight spread steadily southward, reaching our area in the 1920's and 1930's. *C. dentata* remains rather abundant, but now occurs only as stump sprouts and small trees, usually reinfected by blight persisting on oaks and killed at about the size of first fruit production. The accidental introduction of chestnut blight and the subsequent profound alteration of the role of chestnut is one of the most tragic ecological disasters to have affected our area. *Castanea ×neglecta* Dode (pro sp.) [*C. dentata* × *pumila*], occurs in our area; "the leaves of the hybrid resemble those of *C. dentata* in size and shape but have the vestiture and stellate trichomes of *C. pumila*" (Johnson 1988). [= RAB, C, F, FNA, G, K, Pa, S, W, WH, Z]

\* *Castanea mollissima* Blume, Chinese Chestnut. Forests; native of China. June; September. This species is relatively resistant to chestnut blight and has been planted widely as an ornamental and nut tree; it sometimes naturalizes and appears nearly native. Reported for NC (Macon County) by Pittillo & Brown (1988). [= C, FNA, K, Pa, WH]

*Castanea ozarkensis* W.W. Ashe, Ozark Chinquapin. Dry forests. May-July; September-October. S. MO, e. OK, and w. AR; disjunct in c. AL, where now apparently extirpated by blight. *C. ozarkensis* is related to *C. pumila*, though showing some relation as well to *C. dentata*. *C. ozarkensis* is more susceptible to blight than *C. pumila*. [= FNA, S; = *C. pumila* P. Miller var. *ozarkensis* (W.W. Ashe) G.E. Tucker – K, Z]

*Castanea pumila* (Linnaeus) P. Miller, Common Chinquapin. Xeric forests and woodlands, generally in fire-maintained habitats. May-July; September-October. NJ, s. PA, s. OH, n. KY, and s. MO, south to c. peninsular FL and se. TX. It is relatively resistant to chestnut blight. [= FNA, Pa, WH; = *C. pumila* var. *pumila* – C, K, Z; > *C. pumila* var. *pumila* – RAB, F; > *C. pumila* var. *ashei* Sudworth – RAB, F; > *C. alnifolia* Nuttall var. *alnifolia* – RAB; > *C. alnifolia* var. *floridana* Sargent – RAB; > *C. pumila* – G, S, W; > *C. ashei* (Sudworth) Sudworth – S; > *C. floridana* (Sargent) Ashe – S; > *C. alnifolia* – S]

\* *Castanea sativa* P. Miller, Spanish Chestnut. Reported as naturalized in KY, AL, PA, and elsewhere in e. North America (Clark et al. 2005). [= K] {not yet keyed; synonymy incomplete}



**Fagus** Linnaeus 1753 (Beech)

A genus of about 10 species, trees, of temperate regions of the Northern Hemisphere. Our native trees belong to subgenus *Fagus*, section *Grandifolia* (Shen 1992). References: Cooper & Mercer (1977)=Z; Nixon in FNA (1997); Shen (1992)=X; Kubitzki in Kubitzki, Rohwer, & Bittrich (1993); Elias (1971a)=Y; Stanford (1998); Govaerts & Frodin (1998)=V.

- 1 Leaves denticulate; cupule prickles 1-2.5 (-4) mm long, slightly to strongly recurved; cupule valves generally ovate, the apex obtuse, reddish in color; leaves with fairly dense white acicular trichomes on the lower leaf surface at maturity; leaf base sometimes clearly cordate; [plants of the Coastal Plain, Piedmont, and low to moderate elevations (mostly below 1050 m or 3500 feet) in the Mountains] ..... *F. grandifolia* var. *caroliniana*
- 1 Leaves sharply serrate; cupule prickles (3-) 4-10 mm long, projecting forward; cupule valves generally narrowly triangular, the apex acute, grayish-yellow in color; leaves usually lacking white acicular trichomes on the lower surface at maturity, instead with yellowish glandular hairs (acicular trichomes often present on the veins); leaf base not clearly cordate; [plants of moderate to high elevations (mostly above 1050 m or 3500 feet) in the Mountains] ..... *F. grandifolia* var. *grandifolia*

*Fagus grandifolia* Ehrhart var. *caroliniana* (Loudon) Fernald & Rehder, White Beech, American Beech. Moist forests, from near sea level to low elevations in the Mountains, mostly below 1050 meters (3500 feet). March-May; September-October. Se. MA, OH, IN, s. IL, s. MI (?), and MO south to Panhandle FL and e. TX. Several subspecies, varieties, or phases of *Fagus grandifolia* have been described, and their taxonomic recognition is controversial. The most recent monographer, Shen (1992), recognizes three subspecies, one of which is limited to Mexico, the other two as treated here but at the subspecific level. I have here chosen to recognize 2 intergradient varieties in our area. A third variety, var. *mexicana* (Martínez) Little, of the mountains of México, is apparently most closely related to var. *grandifolia*. Cooper & Mercer (1977) studied variation in NC, concluding that two genetic races or varieties were present, the montane var. *grandifolia* and the Piedmont and Coastal Plain var. *caroliniana*, but that patterns of variation were complicated. Hardin & Johnson (1985) and Hardin (1992, 1985) note that variation is "more-or-less" clinal, variation within populations is great, and they do not favor recognition of infraspecific taxa. Depending on one's tolerance or intolerance for intergradational varieties, one may choose to recognize one or two taxa in our

area. [= C, F, G, Y; < *F. grandifolia* – RAB, FNA, K, Pa, S, W, WV, Z; < *F. grandifolia* ssp. *grandifolia* – V; = *F. grandifolia* ssp. *caroliniana* (Loudon) Camp ex Shen – X, nomen nudum; = *F. ferruginea* Aiton]

***Fagus grandifolia* Ehrhart var. *grandifolia***, Gray Beech, Red Beech, American Beech. Moderate to high elevation forests, especially on high elevation ridges, gaps, and open slopes, often forming clonal dwarfed thickets in the most exposed situations. April-May; September-October. NS, NB, and s. QC west to s. ON and n. MI, south to VA, w. NC, n. GA, e. TN, and n. OH. "Red beech" is alleged to differ from "gray beech" in having the involucre 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, Pa, S, W, WV, Z; < *F. grandifolia* ssp. *grandifolia* – V; = *F. grandifolia* ssp. *grandifolia* – X]

\* *Fagus sylvatica* Linnaeus, European Beech, Copper Beech, of subgenus *Fagus*, section *Fagus*, is sometimes cultivated, but is not known to escape in our area. It has only 5-10 (-12) lateral veins, as opposed to (12-) 15-18 (-20) in *F. grandifolia*. {not keyed} [= V; ? *F. sylvatica* ssp. *sylvatica* – X] {not keyed}

### ***Quercus* Linnaeus 1753 (Oak)**

A genus of about 350-530 species, trees and shrubs, of temperate, subtropical, and rarely tropical regions of the Northern Hemisphere. Oaks are the predominant tree of our area, with a variety of species dominating much of the landscape in nearly every ecological situation. Only in a few specialized (and usually in some sense edaphically extreme) communities are oaks generally entirely absent: deepest Coastal Plain swamps, some Coastal Plain depression ponds, wettest pine savannas, pocosins, spruce-fir forests, highest elevation northern hardwood forests, and mountain bogs.

Our native oaks are divided into two well-marked sections; other sections occur outside our area. Red oaks (section *Lobatae*, sometimes treated as subgenus *Erythrobalanus*) are characterized by acorns maturing in two years (in one year in *Q. elliotii*), styles elongate, abortive ovules are at the top of the seed, leaves and leaf lobes bristle-tipped, inner surface of the acorn shell velvety-pubescent, and acorns rooting in spring. White oaks (section *Quercus*, sometimes treated as subgenus *Quercus*) are characterized by acorns maturing in a single year, styles short or absent, abortive ovules at the base of the seed, leaves and leaf lobes not bristle-tipped, inner surface of the acorn shell smooth, and acorns rooting in autumn. Twenty of our *Quercus* species are in this group: *Q. alba*, *Q. austrina*, *Q. bicolor*, *Q. boyntonii*, *Q. chapmanii*, *Q. geminata*, *Q. lyrata*, *Q. macrocarpa*, *Q. margarettae*, *Q. michauxii*, *Q. minima*, *Q. montana*, *Q. muehlenbergii*, *Q. oglethorpensis*, *Q. prinoides*, *Q. robur*, *Q. similis*, *Q. sinuata* var. *sinuata*, *Q. stellata*, and *Q. virginiana*. Hybrids within each section are frequent and diverse; hybrids do not naturally occur between the two sections. The live oaks of the southeastern Coastal Plain and Central America are subsection *Virentes*; other white oaks are subsection *Quercus*. References: Nixon in FNA (1997) (overall treatment); Jensen in FNA (1997) (red oaks); Nixon & Muller in FNA (1997) (white oaks); Godfrey (1988); Stein, Binion, & Acciavatti (2003); Cronquist (1991); Duncan & Duncan (1988); Hunt (1990)=Z; Hunt (1994); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** Many oak species are well-adapted to ecological situations in which fires frequently burn the ground layer. Fire-maintained communities of the Piedmont and Mountains typically have oaks such as *Q. stellata*, *Q. marilandica* var. *marilandica*, *Q. ilicifolia*, and *Q. prinoides*. The two latter species are normally shrubby, and have become rarer because of fire suppression (they require fire to prevent larger trees from outcompeting them). In contrast, *Q. stellata* and *Q. marilandica* var. *marilandica* become larger and more frequent in fire-suppressed conditions.

Fifteen oak species in our area are typical of upland Coastal Plain communities with at least occasional fire: *Q. arkansana*, *Q. chapmanii*, *Q. geminata*, *Q. hemisphaerica*, *Q. incana*, *Q. laevis*, *Q. margarettae*, *Q. marilandica* var. *marilandica*, *Q. minima*, *Q. myrtifolia*, *Q. stellata*, and less typically *Q. falcata*, *Q. nigra*, *Q. velutina*, and *Q. virginiana*. Fire suppression of Coastal Plain communities, especially of sandhills, leads to an unnatural increase in the stature and abundance of oaks present. In frequent fire conditions, most oaks will persist as short, shrubby fire sprouts. Additional suggestions of how to recognize fire sprouts of these species are given below. In general, leaves of fire sprouts are larger and more deeply lobed than normal leaves. In species of the red oak group, the bristle tips are larger and more pronounced. Increased size in leaves is particularly noticeable when an area previously long fire-suppressed is burned (the large underground root system and nutritional resources of a small tree destroyed by fire being devoted to a few very vigorous sprouts). Fire sprouts are often in sunny conditions, which tend to make oak leaves more deeply lobed and more coriaceous than shaded leaves.

White oaks with lobed leaves:

*Q. margarettae* – Often forms dense clonal, stoloniferous patches in frequent fire conditions. Tends to retain standard leaf characteristics.

*Q. stellata* – Less prone to form clonal patches. Sprout leaves often very large, with exaggerated lobing.

Red oaks normally with deeply lobed leaves:

*Q. laevis* – Not clonal. Vigorous sprouter, leaves more deeply lobed than any other fire red oak. Small sprouts often have vertical leaf orientation characteristic of adults, though vigorous fire sprouts sometimes have more normally disposed leaves. Sprout leaves sometimes very large, with very long, curving lobes.

*Q. falcata* – Not clonal. Sprout leaves generally less lobed than typical adult leaves, more like forma *triloba*, but larger and coarser in texture, difficult to distinguish in shape from *Q. marilandica* var. *marilandica* and *Q. velutina*. See pubescence differences in main key.

*Q. velutina* – Not clonal. Leaves variable, sometimes minimally lobed and closely resembling *Q. marilandica* var. *marilandica* and *Q. falcata*. See pubescence differences in main key.

Red oaks normally with unlobed leaves:

*Q. marilandica* var. *marilandica* – Sprout leaves sometimes coarsely (though never deeply) lobed. Texture often very coriaceous, shiny, and very stiff. See pubescence characters in main key.



*Q. nigra* – Not very typically in fire-prone situations, but sometimes so. Young saplings, as well as fire sprouts, often with wildly different leaves than the typical adult form, frequently deeply lobed (for excellent illustrations showing variability in leaf shapes, see p. 329 of Godfrey, 1988 and pp. 51-52 of Godfrey & Wooten, 1981). Leaves always smaller and more glabrous than those of other fire oaks (except *Q. hemisphaerica*).

*Q. incana* – Generally not strongly clonal and stoloniferous even in frequently burned situations. Fire sprouts and vigorous shoots more prone to lobing than adult trees. Even fire shoots, though, usually with only one to several lobes, and the characteristic bluish-green characteristic holds. See comments above on *Q. elliotii*.

*Q. elliotii* – Strongly clonal via a stoloniferous "runner", never tree-like. Leaves never lobed, even on fire sprouts, though fire sprout leaves can be larger (to 15 cm long and 5 cm wide). Very difficult to tell from fire sprouts or seedlings of *Q. incana*, best separated by leaf pubescence (white in *Q. elliotii*, gray in *Q. incana*), margin (slightly revolute in *Q. elliotii*, flat in *Q. incana*), leaf vernation (planate in *Q. incana*, rolled in *Q. elliotii*), and acorn maturation (1 year in *Q. elliotii*, with acorns often on small plants, 2 years in *Q. incana*, with small plants rarely producing acorns).

*Q. hemisphaerica* – Not clonal. Leaves of vigorous shoots and fire sprouts often shallowly lobed, the lobing usually fairly neat and regular, triangular-ascending, and with bristle tips.

Live oaks:

*Q. geminata* – Sometimes clonal. Leaves, even of sprouts, not normally with lobes or teeth.

*Q. virginiana* – Sometimes clonal. Leaves of vigorous summer shoots (but apparently not spring shoots) often coarsely toothed, very similar to similar leaves of *Q. hemisphaerica*, but lacking bristle tips (instead the translucent margin with a darker, thickened callus at the tip of the tooth).

*Q. minima* – Always clonal. Leaves often with teeth or lobes.

Some oaks with ambiguous leaves are keyed in both Key A and Key D or in both Key B and Key C. The leaves of juvenile (seedling or sapling) branches, fire-sprout shoots, or other vigorous shoots (resulting from similar stimuli such as insect damage) are often much different than typical leaves and are not accounted for in these keys (see discussion at end of generic treatment). Hybrids are frequently encountered; they, too, are not keyed here, but can usually be identified (with difficulty) by their intermediate morphology and by parental context. Trichome types are useful in making and confirming identifications of oaks, since certain types are restricted to various groups of species. Hand lenses of 10× or 20× can be useful, but a dissecting scope with 20× to 40× dissecting microscope is far preferable. See Hardin (1992, 1976, 1979), and Thomson & Mohlenbrock (1979).

- 1 Most of the leaves on a relatively mature tree entire and unlobed (some species frequently with some leaves on a tree, especially those on young or vigorous growth, that are toothed or shallowly lobed, the teeth or lobes generally few and irregular in size or location); [primarily either "laurel oaks" of section *Lobatae* or "live oaks" of section *Quercus*] ..... **Key A**
- 1 Most of the leaves on a relatively mature tree lobed or toothed.
  - 2 Venation of the leaves neatly and evenly pinnate, the 3-17 (or more) main lateral veins on each side distinctly parallel to each other, each ending in a tooth or shallow, crenate lobe extending < ¼ of the way to the midrib; ["chestnut oaks" of sections *Quercus* and *Cerris*] ..... **Key B**
  - 2 Venation of the leaves pinnate, but more branched and irregular, the 1-7 main lateral veins on each side rebranching into prominent side veins, the leaf usually distinctly lobed, at least some of the lobes of some of the leaves of a tree extending > ¼ of the way to the midrib.
    - 3 Apices of the lobes or teeth obtuse (rarely acute), lacking bristle tips; ["white oaks" of section *Quercus*] ..... **Key C**
    - 3 Apices of the lobes or teeth acuminate (rarely acute), and with bristle tips; ["red oaks" of section *Lobatae*] ..... **Key D**

#### Key A – Leaves (most of them) entire and unlobed (Laurel Oaks and Live Oaks)

- 1 Leaves broadly obovate or spatulate, 1-2.5 (-3)× as long as wide.
  - 2 Leaves 10-30 cm long, with rounded, subcordate, truncate, or oblique bases; lower leaf surfaces thinly to densely pubescent with tawny to orange glandlike hairs; [section *Lobatae*] ..... *Q. marilandica* var. *marilandica*
  - 2 Leaves 2-10 (-15) cm long, mostly with cuneate or rounded bases (in some species sometimes subcordate, truncate, or oblique); lower leaf surfaces glabrous, glabrescent, or pubescent, but the pubescence not orange and glandlike.
    - 3 Twigs of the current year densely and finely hairy, obscuring the surface; [scrubby trees of sandhills from se. SC southward]; [section *Quercus*] ..... *Q. chapmanii*
    - 3 Twigs of the year glabrous or sparsely pubescent; [shrubs, scrubby small trees, or large trees of various habitats].
      - 4 Leaves grayish beneath; [section *Quercus*] ..... *Q. sinuata* var. *sinuata*
      - 4 Leaves bright green or orange-scurfy beneath; [section *Lobatae*].
        - 5 Leaf blade strongly convex; lower leaf surface orange-scurfy; [of sandhills and scrub from n. FL southward] ..... *Q. inopina*
        - 5 Leaf blade planar (the margins sometimes revolute); lower leaf surface glabrous or pubescent and also with tufts of hairs in the vein axils; [collectively more widespread in habitat and distribution].
          - 6 Leaves evergreen, (including the petiole) usually < 4 cm long (sometimes to 9 cm long) and < 2 cm wide (to 6 cm wide); lower leaf surface usually entirely glabrous at maturity (rarely with pubescence in the vein axils); leaf blades rarely lobed; [shrub to scrubby tree of sandhills in se. SC and southward] ..... *Q. myrtifolia*
          - 6 Leaves deciduous, (including the petiole) usually > 5.5 cm long (rarely smaller) and usually 3-5 cm wide; lower leaf surface usually with tufts of hairs in the main vein axils beneath; leaf blades often lobed.
            - 7 Leaves with broadly cuneate to rounded leaf bases, the blades 5-15 cm long; lower leaf surfaces generally pubescent across the surface, and also with tufts in the axils; [of sw. GA westward] ..... *Q. arkansana*
            - 7 Leaves with cuneate bases, the blades 5-10 (-15) cm long; lower leaf surfaces glabrous, except for tufts of hairs in the vein axils; [widespread in our area] ..... *Q. nigra*
    - 1 Leaves linear, elliptic, or narrowly obovate, 2-10× as long as wide.
      - 8 Leaves (at maturity) glabrous or at most sparsely pubescent on the surface below, though often with tufts of hairs in the main vein axils.
        - 9 Twigs of the year densely and finely hairy, obscuring the surface; leaves (at maturity) sparsely pubescent beneath; [scrubby trees of sandhills from se. SC south]; [section *Quercus*] ..... *Q. chapmanii*

- 9 Twigs of the year glabrous or sparsely pubescent; leaves (at maturity) bright green and glabrous beneath, though often with tufts of hairs in the main vein axils; [medium to large trees, more widespread, mostly of moist habitats, except *Q. hemisphaerica*]; [section *Lobatae*].
- 10 Leaves predominantly lanceolate, mostly 6-12 cm long and 0.7-2 cm wide, most of them 5-8× as long as wide, the apex acute; mature leaves with tufts of hairs in the vein axils below, and sometimes also some pubescence on the blade surface near the midrib; blades never with lobes or teeth; leaves deciduous in autumn; young leaves bronze red, emerging tightly rolled lengthwise and appearing linear; [trees of bottomlands and upland depression swamps, mesic uplands, and also weedy and frequent in disturbed successional habitats] ..... *Q. phellos*
- 10 Leaves predominantly oblanceolate, obovate, or rhombic, mostly 2.5-10 cm long and 1.5-4 cm wide, most of them 2-5× as long as wide, the apex acute, obtuse, or rounded; mature leaves with or without tufts of hairs in the vein axils below, lacking pubescence on the blade surface; blades sometimes with 1-5 lateral lobes or teeth; leaves persisting until spring, or tardily and irregularly deciduous in winter; young leaves red, yellow, or green, not emerging tightly rolled lengthwise; [trees primarily either of swamp forests, maritime forests, or sandhills, not typically weedy].
- 11 Mature leaves entirely glabrous below; leaves mostly with acute apices and bristle tips (rarely a few rounded), mostly 2.5-8 cm long and 1-2 (-3) cm wide, the upper surface shiny, the vein network not readily visible when backlit; leaves evergreen (persisting until spring); petiole 0.5-2 mm long; leaves of vigorous growth often with dentate lobes; [trees of dry sandy habitats, such as sandhills and maritime forests] ..... *Q. hemisphaerica*
- 11 Mature leaves with tufts of stellate trichomes in the vein axils; leaves mostly with rounded apices (rarely a few acute and then bristle-tipped), mostly 5-10 cm long and (1.8-) 2-4 cm wide, the upper surface dull, the vein network readily visible when backlit; leaves tardily deciduous; petiole 2-6 mm long; leaves of vigorous growth rarely lobed, and then not dentate; [trees of moist habitats, such as floodplain forests] ..... *Q. laurifolia*
- 8 Leaves (at maturity) persistently and densely pubescent on the surface below, the pubescence in some species so dense and tight as to be difficult to perceive without at least 10× magnification.
- 12 Leaves bristle-tipped (sometimes the bristle fallen or broken off, but leaving a truncate scar), deciduous in autumn; multi-armed trichomes of the rosulate or multiradiate types, many of the arms ascending or erect (never with the stellate or fused-stellate trichomes characteristic of the live oaks); acorns maturing in 2 years (immature acorns present through the winter on fruiting trees); [section *Lobatae*].
- 13 Leaves (including petiole) mostly 10-17 cm long, 3.5-7 cm wide; lower leaf surface (at maturity) sparsely to moderately densely pubescent with soft hairs; leaves lustrous dark-green above; [trees of the Mountains, Piedmont, and rarely Coastal Plain] ..... *Q. imbricaria*
- 13 Leaves (including petiole) mostly 4-11 cm long, 0.5-3.0 cm wide; lower leaf surface densely covered with soft hairs; leaves lustrous dark-green or bluish-green above; [stoloniferous shrubs and small to medium trees of the Coastal Plain].
- 14 Leaves 0.5-1.5 cm wide, mostly 4-8× as long as wide, lustrous dark-green above; acorns 8-12 mm long; petioles 1-3 mm long; [plant a stoloniferous shrub, to 1 m tall (or to 2 m in fire-suppressed pinelands)] ..... *Q. elliotii*
- 14 Leaves 1.5-3.0 cm wide, mostly 2-4× as long as wide, dull bluish-green above; acorns 10-15 mm long; petioles 4-15 mm long; [plant a small to medium tree] ..... *Q. incana*
- 12 Leaves not bristle-tipped, evergreen (overwintering, falling with the expansion of new leaves in the spring) or deciduous (in *Q. oglethorpensis*); multi-armed trichomes of the fused-stellate and stellate types, the arms parallel to the leaf surface, radiating from a well developed disc that appears as a white eye or dot at 20-40× magnification (or rosulate or multiradiate in *Q. oglethorpensis*); acorns maturing in 1 year (immature acorns not present through the winter, unless aborted); [section *Quercus*].
- 15 Leaves deciduous in autumn; bark gray, resembling *Q. alba*; [trees of bottomlands and upland clay flats of GA and SC] ..... *Q. oglethorpensis*
- 15 Leaves evergreen (overwintering, falling with the expansion of new leaves in the spring); bark (on the tree species) brownish, deeply furrowed; [trees and stoloniferous shrubs of sandy habitats of the Coastal Plain of GA, NC, SC, and VA].
- 16 Plant a stoloniferous shrub, to 1 m tall (or to 2 m in fire-suppressed pinelands) and producing acorns at that size ..... *Q. minima*
- 16 Plant a small to large tree, not producing acorns until >2m tall.
- 17 Leaf blades with the margins strongly revolute, and also the sides of the blades generally rolled downward and obscuring part of the lower surface, the leaf appearing boatlike (the depth of the "boat" often approaching the width of the leaf); midvein and major lateral veins impressed on the upper surface and raised on the lower surface (the lower surface therefore appearing rugose); buds dark brown; cup scales gray-tipped; pubescence of the lower surface stellate, both appressed and erect, the individual stellae readily visible at 20× magnification (sometimes at 10× magnification); acorns (1-) 2 (-6) per stalk; [typically a small tree of dry sands] ..... *Q. geminata*
- 17 Leaf blades flat, or the margins slightly to strongly revolute, the sides of the blade sometimes rolled downward, usually not obscuring part of the lower surface, the leaf not boatlike (the leaf much wider than deep); midvein and major lateral veins not impressed (or very slightly so) on the upper surface and only very slightly, if at all, raised on the lower surface (the lower surface therefore not appearing notably rugose); buds red-brown; cup scales red-tipped; pubescence of the lower surface stellate, all of it tightly appressed, the individual stellae readily visible only at 30× magnification (sometimes barely distinguishable at 20× magnification); acorns 1-2 per stalk; [typically a large upland or bottomland tree, or northwards a salt-pruned shrub to large tree of dunes and estuarine shorelines] ..... *Q. virginiana*

#### Key B – Leaves with even crenations or teeth (Chestnut Oaks)

- 1 Scales of the acorn cup prolonged and long tapered; lateral veins terminating in a well-developed bristle; [species planted, rarely escaped]; [section *Cerris*] ..... *Q. acutissima*
- 1 Scales of the acorn cup acute to obtuse; lateral veins terminating in a minute mucro or hardened projection; [species native]; [section *Quercus*].
- 2 Acorns on peduncles (2-) 4-7 cm long; acorns 1.5-2.5 cm long; veins ending in crenations usually 6-10 on each side of leaf ..... *Q. bicolor*
- 2 Acorns sessile or on peduncles 0-1 cm long; acorns 1-2 cm or 2.5-3.5 cm long; veins ending in crenations usually 8-15 or 3-7 (if 3-7, then a stoloniferous shrub).

- 3 Leaves mostly obovate, with rounded teeth (crenations), the teeth sometimes with a minute mucro; hairs of the leaf undersurface clustered in sessile, stellate-appearing clusters of 2-8 hairs; acorns 2.5-3.5 cm long; large trees.
- 4 Hairs of the leaf undersurface in clusters with a diameter of 0.15-0.5 mm, dense to sparse; bark of mature trees light gray, loose, breaking into plates or scales..... *Q. michauxii*
- 4 Hairs of the leaf undersurface asymmetric, appressed-stellate, with a diameter of 0.1-0.25 mm, sparse; bark of mature trees dark gray, tight, deeply furrowed ..... *Q. montana*
- 3 Leaves mostly narrowly elliptic, narrowly ovate, or narrowly obovate (but sometimes broadly obovate), with sharp ascending, often incurved teeth, the teeth ending in a hardened projection; hairs of the leaf undersurface tiny and stellate, with 6-10 rays parallel to the leaf surface; acorns 1-2 cm long; medium to large trees or stoloniferous shrubs.
- 5 Medium to large tree; veins ending in teeth usually 7-13 on each side of the leaf; leaves 8-20 cm long and 4-10 cm wide; [of dry to moist calcareous woodlands and forests]..... *Q. muehlenbergii*
- 5 Stoloniferous shrub to 5 m tall; veins ending in teeth usually 3-8 (-9) on each side of the leaf; leaves 4-10 (-14) cm long and 2-6 (-8) cm wide; [of dry, often sandy and acid woodlands]..... *Q. prinoides*

### Key C – Leaves with lobes not bristle-tipped (White Oaks)

- 1 Lower surfaces of mature leaves glabrous.
  - 2 Leaf lobes with acute apices; sinuses often both broad and "flat-bottomed" (with portions parallel to the midrib); acorn cup covering 2/3 to 3/4 of acorn ..... *Q. lyrata*
  - 2 Leaf lobes with obtuse apices; sinuses narrow (often notch-like), narrowly to broadly rounded or triangular (lacking portions parallel to the midrib); acorn cup covering 1/4 to 1/2 of acorn.
    - 3 Leaves mostly 4-10 (-17) cm long, 2-5 (-9) cm wide, with 1-5 shallow lobes or undulations, extending 1/8 to 1/2 of the way to the midrib; acorn cup flat at the base, covering < 1/4 of the acorn..... *Q. sinuata* var. *sinuata*
    - 3 Leaves mostly 7-20 cm long, 3-10 cm wide, with 3-11 lobes, extending 1/4 to 5/6 of the way to the midrib (if the lobing < 1/2 of the way to the midrib, then the acorn cup rounded at the base and covering 1/4 to 1/2 of the acorn).
      - 4 Leaf base deeply cordate; [alien, sometimes planted and persistent] ..... *[Q. robur]*
      - 4 Leaf base cuneate; [native]
        - 5 Leaves with 7-11 lobes (the sinuses usually deep, those of the larger leaves usually about 2/3 to 5/6 of the way to the midrib), 10-20 cm long, 5-10 cm wide; terminal bud rounded or globose; basal scales of acorn cup thickened, the thickening giving the cup a knobby texture ..... *Q. alba*
        - 5 Leaves with 3-7 lobes (the sinuses usually shallow, those of the larger leaves usually ranging from 1/4 to 1/2 of the way to the midrib), 7-15 cm long, 3-8 cm wide; basal scales of the acorn cup thin, appressed, the cup having a rough but not knobby texture.. ..... *Q. austrina*
- 1 Lower surfaces of mature leaves pubescent, the pubescence varying from dense to sparse (sometimes minute and requiring 10× magnification to be readily visible).
  - 6 Lower surfaces of mature leaves whitish to pale green, with a mixture of minute, sessile, stellate hairs with horizontal tips and longer stellate hairs with erect ascending tips; leaves shallowly lobed (if so, the lobes 9-19) to deeply lobed (if so, the lobes with acute apices), the sinuses extending 1/4 to 4/5 of the way to the midrib.
    - 7 Leaves mostly shallowly lobed at the base, the sinuses extending 1/4 to 1/2 of the way to midrib, grading into mere crenations toward the tip of the leaf, the total number of lobes/crenations usually 9-19; acorns borne on peduncles 2-10 cm long; acorn cup covering 1/3 to 1/2 of acorn, the upper scales with long-acuminate apices..... *Q. bicolor*
    - 7 Leaves mostly relatively deeply lobed throughout the length of the leaf, the sinuses extending 1/2 to 4/5 of the way to the midrib, the total number of lobes 3-13; acorns sessile or borne on peduncles up to 1 cm long; acorn cup covering 1/3 to 3/4 of acorn, the upper scales with acute, long-acuminate, to long-awned apices.
      - 8 Upper scales of the acorn cups thin and acute; acorn cup covering 1/2 to 3/4 of the acorn; [swamps in the Coastal Plain and lower Piedmont of GA, NC, SC, and VA]..... *Q. lyrata*
      - 8 Upper scales of the acorn cups long-attenuate into nearly terete awns; acorn cup covering 1/3 to 1/2 of the acorn; [Mountains of VA] ..... *Q. macrocarpa* var. *macrocarpa*
  - 6 Lower surfaces of mature leaves gray, green, pale green, or yellowish, glabrescent or densely pubescent, the hairs few-branched and erect; leaves mostly relatively deeply and obtusely lobed, rarely shallowly lobed (if so, the lobes 3-7), the sinuses extending 1/2 to 4/5 of the way to the midrib, the total number of lobes 3-7; acorns sessile or nearly so.
    - 9 Leaf lobes with acute apices; acorn cup covering 2/3 to 3/4 of acorn ..... *Q. lyrata*
    - 9 Leaf lobes with obtuse to rounded apices; acorn cup covering 1/3 to 1/2 of acorn.
      - 10 Woody twigs of the season glabrous or with scattered, deciduous 2-forked hairs; petioles of mature leaves 3-10 (-15) mm long; leaf blades (2.5-) 4-8 (-13.5) cm long, irregularly and often rather shallowly 3-5 (-7) lobed, the overall form of the leaf only rarely cruciform; largest lateral lobes usually at the midpoint of the blade (or even below it), the lobes usually not sublobed, tapering from base to tip; [xeric sandy sites in the Coastal Plain from se. VA southward] ..... *Q. margaretae*
      - 10 Woody twigs of the season densely and persistently stellate-pubescent, especially toward the tip of the twig; petioles of mature leaves 15-20 mm long (*Q. stellata*) or 3-10 (-15) mm long (*Q. boyntonii* and *Q. similis*); leaf blades (5-) 7.5-15 (-20) cm long, usually 5-lobed, the overall form of the leaf typically cruciform (*Q. stellata*) or not (*Q. boyntonii* and *Q. similis*); largest lateral lobes of the leaves usually above the midpoint of the blade, these lobes **either** often sublobed or squarish in shape, usually wider near their tips than at their bases (*Q. stellata*) **or** not sublobed, tapering from base to tip (*Q. boyntonii* and *Q. similis*); [collectively widespread in our area].
        - 11 Leaves usually cruciform, the largest lateral lobes often sublobed or squarish in shape, usually wider near their tips than at their bases, and borne at right angles to the midrib; [usually of dry to dry-mesic upland situations, widespread in our area] ..... *Q. stellata*
        - 11 Leaves not cruciform, the largest lateral lobes usually not sublobed, the lobes tapering from base to tip, and borne at ascending angles relative to the midrib; [of temporarily flooded calcareous swamps of the Coastal Plain, from SC (NC?) southward in our area (*Q. similis*) or localized on sandstone in nc. AL (*Q. boyntonii*)].
      - 12 Rhizomatous shrubs to small trees, generally < 2 m tall; [of sandstone outcrops in nc. AL] ..... *Q. boyntonii*

- 12 Single-trunked large trees; [usually of temporarily flooded calcareous swamps of the Coastal Plain, from SC (NC?) southward in our area] ..... *Q. similis*

**Key D – Leaves with lobes or teeth bristle-tipped (Red Oaks)**

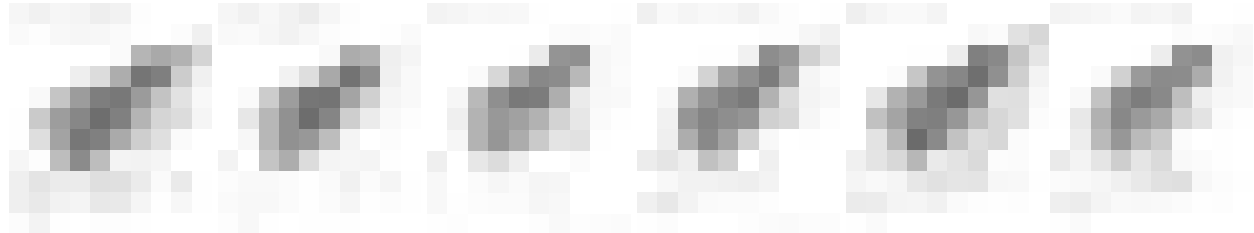
- 1 Leaves shallowly 3-lobed near the broad apex (some leaves of sprout or juvenile shoots may be more lobed).
- 2 Leaf blades 5-15 cm long; lower leaf surfaces glabrous, except for tufts of hairs in the vein axils (or pubescent across the surface in *Q. arkansana*).
- 3 Leaves with broadly cuneate to rounded leaf bases, the blades 5-15 cm long; lower leaf surfaces generally pubescent across the surface, and also with tufts in the axils; [of sw. GA westward] ..... *Q. arkansana*
- 3 Leaves with cuneate bases, the blades 5-10 (-15) cm long; lower leaf surfaces glabrous, except for tufts of hairs in the vein axils; [widespread in our area] ..... *Q. nigra*
- 2 Leaf blades 10-30 cm long; lower leaf surfaces pubescent across the surface (and often also with denser tufts of hairs in the vein axils).
- 4 Petioles short and stout, 5-15 mm long; lower leaf surfaces thinly to densely pubescent with a mixture of tawny or orange glandlike hairs and stellate hairs whose structure is easily visible at 10× magnification ..... *Q. marilandica* var. *marilandica*
- 4 Petioles long and slender, (14-) 20-50 mm long; lower leaf surfaces densely puberulent with tawny stellate hairs whose structure is barely visible at 10× magnification ..... *Q. falcata*
- 1 Leaves shallowly to deeply 5-12-lobed (some of the leaves of *Q. georgiana* only 3-lobed), the lobes primarily lateral.
- 5 Mature leaves pubescent beneath on the surface with stellate hairs.
- 6 Leaves 5-10 (-12) cm long, 5-lobed; shrub or small tree; [w. NC northward] ..... *Q. ilicifolia*
- 6 Leaves (8-) 10-20 cm long, 5-12-lobed; small to large trees [collectively widespread in our area].
- 7 Petioles 0.5-1.0 (-1.8) cm long, generally twisted such that the blade is oriented in a vertical plane; leaves all deeply lobed, some of the sinuses extending > 4/5 of the way to the midrib; pubescence of the lower leaf surface greenish yellow, matted, and glandlike, usually sloughing off by late in the year ..... *Q. laevis*
- 7 Petioles 2-5 cm long, not twisted so that the blade is oriented in a vertical plane; leaves shallowly to deeply lobed, some of the leaves on a tree generally shallowly lobed, none of the sinuses extending > 2/3 of the way to the midrib; pubescence of the lower leaf surface tawny or gray, stellate, not glandlike, persistent or sloughing off by late in the year.
- 8 Acorns 12-20 mm long, in a cup 15-25 mm across and 10-12 mm deep; mature leaves loosely and rather coarsely pubescent (the stellate hairs conspicuous and readily distinguishable at 10× magnification), often becoming nearly or entirely glabrous by late in the year (except for tufts of hairs in the vein axils); terminal bud 4-angled, 7-10 mm long, densely gray-tomentose ..... *Q. velutina*
- 8 Acorns 10-15 mm long, in a cup 12-14 mm across and 4-5 mm deep; mature leaves densely and finely pubescent (the stellate hairs minute and scarcely distinguishable at 10× magnification), the pubescence permanent; terminal bud only obscurely angled (if at all), 5-8 mm long, brown-puberulent.
- 9 Base of blades of sun-leaves typically rounded, thus forming a U-shape (some leaves cuneate, angled, or oblique); terminal lobe of leaves generally long-attenuated, narrow (its sides nearly parallel for much of its length), and curved to one side (falcate) (note that trees with the trilobed leaf form will key out above); leaves with 3-7 well-developed lobes, these often very irregular in size, shape, spacing, and orientation; pubescence of lower leaf surface normally tawny (when fresh) ..... *Q. falcata*
- 9 Base of blades of sun-leaves typically cuneate or angled, thus forming a V-shape (some leaves somewhat U-shaped or oblique); terminal lobe of leaves generally short, broadly triangular (its sides normally tapering toward the tip for most of their length), not strongly curved to one side; leaves with 5-9 well-developed lobes, these generally rather uniform in size, shape, spacing, and orientation; pubescence of leaf surface gray ..... *Q. pagoda*
- 5 Mature leaves glabrous beneath on the surface, with tufts of hairs in the main vein axils beneath.
- 10 Petioles 0.5-1.0 (-1.8) cm long, generally twisted such that the blade is oriented in a vertical plane; inner cup-scales of the acorn cup inflexed, thus the cup appearing to have a broadly rounded rim ..... *Q. laevis*
- 10 Petioles 2.5-7 cm long, not twisted so that the blade is oriented in a vertical plane; inner cup-scales of the acorn cup not inflexed, thus the cup appearing to have a sharp rim appressed against the acorn.
- 11 Terminal buds 4-angled, 7-10 mm long, the bud scales densely gray-tomentose ..... *Q. velutina*
- 11 Terminal buds not 4-angled, 3-5 (-7) mm long, the bud scales glabrous or with ciliate margins.
- 12 Leaves relatively shallowly lobed, the sinuses extending up to 2/3 of the way to the midrib; upper leaf surface dull, not lustrous.
- 13 Acorn cup covering about 1/4 of acorn; leaf sinuses extending about 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] ..... *Q. rubra* var. *rubra*
- 13 Acorn cup covering about 1/3 of acorn; leaf sinuses extending about 1/3 of the way to the midrib; bark of mature trees medium gray; [of the Mountains, mostly at 1000 m and above] ..... *Q. rubra* var. *ambigua*
- 12 Leaves relatively deeply lobed, the sinuses extending 2/3 to 9/10 of the way to the midrib; upper leaf surface lustrous.
- 14 Larger lateral lobes of most leaves with 1 bristle per lobe (-2 on some lobes); total bristle tips < 10/leaf ..... *Q. georgiana*
- 14 Larger lateral lobes of most leaves with 2 or more bristles; total bristle tips 9-50/leaf.
- 15 Mature leaves mostly 7-12 cm long, 5-11 cm wide (averaging about 9 cm long and 8 cm wide), with 5-7 lobes; acorns (8-) 10-13 (-15) mm long; acorn cup nearly flat at base, covering about 1/4 of the acorn ..... *Q. palustris*
- 15 Mature leaves mostly 10-20 cm long, 8-15 cm wide (averaging about 12-15 cm long and 10-12 cm wide), with (5-) 7-11 lobes; acorns (12-) 15-25 (-37) mm long; acorn cup nearly flat, turbinate, or rounded, covering 1/4-1/2 of the acorn.
- 16 Acorn cup nearly flat at base, covering about 1/4-1/3 of the acorn; acorn 15-37 mm long, lacking concentric grooves near the tip; upper surface of leaves dark green ..... *Q. shumardii*
- 16 Acorn cup turbinate, covering about 1/2 of the acorn; acorn (12-) 15-26 mm long, with or without 1-3 concentric grooves near the tip; upper surface of leaves bright green.
- 17 Acorn (12-) 15-20 mm long, with 1-3 concentric grooves near the tip; bud silvery or tawny pubescent toward the tip; upper surface of leaves bright green; lobes 5-9 per leaf; total bristle tips 18-50/leaf; [usually of dry uplands, widespread in our area] ..... *Q. coccinea*
- 17 Acorn 15-26 mm long, without concentric grooves near the tip; bud glabrous, or with the scales merely ciliate-margined; lobes 7-11 per leaf; total bristle tips 9-24/leaf; [bottomlands, from c. TN and AL westward] ..... *Q. texana*

\* *Quercus acuta* Thunberg, Japanese Evergreen Oak. Suburban woodlands; native of Japan. Reported as aggressively establishing near plantings at Kalmia Gardens, Coker College, Darlington County, SC. [= *Cyclobalanopsis acuta* (Thunberg) Oersted] {not yet keyed}

\* *Quercus acutissima* Carruthers, Sawtooth Oak. Commonly cultivated as a suburban street tree and also widely planted in "wildlife food plots", rarely naturalizing; native of Japan. This species has been a popular recommendation for "wildlife plantings" in the recent past, and entire stands can be encountered in relatively remote areas, planted by federal and state land management agencies; why "wildlife" species in our area need more oak trees is somewhat mystifying! See Whittemore (2004) for additional information. Spreading from plantings in Knoxville, TN (D. Estes, pers. comm. 2007). [= K, Pa; ? *Q. acutissima* ssp. *acutissima*]

*Quercus alba* Linnaeus, White Oak. Mesic to xeric forests. April; September–November (of the same year). ME west to MN, south to Panhandle FL and e. TX. Historically, one of the most valuable timber trees of eastern North America. *Q. alba* is probably the most abundant native plant in our area, and in eastern North America, based on biomass, leaf area, and ubiquity. Hardin (1975) discusses introgression between *Q. alba* and many other species of *Quercus* subgenus *Quercus*. [= RAB, C, F, FNA, G, K, Pa, W, WH, WV; < *Q. alba* – S (also see *Q. austrina*)]

*Quercus arkansana* Sargent, Arkansas Oak. Dry bluffs. Sw. and wc. GA and Panhandle FL west in a fragmented distribution to sw. AR and e. TX. [= FNA, K, S, WH; > *Q. caput-rivuli* W.W. Ashe]



*Quercus austrina* Small, Bluff Oak. River bluffs, mesic hammocks, dry hammocks, natural levees of brownwater rivers, over mafic rocks, on shell or calcareous sediments. April; October (of the same year). Essentially a Southeastern Coastal Plain endemic, ranging from sc. NC south to n. FL and west to MS, nowhere common. [= RAB, FNA, K, WH; < *Q. alba* – S (apparently)]

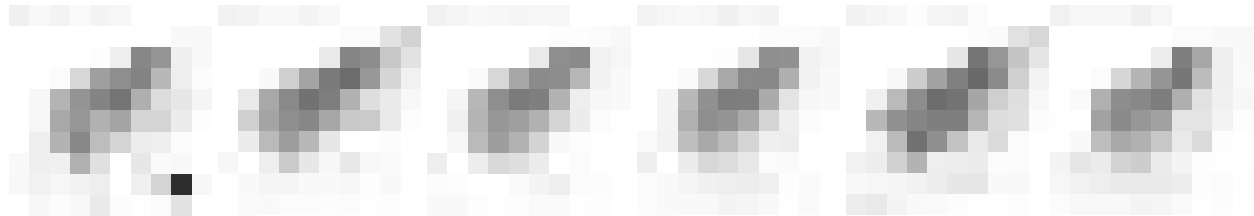
*Quercus bicolor* Willdenow, Swamp White Oak. Upland depression swamp forests over mafic rocks such as gabbro or diabase, bottomland swamps with calcareous sediments. April; September (of the same year). Widespread in ne. North America, south to NC, SC (Nelson 1993), TN, n. AL, and MO. [= RAB, C, F, FNA, G, GW, K, Pa, S, W]

*Quercus boyntonii* Beadle, Boynton Oak. Dry forests. Ne. AL and (possibly) TX. [= FNA, K, S; = *Q. stellata* Wangenheim var. *boyntonii* (Beadle) Sargent]

*Quercus chapmanii* Sargent, Chapman Oak. Dry pinelands, sandhills, scrub. February–March; September–November (of the same year). A Southeastern Coastal Plain endemic: se. SC south to s. FL, west to sw. AL. [= RAB, FNA, K, S, WH]

*Quercus coccinea* Muenchhausen, Scarlet Oak. Xeric upland forests. April; September–November (of the second year). Centered in the Appalachians, from s. ME south to c. AL, but ranging west to MS, ne. AR, s. IL, and s. MI. [= RAB, C, F, FNA, G, Pa, S, W, WV; > *Q. coccinea* var. *coccinea* – K; > *Q. coccinea* var. *tuberculata* Sargent – K]

*Quercus elliotii* Wilbur, Running Oak. Pine flatwoods, especially on loamy soils in the Middle Coastal Plain. March–April; September (of the first year). A Southeastern Coastal Plain endemic: se. NC south to s. FL and west to s. MS. Wilbur (2002b) and Wilbur & Ho (2008) discuss the reasons for rejecting the traditional use of *Q. pumila* for this species; Walter's diagnosis states that *Q. pumila* has leaves that are glabrous and glaucous below, ruling out application to this species. [= WH; = *Q. pumila* Walter – RAB, FNA, K, S, Z, apparently misapplied]



*Quercus falcata* Michaux, Spanish Oak, Southern Red Oak. Upland forests, usually xeric. April; September–November (of the second year). Widespread in se. North America, north to e. OK, s. MO, s. IL, s. IN, s. OH, WV, se. PA, NJ, and reported (apparently without specimen documentation) from Long Island, NY. "*Q. triloba* Michaux", the form with the leaves only shallowly trilobed at the apex, causes much confusion. Though even medium-sized trees sometimes have leaves only of this form (rather than the typical form, deeply 5-7-lobed, the terminal lobe long-attenuate and falcate), it has no taxonomic merit. [= C, FNA, K, Pa, W, WH, WV; = *Q. falcata* var. *falcata* – RAB, G, GW; > *Q. falcata* var. *falcata* – F; > *Q. falcata* var. *triloba* (Michaux) Nuttall – F; = *Q. rubra* – S, misapplied; ? *Q. digitata* Sudworth; > *Q. triloba* Michaux]

*Quercus geminata* Small, Sand Live Oak. Xeric sandhills (northward restricted to areas very near the coast). April; September–November (of the same year). A Southeastern Coastal Plain endemic: se. NC south to s. FL, and west to s. MS. The alleged occurrence of *Q. geminata* as far north as se. VA is apparently based on ambiguous specimens that probably are only *Q. virginiana* (the so-called var. *maritima*). A careful study of the genetics, morphology, and ecology of *Q. geminata* and *Q. virginiana* supports their recognition as separate species (Cavender-Bares & Pahlich 2009). *Q. geminata* flowers about 2-3

weeks later than *Q. virginiana* when growing in close proximity. [= C, FNA, GW, K, S, WH; < *Q. virginiana* – RAB; ? *Q. virginiana* var. *maritima* (Michaux) Sargent – F, misapplied]

***Quercus georgiana*** M.A. Curtis, Georgia Oak. Dry slopes and bluffs, mainly over granite. April; September–October (of the second year). Sc. NC south and west through GA to c. AL; the NC population discovered by David Campbell in 2010 (pers.comm., specimens at NCU and UNCC). [= RAB, FNA, K, S]

***Quercus hemisphaerica*** Bartram ex Willdenow, Sand Laurel Oak, Darlington Oak. Sandhills and other dry, sandy soils, an abundant component of maritime forests with *Q. virginiana*, and widely planted as a street tree in most parts of our region. March–April; September–November (of the second year). Essentially a Southeastern Coastal Plain endemic: se. VA south to s. FL and west to s. TX, north uncommonly in the interior to nc. AL, n. MS, and s. AR. Often confused with *Q. laurifolia* (see the key for distinctions). *Q. hemisphaerica* is the semi-evergreen laurel oak planted widely as a street tree in southern cities, often intermixed with the strictly deciduous *Q. phellos*. [= C, F, FNA, Z; < *Q. laurifolia* – RAB, WH; = *Q. laurifolia* – S, misapplied; > *Q. hemisphaerica* var. *hemisphaerica* – K; > *Q. hemisphaerica* var. *maritima* (Michaux) Muller – K]

***Quercus ilicifolia*** Wangenheim, Bear Oak, Scrub Oak. Xeric soils in ridges in the Mountains and monadnocks in the upper Piedmont, other dry sites. Late April–June; August (of the second year). Primarily Appalachian: s. ME south to w. VA, w. NC, and e. KY. In NC this scrubby oak is rare and probably declining because of fire suppression (Barden 1985), though recent ice storms have opened the tree canopy at several of its NC sites. The occurrence of *Q. ilicifolia* in KY was confirmed at the Devil's Teatable, Floyd County (Clark et al. 1997). [= RAB, C, F, FNA, G, K, Pa, S, W, WV]



***Quercus imbricaria*** Michaux, Shingle Oak. Rich soils of upper floodplains of rivers and creeks, often at the base of the slope into the upland, also on lower slopes, and in forests over diabase in the Piedmont of VA and n. NC. May; October (of the second year). Primarily midwestern, ranging from NJ, PA, n. OH, s. MI, n. IL, and c. IA, south to e. VA, nc. and w. NC, sc. TN, n. AL, and n. AR. [= RAB, C, F, FNA, G, K, Pa, S, W, WV, Z]

***Quercus incana*** Bartram, Bluejack Oak. Sandhills, primarily in somewhat loamier textured, submesic soils, inland from the Coastal Plain on coarse sandy alluvium or upland ridges over quartzite or other acidic rocks. April; September–November (of the second year). Primarily a species of the Southeastern Coastal Plain, but rarely extending inland into the Piedmont (especially on coarse sandy alluvium): se. VA south to c. peninsular FL and west to e. TX, sw. AR, and se. OK. This oak is recognizable even at a distance by its bluish color. [= RAB, F, FNA, K, Z; = *Q. cinerea* Michaux – C, G, S; ? *Q. humilis* Walter]

***Quercus inopina*** W.W. Ashe, Florida Scrub Oak. Scrub, sandhills. FL peninsula, north to St. Johns County. [= FNA, K, WH] {add to synonymy}

***Quercus laevis*** Walter, Turkey Oak. Sandhills, primarily in very xeric soils of deep sandy deposits (Carolina bay rims, old beach dunes, early Cenozoic deposits of the Sandhills Province), or inland from the Coastal Plain on dry ridges and slopes over quartzite or other acidic rock types. April; September–October (of the second year). Essentially a Southeastern Coastal Plain endemic: se. VA south to s. FL and west to e. LA. The leaves turn an intense orange-red in the autumn (November). [= RAB, C, F, FNA, G, K, S, WH, Z; = *Q. catesbaei* Michaux]

***Quercus laurifolia*** Michaux, Laurel Oak. Mesic to seasonally flooded soils of floodplains, also (rarely) mesic slopes and swamps in maritime forests. March–April; September–November (of the second year). A Southeastern Coastal Plain endemic: se. VA south to s. FL and west to e. TX and s. AR. Sometimes confused with *Q. hemisphaerica*, but (in addition to the key characters above) *Q. laurifolia* has blunter leaf tips, flowers about 2 weeks earlier, and generally occupies much moister habitats. [= C, F, FNA, G, GW, K, Z; < *Q. laurifolia* – RAB, WH (also see *Q. hemisphaerica*); = *Q. obtusa* (Willdenow) Ashe – S]



***Quercus lyrata*** Walter, Overcup Oak. Seasonally rather deeply and frequently flooded soils of floodplains of the Coastal Plain, less commonly in seasonally flooded swamps in Triassic basins in the lower Piedmont, and rarely in upland depression swamps of the Piedmont (developed over clays weathered from mafic rocks) and Coastal Plain. March–April; September–October (of the same year). Primarily a species of the Southeastern Coastal Plain: DE south to Panhandle FL, west to e. TX and se. OK, north in the inland to w. TN, s. IN, s. IL, and se. MO. Of our oaks, *Q. lyrata* tolerates the wettest habitats, both in terms of depth and duration of flooding. [= RAB, C, F, FNA, G, GW, K, S, WH]

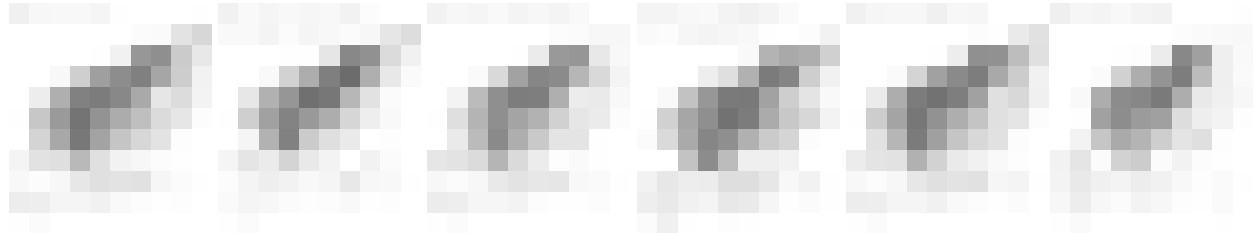
*Quercus macrocarpa* Michaux var. *macrocarpa*, Bur Oak, Mossycup Oak. Rich bottomland forests, sometimes in drier forests and then usually over limestone or other calcareous rocks. NB and QC west to s. MB, south to nw. VA, KY, TN, LA, and TX. Variation in this species needs additional study; *Q. macrocarpa* in our area is the typical variety or subspecies if other taxa are recognized. [= K; < *Q. macrocarpa* – C, F, FNA, G, GW, Pa, S, W, WV]

*Quercus margarettae* Ashe ex Small, Sand Post Oak. Sandhills, typically in slightly loamy or clayey soils, not usual in the deepest and most xeric sands. April; September–November (of the same year). Primarily a species of the Southeastern Coastal Plain: se. VA south to FL and west to TX and se. OK. As stated by Fernald (1950), this oak was "chivalrously named [by W.W. Ashe] in 1903 for Margaret Henry Wilcox, who two years later became Mrs. Ashe." There has been controversy, however, over the spelling of the specific epithet; apparently it should be corrected to the genitive "ae" (K. Gandhi, pers. comm. 2007). [= *Q. margareta* – RAB, C, FNA, G, S, WH; = *Q. margarettiae* Ashe ex Small – K, orthographic variant; = *Q. stellata* var. *margareta* (Ashe ex Small) Sargent – F]

*Quercus marilandica* Muenchhausen var. *marilandica*, Blackjack Oak. Upland forests and woodlands, usually on periodically droughty soils, as over shrink-swell clays, sandstones, deep sands, and sands with clay lenses. April; September–November (of the second year). NY (Long Island), NJ, se. PA, w. VA, s. OH, s. IN, c. IL, s. IA, and se. NE south to s. GA, Panhandle FL, and sc. TX (west to the Prairie border). There are historical accounts of the existence of prairies or barrens in the vicinity of Charlotte in the late eighteenth century, known as the "the blackjack lands." These areas were described as open and prairie-like, until the early nineteenth century, when they became dominated by dense forests of blackjack oak. The previously open condition was almost certainly maintained by fire, perhaps set by the Waxhaw Indians. Blackjack oak has long been considered an indicator of poor soil, as in Guthrie (1820), who states in his discussion of NC, "the Black Jack land is generally poor, ... and is avoided by farmers, as unproductive." Var. *marilandica* is the widespread taxon; var. *ashei* Sudworth [= *Q. neoashei* Bush] is worthy of recognition at the varietal level at least, and occurs from s. MO and s. KS south to c. AR, e. TX, and sc. TX, especially on the Edwards Plateau (Hunt 1990). [= FNA, K, Z; < *Q. marilandica* – RAB, C, F, G, Pa, S, W, WH, WV]

*Quercus michauxii* Nuttall, Basket Oak, Swamp Chestnut Oak. Bottomland forests, especially in fertile soils of upper terraces where flooded only infrequently and for short periods, upland depression ponds. April; September–October (of the same year). NJ south to n. peninsular FL and west to e. TX and se. OK, north in the interior to s. IL and s. IN. See discussion under *Q. montana* about the application of the name *Q. prinus* Linnaeus. [= RAB, C, F, FNA, G, GW, K, W, WH; = *Q. prinus* Linnaeus – S, name rejected (possibly misapplied, and a source of confusion)]

*Quercus minima* (Sargent) Small, Dwarf Live Oak. Pine flatwoods, coastal fringe sandhills. April; September–November (of the same year). A Southeastern Coastal Plain endemic: se. NC (New Hanover County) south to s. FL, west to s. MS. [= FNA, K, S, WH]



*Quercus montana* Willdenow, Rock Chestnut Oak. Xeric forests of ridges, slopes. April; September–November (of the same year). Primarily Appalachian but broadly distributed in e. North America: s. ME, NY, MI, s. UN, s. IL, and se. MO (Smith & Parker 2005) south to c. GA, c. AL, ne. MS (and LA?). The proper application of the Linnaean "*Q. prinus*" is controversial and unclear, having been debated and variously applied for well over a century. The name "*Q. prinus*" has nomenclatural priority over either "*Q. montana*" or "*Q. michauxii*", but it is not clear which species was intended; Whittemore & Nixon (2005) proposed its formal rejection and the proposal was formally and unanimously accepted (Brummitt 2007). [= FNA, Pa, S, W; = *Q. prinus* Linnaeus – RAB, C, F, G, K, WV, name rejected (probably misapplied, and a source of confusion)]

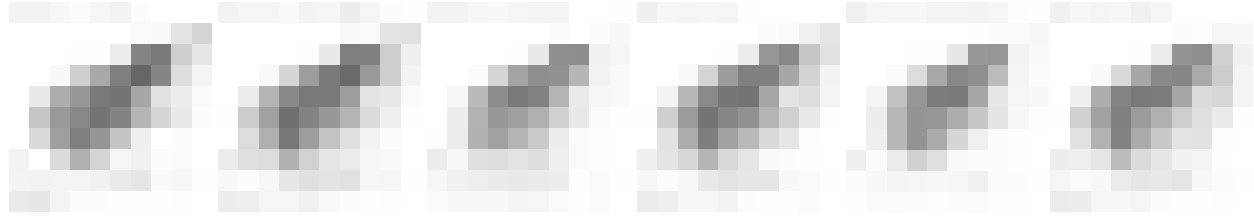
*Quercus muehlenbergii* Engelm., Yellow Oak, Chinquapin Oak. Slopes and bluffs, on soils derived from calcareous or mafic rocks. April; October–November (of the same year). S. New England and ON west to WI, se. MN, and IA, south to nw. FL, TX, and n. Mexico. The similar *Q. montana* sometimes has a few leaves with somewhat sharply lobed leaves, but these are minutely mucronate and lack the well-developed callus of *Q. muehlenbergii*. Additionally, *Q. muehlenbergii* has a flaky, light gray bark, very different from the dark gray, deeply furrowed bark of *Q. montana*. [= RAB, C, F, K, WH, WV; = *Q. muelenbergii* – FNA, Pa, S, W, orthographic variant; = *Q. prinoides* Willdenow var. *acuminata* (Michaux) Gleason – G]

*Quercus myrtifolia* Willdenow, Myrtle Oak. Dry pinelands. February–March; September (of the second year). A Southeastern Coastal Plain endemic: se. SC south to s. FL, west to se. MS. [= RAB, FNA, K, S, WH, Z]

*Quercus nigra* Linnaeus, Water Oak, Paddle Oak. Bottomland forests, especially on levees or second terraces where flooded infrequently and for short periods, less commonly on mesic slopes. April; September–November (of the second year). Primarily a species of the Southeastern Coastal Plain: s. NJ south to s. FL and west to e. TX and se. OK, north in the interior to se. TN, c. TN, w. and sc. KY (Clark et al. 2005), se. MO, and e. OK. Seedlings and fire sprouts of this species are highly variable; see discussion at end of generic treatment. [= RAB, C, FNA, G, GW, K, S, W, WH, Z; > *Q. nigra* var. *nigra* – F; > *Q. nigra* var. *heterophylla* (Aiton) Ashe – F; = *Q. aquatica* Walter]

*Quercus oglethorpensis* Duncan, Oglethorpe Oak. Bottomland forests, upland oak flats over clays (Iredell and Enon soils). April; September–October (of the same year). Widely scattered from w. SC, to adjacent e. GA, nw. AL (Sorrie pers. comm. 2002), MS, and LA. [= RAB, FNA, GW, K]

***Quercus pagoda*** Rafinesque, Cherrybark Oak, Swamp Spanish Oak. Bottomland forests, especially on second terraces, also mesic upland sites. April; September-November (of the second year). A Southeastern Coastal Plain endemic: e. and c. VA south to nw. FL and west to se. TX and north in the interior to e. TN, s. IL, and s. IN. [= C, FNA, K, S, WH; = *Q. falcata* var. *pagodifolia* Elliott – RAB, F, G, GW]



***Quercus palustris*** Muenchhausen, Pin Oak. Swamps and bottomlands, especially the broader swamps developed in the sedimentary rocks of Triassic basins of the lower Piedmont, isolated upland sag ponds, also widely planted as a street tree in towns and cities. March-April; October-November (of the second year). MA and NY west to se. IA and e. KS, south to c. NC, nw. GA, sc. TN, n. AR, and e. OK. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV]

***Quercus phellos*** Linnaeus, Willow Oak. Bottomland forests, especially on natural levees and second terraces, also in upland depression swamps developed on clay soils, weedy and successional on slopes and upland sites following disturbance, and widely planted as a street tree in towns and cities. March-April; September-November (of the second year). Primarily a species of the Southeastern Coastal plain: NY (Long Island), s. NJ, and se. PA south to s. GA and Panhandle FL, west to e. TX and se. OK, north in the interior to e. TN, s. KY, w. KY, s. IL, and se. MO, and e. OK. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, Z]

***Quercus prinoides*** Willdenow, Dwarf Chinquapin Oak. Xeric uplands, especially on clay soils derived from mafic rocks, and probably in sites which naturally burned rather frequently. April; August-September (of the same year). MA and s. MI south to NC, OK, and TX. Fire suppression in the sites where this rare oak occurs has nearly or entirely extirpated it from much of our area. [= RAB, C, FNA, K, Pa, S, W; > *Q. prinoides* var. *prinoides* – F; > *Q. prinoides* var. *rufescens* Rehder – F; = *Q. prinoides* var. *prinoides* – G]

\* ***Quercus robur*** Linnaeus, English Oak. Rarely cultivated in our area; sometimes persisting or escaping in ne. United States, south at least to s. PA (Rhoads & Klein 1993; Rhoads & Block 2007). [= FNA, K, Pa] {rejected; not mapped}

***Quercus rubra*** Linnaeus var. *ambigua* (A. Gray) Fernald, Gray Oak. Forests on ridges, slopes, and coves, mostly at over 1000 meters elevation. May; September-October (of the second year). Fairly widespread in ne. North America south to PA, and in the Appalachians to w. NC, nw. SC, and n. GA. This and var. *rubra* tend to intergrade and their distinction as even varieties may not be warranted. For discussion of the two varieties, see McDougal & Parks (1984) and Jensen (1977). [= K; = *Q. rubra* var. *borealis* (Michaux f.) Farwell – RAB, F, FNA, WV; < *Q. rubra* – C, Pa, W; = *Q. borealis* Michaux f. var. *borealis* – G; = *Q. borealis* – S]

***Quercus rubra*** Linnaeus var. *rubra*, Red Oak. Moist to fairly dry forests of slopes, coves, and ravines, below 1000 meters elevation. April; August-September (of the second year). Widespread in e. North America, south to e. VA, GA, AL, MS, AR, and OK. [= RAB, F, FNA, K, WV; < *Q. rubra* – C, Pa, W; = *Q. borealis* Michaux f. var. *maxima* (Marshall) Ashe – G; = *Q. maxima* (Marshall) Ashe – S]

***Quercus shumardii*** Buckley, Shumard Oak. Moist and fertile soils of bottomlands and lower slopes, also in xeric sites over calcareous rocks (such as limestone). April; September-October (of the second year). Sc. PA, OH, s. MI, IN, s. IL, MO, and e. KS south to n. peninsular FL and TX. A number of varieties have been recognized in *Q. shumardii*, and the morphological and habitat variation needs additional study. Var. *schnneckii* (Britton) Sargent is apparently distributed in calcareous uplands west of the Blue Ridge, especially on dry limestone slopes. It is allegedly distinguished by the acorn cups rounded to turbinate below (vs. flattened and saucer-shaped in var. *shumardii*). Hess & Stoyoff (1998) tentatively concluded that no varieties should be recognized within *Q. shumardii*. *Q. acerifolia* (E.J. Palmer) Stoyoff & W.J. Hess (*Q. shumardii* var. *acerifolia* Palmer) is an endemic of Magazine Mountain in n. AR and scattered sites in OK; it is best treated as a distinct species, though there has been much debate about its taxonomic status, with opinions ranging from full species to mere form (Smith 1988, Stoyoff & Hess 1990, Johnson 1992, Johnson 1994, Hess & Stoyoff 1998). [= RAB, C, FNA, Pa, S, W, WH; > *Q. shumardii* var. *shumardii* – F, G, K, WV; > *Q. shumardii* var. *schnneckii* (Britton) Sargent – F, G, K, WV]



***Quercus similis*** Ashe, Swamp Post Oak, Delta Oak. Calcareous stream flats. SC south to GA, west to e. TX; disjunct in c. TN. *Q. similis* resembles *Q. stellata*, differing in its less definitely cross-shaped leaves and its distinctly wetland habitat. [= FNA, K; = *Q. stellata* Wangenheim var. *paludosa* Sargent; = *Q. ashei* Sterret]

***Quercus sinuata*** Walter var. *sinuata*, Bastard Oak. Alluvial and slope forests. April-May; September-November (of the same year). Se. SC south to FL Panhandle, west to TX. [= FNA, K; > *Q. durandii* Buckley – RAB, S; < *Q. sinuata* – WH]

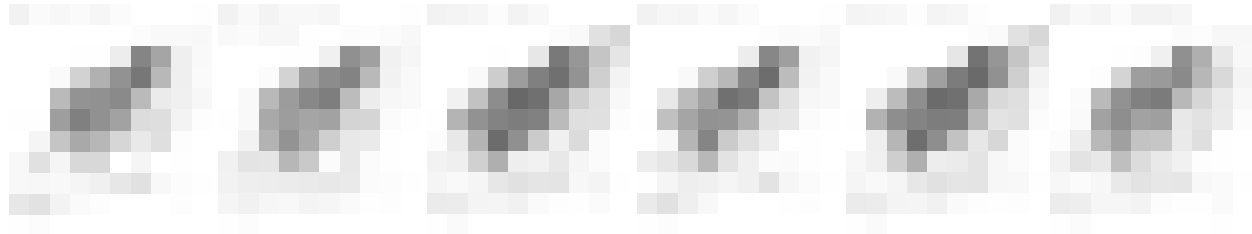


*Quercus stellata* Wangenheim, Post Oak. Upland forests and woodlands, especially in clay or rocky soils and in fire communities. April; September-November (of the same year). Se. MA, s. NY, s. PA, s. OH, s. IN, s. IA, and e. KS south to n. peninsular FL and TX. In KS, OK, and TX, post oak is one of the trees that forms the Prairie boundary. There is no question of the distinctness of *Q. margarettae* from *Q. stellata*. See *Q. similis*. [= RAB, C, FNA, G, K, Pa, S, W, WH, WV; = *Q. stellata* var. *stellata* - F; = *Q. villosa* Walter]

*Quercus texana* Buckley, Nuttall Oak, Texas Red Oak. Floodplain swamps and bottomlands. AL, TN, w. KY (Clark et al. 2005), west to e. TX. [= FNA, K; = *Q. nuttallii* E.J. Palmer - F, GW; = *Q. shumardii* Buckley var. *texana* (Buckley) W.W. Ashe] {not yet keyed}

*Quercus velutina* Lamarck, Black Oak. Upland forests and woodlands, especially in fairly xeric and sandy soils. April; September-October (of the second year). ME west to MN and NE, south to Panhandle FL and TX. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, WV]

*Quercus virginiana* P. Miller, Live Oak. Locally common to abundant in maritime forests and maritime scrub on barrier islands, more rarely inland (though regularly on the mainland from se. NC south, and extending substantially inland from s. SC south), sometimes in dry, fire-maintained habitats more usually occupied by *Q. geminata*, also planted (especially in the outer Coastal Plain). April; September-November (of the same year). A Southeastern Coastal Plain endemic: se. VA south to s. FL and west to TX. *Q. fusiformis* Small of TX has sometimes been treated as a variety of *Q. virginiana*, but is best separated as a species. Flowering before *Q. geminata* when growing together. [= C, FNA, GW, K, S; < *Q. virginiana* - RAB, G (also see *Q. geminata*); < *Q. virginiana* var. *virginiana* - F; ? *Q. sempervirens* Walter]



### 158. MYRICACEAE Blume 1829 (Bayberry Family) [in FAGALES]

A family of about 3-5 genera and 55 species, trees and shrubs, nearly cosmopolitan. See *Morella* for discussion of our 3 genera. References: Bornstein in FNA (1997); Wilbur (1994)=Z; Elias (1971b)=Y; Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Leaves oblong or linear-lanceolate, pinnatifid, stipulate; fruit in a bristly involucre formed by 8 bractlets..... *Comptonia*
- 1 Leaves mostly obovate or oblanceolate, entire or toothed (especially apically), estipulate; fruit either exposed and densely waxy (*Morella*), or partially enclosed in 2 wing-like bractlets (*Myrica*).
- 2 Fruit spherical, densely waxy, exposed (the 4-6 bractlets small and inconspicuous); terminal buds present; aments inserted on old wood mainly below the leaves; [in our area, common and in the Coastal Plain, Mountains, and Piedmont]..... *Morella*
- 2 Fruit flattened, not waxy, partially enclosed in 2 wing-like bractlets; terminal buds lacking; aments inserted at the summit of the branchlets of the preceding year; [in our area, very rare and restricted to bogs in the Mountains]..... *Myrica*

#### *Comptonia* L'Heritier ex Aiton 1789 (Sweet-fern)

A monotypic genus, a shrub, of e. North America, known as fossils from a much broader area. References: Bornstein in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

*Comptonia peregrina* (Linnaeus) J.M. Coulter, Sweet-fern. Dry open woods and barrens, in the mountains on xeric ridges at low to medium elevations, usually in fire-maintained habitats, also in xeric and fire-maintained habitats on monadnocks in the upper Piedmont and in dry, sandy sites in the lower Piedmont and fall-line sandhills. April-May; August-September. NB, ON and MN, south to sc. and w. NC, w. SC, ne. GA, nc. TN, and IL. [= RAB, C, FNA, K, Pa, S, W, WV; > *Comptonia peregrina* var. *asplenifolia* (Linnaeus) Fernald - F, Y; > *Comptonia peregrina* var. *peregrina* - F, Y; > *Myrica asplenifolia* Linnaeus var. *asplenifolia* - G; > *Myrica asplenifolia* var. *tomentosa* (Chevallier) Gleason - G]

#### *Morella* Loureiro 1790 (Bayberry, Wax-myrtle, Candleberry)

Wilbur (1994) makes a compelling case for the recognition of three genera among eastern North American Myricaceae, and for application of the name *Myrica* to *Myrica gale*. The typification of the genus *Myrica* with *Myrica gale* Linnaeus has been confirmed (Brummitt 1999); thus, the familiar southeastern species placed by many authors in *Myrica* must take another name. Wilbur (1994) prefers to treat our species as subgenus *Cerothamnus* (Tidestrom) Wilbur of genus *Morella* Loureiro; subgenus *Morella* is restricted to e. Asia, the Philippines, and Malaysia, and differs in a number of ways from subgenus *Cerothamnus*, including its fleshy and succulent, rather than waxy and hard, berries. Small maintained *Cerothamnus* at the generic level. Wilbur's inclusion of *Cerothamnus* in *Morella* may well be warranted (and is followed here), but I disagree with his provisional decision to include the taxon treated below as *Morella pumila* in *Morella cerifera*, and the taxon treated below as *Morella*

*pensylvanica* in *Morella caroliniensis*, though their appropriate rank may be questioned. References: Bornstein in FNA (1997); Wilbur (1994)=Z; Wilbur (2002a); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Fresh leaves odorless when crushed; staminate flowers with 6-10 stamens (or as few as 3 in distal flowers); leaves usually entire; [of s. GA south and west]; [subgenus *Certhamnus*, series *Faya*]..... ***M. inodora***
- 1 Fresh leaves aromatic when crushed; staminate flowers with 3-5 (-7) stamens; leaves usually serrate, at least near the tip; [collectively widespread in our area]; [subgenus *Certhamnus*, series *Certhamnus*].
  - 2 Leaves oblanceolate (generally narrowly so), most of them 0.5-1.5 cm wide, 4-6× as long as wide, evergreen; mature fruits 2.0-3.5 mm in diameter.
  - 3 Medium shrub to small tree (usually 2-10 m tall), not stoloniferous; leaves of fertile branches 4-9 cm long, 8-20 mm wide; [of a wide range of wetland habitats, including wet Coastal Plain pinelands; also planted and naturalized in upland sites] ..... ***M. cerifera***
  - 3 Small shrub (usually < 1 m tall), strongly stoloniferous; leaves of fertile branches 1.5-4 cm long, 3-8 mm wide; [restricted to Coastal Plain pinelands (or areas formerly so)] ..... ***M. pumila***
  - 2 Leaves elliptic to broadly oblanceolate, most of them 1.5-4 cm wide, 2-4× as long as wide, evergreen to deciduous; mature fruits 3.0-7.0 mm in diameter.
  - 4 Leaves subcoriaceous and more or less evergreen, not revolute (or slightly so if sun-grown), the larger ones usually about 9 cm long and 3.5 cm wide, with punctate glands dense on the lower surface and nearly or entirely absent on the upper surface; fruits 3-4.5 mm in diameter, the fruit wall glabrous or sparsely glandular, the warty protuberances glandular; twigs densely hairy to rarely glabrous; older branches blackish; [of various boggy habitats, widespread in our area]..... ***M. caroliniensis***
  - 4 Leaves coriaceous, tardily deciduous, often revolute, the larger ones about 6 cm long and 2 cm wide, with punctate glands fairly dense on both surfaces; fruits 4-6 (-7) mm in diameter, the fruit wall and warty protuberances densely hirsute when young; twigs glabrous to sparsely hairy; older branches whitish gray; [usually of dunes, from Dare County, NC northward] ..... ***M. pensylvanica***

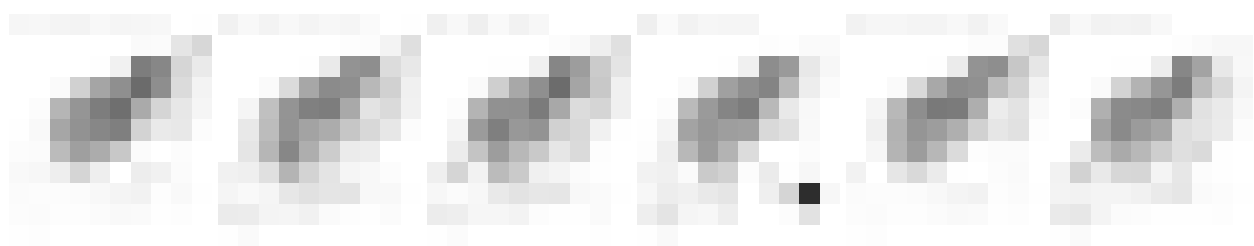
***Morella caroliniensis*** (P. Miller) Small, Pocosin Bayberry, Evergreen Bayberry. Pocosins, wet savannas and pine flatwoods, sandhill seepage bogs, and other peaty or sandy-peaty wetlands. April; August-October. Primarily limited to the Southeastern Coastal Plain, from NJ south to FL and west to TX and AR. [= K; = *Myrica heterophylla* Rafinesque – RAB, C, FNA, W, Y; > *Myrica heterophylla* var. *heterophylla* – F; > *Myrica heterophylla* var. *curtissii* (Chevallier) Fernald – F; < *Myrica pensylvanica* – G; < *Certhamnus carolinensis* – S (also see *Morella pensylvanica*); < *Morella caroliniensis* (P. Miller) Small – Z (also see *Morella pensylvanica*)]

***Morella cerifera*** (Linnaeus) Small, Common Wax-myrtle, Southern Bayberry. Interdune swales (where often dominant), pocosins, brackish marshes, other wet to moist habitats, now also widely planted (including in the Piedmont) as an ornamental or landscaping shrub and preistent or naturalizing in suburban woodlands. April; August-October. Widespread in the Coastal Plain of Southeastern United States: NJ south to FL and west to TX. Our most common *Morella*, and also the largest, sometimes becoming a small tree, to at least 10 m tall and 20 cm DBH. See *Morella pumila* for a discussion of the controversial taxonomy of *Morella cerifera* and *Morella pumila*. [= *Myrica cerifera* Linnaeus var. *cerifera* – RAB, Y; < *Myrica cerifera* – C, FNA, GW (also see *C. pumilus*); = *Myrica cerifera* – F, G; = *Certhamnus ceriferus* (Linnaeus) Small – S; < *Morella cerifera* (Linnaeus) Small – K, Z (also see *Morella pumila*)]

***Morella inodora*** (Bartram) Small, Odorless Bayberry. Acid wetlands, especially in wooded, acid, streamhead "bogs" and bayheads, often associated with *Magnolia virginiana*, *Persea palustris*, *Cyrilla racemiflora*, *Cliftonia monophylla*, and *Woodwardia areolata*. A Southeastern Coastal Plain endemic: se. GA west to s. MS. [= K, Z; = *Myrica inodora* Bartram – FNA, GW, Y; = *Certhamnus inodorus* (Bartram) Small – S]

***Morella pensylvanica*** (Mirbel) Kartesz, Northern Bayberry. Dunes, sometimes even on the foredune and stoloniferously colonizing the upper beach, more typically behind the foredune on secondary dunes and sandy flats, often growing intermixed with *Morella cerifera*, but able to occupy drier sites higher on the dunes, from VA north, also ranging inland in sandy situations. April; August-October. This species reaches its southern limit at Avon (Kinnakeet), Dare County, NC. On interdune flats, it often grows intermixed with *Morella cerifera*, but is readily distinguished (even at a distance) by its stoloniferous growth (appearing as dome-shaped clones 3-20 m in diameter), stouter twigs, and tardily deciduous leaves. The twigs of this species are noticeably stouter than those of *Morella cerifera*; measured at 10 cm from the twig tips, they are (2-) 3-5 mm in diameter, those of *Morella cerifera* ca. 1.5-2.5 mm. [= K; = *Myrica pensylvanica* Loiseleur – RAB, C, F, FNA, GW, Pa, Y; < *Myrica pensylvanica* – G (also see *Morella heterophylla*); < *Certhamnus carolinensis* – S (also see *Morella pensylvanica*); < *Morella caroliniensis* (P. Miller) Small – Z; = *Certhamnus pensylvanicus* (Mirbel) Moldenke]

***Morella pumila*** (Michaux) Small, Dwarf Bayberry, Dwarf Wax-myrtle. Savannas, pine flatwoods, relatively moist to extremely dry sites in sandhills (under *Quercus laevis* and *Q. geminata*). April; August-October. A Southeastern Coastal Plain endemic: se. VA south to FL and west to LA (or TX). Some authors dismiss the distinction between this taxon and *Morella cerifera* as merely environmental, while others treat the two as distinct at the varietal or specific level. In our area at least, they appear to be genetically distinct. They often occur in close proximity (though their typical habitats differ, they can be seen side by side in wet spodosolic pine savannas, sometimes also intermixed with *Morella caroliniensis*), and maintain their distinctiveness. There are some observations that there is a phenologic difference, with *Morella pumila* peak flowering 3 weeks later than *Morella cerifera* (J. Townsend, pers. comm. 2002). Though the issue remains unresolved, the stoloniferous growth of *Morella pumila* is not merely a fire response; I here maintain the two as distinct, pending further research. [= *Myrica cerifera* Linnaeus var. *pumila* Michaux – RAB, Y; < *Myrica cerifera* – C, FNA, GW; = *Myrica pusilla* Rafinesque – F, G; = *Certhamnus pumilus* (Michaux) Small – S; < *Morella cerifera* (Linnaeus) Small – K, Z]



*Myrica* Linnaeus 1753 (Sweet Gale)

A genus of two species, shrubs, of temperate and subarctic regions of North America and Eurasia. References: Bornstein in FNA (1997); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

*Myrica gale* Linnaeus, Sweet Gale. Peaty bogs. April; August-September. A circumboreal species, south in North America to NJ, PA, MI, MN, and OR, disjunct from PA and s. NJ to Henderson County, NC, where considered extirpated at one time, as a result of the destruction of the famous East Flat Rock Bog. This shrub has been relocated at a single site, where it is abundant in a small area (less than 0.25 hectare). [= C, FNA, G, GW, K, Pa, S, W, Y; = *Gale palustris* Chevallier – RAB; > *Myrica gale* var. *gale* – F]

**159. JUGLANDACEAE** A. Richard ex Kunth 1824 (Walnut Family) [in FAGALES]

A family of about 8 genera and 60 species, trees and shrubs, mostly temperate. References: Stone in FNA (1997); Manos & Stone (2001); Elias (1972); Stone in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Nutlets 6-7 mm long, with 2 wings; leaf rachis usually winged.....*Pterocarya*
- 1 Nuts > 15 mm long, unwinged; leaf rachis unwinged.
  - 2 Fruit with husk dehiscent into 4 valves; pith of twigs continuous; leaves with (3-) 5-17 (-19) leaflets, the largest usually the terminal or final 2 lateral; nut with shell smooth, ridged, or irregularly wrinkled (but not deeply furrowed); terminal buds with imbricate (overlapping) or valvate scales; [tribe *Juglandae*, subtribe *Caryinae*].....*Carya*
  - 2 Fruit with husk indehiscent; pith of twigs chambered (not always developing until autumn of the first year's growth); leaves with (7-) 11-19 (-23) leaflets, the largest usually about halfway up the leaf; nut with shell deeply furrowed in a complex corrugated pattern; terminal buds with valvate; [tribe *Juglandae*, 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. illinoensis*) and section *Carya* (*C. carolinae-septentrionalis*, *C. glabra*, *C. laciniosa*, *C. myristiciformis*, *C. ovalis*, *C. ovata*, *C. pallida*, *C. tomentosa*). The southeastern United States is the center of diversity of *Carya*. Our four-state area includes 11 of 13 North American species (including the naturalized *C. illinoensis* 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. illinoensis*, *C. myristiciformis*, *C. laciniosa*, *C. ovata*, and *C. carolinae-septentrionalis* are diploids, with  $n = 16$ . *C. pallida*, *C. glabra*, *C. ovalis*, and *C. tomentosa* are tetraploids with  $n = 32$  (Stone 1961). As suggested by Stone, Adrouny, & Flake (1969), it seems possible that reticulate evolution involving extant or extinct diploid species is responsible for some of the difficulties in the *C. glabra-ovalis* complex. Many hybrids have been described, but some are questionable. Additionally, Hardin & Stone (1984) state that "most of these hybrids are localized and have not led to introgressive populations, or at least none that have been recognized". Ecologically, *Carya* is one of the more diverse and ubiquitous genera of trees in our area, surpassed in number of species, abundance, and ecological amplitude only by *Quercus* and *Pinus*. This has led to a long tradition of describing large parts of our area (in particular the Piedmont) as being characterized by "oak-hickory" or "oak-pine-hickory" forests (e.g. Küchler 1964; Greller 1988; Schafale & Weakley 1990; Skeen, Doerr, & Van Lear 1993). Ware (1992) and others have recently questioned this tradition, pointing out that *Carya* only rarely dominates or codominates, primarily in specialized circumstances (such as in soils with greater cation concentrations, derived from mafic rocks). The association of many (but certainly not all) species of hickories with soils with high base status was noted in print as early as 1820 in an account of the landscape of North Carolina. "The sandy pine barrens, and all the lands on which pine is the exclusive growth, are unfriendly to agriculture; but where the pine is intermixed with oak and hickory, the soil is good. Some of our strongest lands have tall pine, mixed not only with hickory and oak, but also with walnut and cherry, and such trees that indicate the best soil. Where hickory prevails, the land is strong" (Guthrie 1820). References: Stone in FNA (1997); Hardin (1992); Hardin & Stone (1984); Elias (1972); Stone, Adrouny, & Flake (1969); Stone (1961); Mohlenbrock (1986); Sargent (1918); Manning (1950); Hardin (1952); Little (1969); Harrar & Harrar (1962); Stone in Kubitzki, Rohwer, & Bittrich (1993). Key based in part on an unpublished manuscript prepared by Stone & Hardin for the Flora of the Southeastern United States.

**Identification notes:** Surface vestiture of leaves and bud scales is useful in distinguishing species of *Carya*. Some use of these characters can be made with a 10× or 20× hand lens; better still is a dissecting microscope. It is important to understand the different trichome types mentioned in the key (terminology follows Hardin 1990 and Hardin & Stone 1984). **Short acicular trichomes** are simple, unicellular trichomes tapered to a pointed tip, 0.10-0.35 mm long and with rough walls. **Long acicular trichomes** ("solitary" of Hardin & Stone 1984) are similar to short acicular, but are much larger, 0.45-1.6 mm long, and have smooth walls. **Fasciculate trichomes** are multicellular and have 2-8 straight or curled rays radiating from a clustered base. **Multiradiate trichomes** are similar to fasciculate, but have 8-17 rays, the inner (and usually more upright) rays attached basally above the outer (and usually more spreading) rays. **Capitate glandular trichomes** are unicellular or multicellular, and are distinguished by their bulbous or expanded tip; they are usually 0.02-0.1 mm long. **Peltate scales** are flat or dome-shaped shields or disks, slightly to strongly glandular, (sometimes regularly or irregularly lobed) and can be either sessile or stalked (they are often referred to as scales, resin dots, peltate glands, or lepidote scales). On the lower surfaces of leaflets, peltate scales are of two types: **large peltate scales** are 0.08-0.3 mm in diameter and are round, with smooth or slightly irregular margins, while **small peltate scales** are 0.025-0.12 mm in diameter and are either round, irregularly lobed or regularly 2- or 4-lobed.

- 1 Terminal buds elongate, flattened in cross-section, with 4-6 valvate scales; leaves with 7-13 (-19) leaflets, these symmetrical to strongly falcate; fruit sutures narrowly winged.
  - 2 Leaves with 7-9 (-11) leaflets, these symmetrical to slightly falcate; fasciculate trichomes with 2-4 rays; terminal bud, 9-19 mm long, bright orangey yellow to dull orange-tan; [common and widely distributed tree in our area, typically in floodplain and slope forests] ..... *C. cordiformis*
  - 2 Leaves with (7-) 9-19 leaflets, these slightly to strongly falcate; fasciculate trichomes with 2-8 rays; terminal bud { } mm long, brown to rusty-brown.
    - 3 Leaves with (7-) 9-11 (-13) leaflets, the lower surfaces pubescent at least along the midrib and in the main vein axils; bark shaggy; lateral petiolules 0-2 mm long; nut flattened and angled in cross-section; kernel bitter; [native, of swamp forests, primarily in the Coastal Plain]..... *C. aquatica*
    - 3 Leaves with (7-) 11-19 leaflets, the lower surfaces nearly glabrous; bark scaly, with small exfoliating plates; lateral petiolules 0-7 mm long; nut round in cross-section; kernel sweet; [introduced, frequently cultivated, long persistent, and occasionally naturalized]..... *C. illinoensis*
- 1 Terminal buds ovoid, terete in cross-section, with 6-15 imbricate scales; leaves with (3-) 5-9 (-11) leaflets, these symmetrical to slightly falcate; fruit sutures not winged (except *C. myristiciformis*).
  - 4 Bark shaggy (on large trees separating in segments to a meter in length); leaves with (3-) 5 (-7) leaflets; serrations of the leaflets densely (or only moderately) ciliate when young, most densely so just below the tooth apex, the hairs sloughing with age but leaving a subapical tuft of white trichomes on at least some teeth; fallen foliage turning black.
    - 5 Twigs slender, hardened first-year growth or second-year growth 1-3 mm in diameter; terminal bud 6-15 mm long, glabrous to sparsely puberulent (except for ciliate fringe on the scales), reddish-brown (usually turning black on drying); lower surface of leaflets nearly glabrous, except for tufts of trichomes in the main vein axils, and only slightly lepidote with a few, scattered scales, the large peltate scales yellow and round, the small peltate scales brown, 2- and 4-lobed; terminal leaflet 2-5 (-6) cm wide... *C. carolinae-septentrionalis*
    - 5 Twigs stout, hardened first-year growth or second-year growth (2.5-) 3-6 mm in diameter; terminal bud 9-18 mm long, tomentose, tan to brown (rarely turning black on drying); lower surface of leaflets moderately to densely hirsute with acicular and fasciculate hairs (sometimes the hairs more or less limited to the main veins), and also moderately lepidote, the large peltate scales yellow and round, the small peltate scales dark brown and mostly round; terminal leaflet (4-) 6-15 cm wide..... *C. ovata*
  - 4 Bark tight (the ridges typically forming an interlocking diamond pattern), scaly, or shaggy (when shaggy, the separated segments normally much < 1 meter long); leaves with (3-) 5-9 (-11) leaflets; serrations of the leaflets glabrous or ciliate, but lacking subapical tufts of trichomes; fallen foliage not notably blackening.
    - 6 Twigs stout; terminal buds 8-20 mm long; leaves with (5-) 7-9 (-11) leaflets; lower surface of leaflets moderately to densely hirsute with a mixture of acicular (single), fascicled (2-8 rays), and multiradiate (8-many rays) hairs; small peltate scales of the lower surface of leaflets all round; fruit husk 4-13 mm thick; nuts slightly to strongly 4-angled toward the apex.
      - 7 Bark shaggy; petiole hirtellous; leaflet apex acuminate; lower surface of leaflets hirsute with acicular (single), 2-6-rayed fascicled, and occasional multiradiate hairs; fruit husk pubescent, lacking pustulate bumps; fruit 4-7 cm long; nut 3-6 cm long; [rare in our area]..... *C. laciniosa*
      - 7 Bark tight; petiole hirsute; leaflet apex acute; lower surface of leaflets densely hirsute with acicular (single) and abundant 2-8-rayed fascicled and multiradiate hairs; fruit husk glabrous, with pustulate bumps; fruit 3.5-5 cm long; nut 2.5-3.5 cm long; [common in our area]..... *C. tomentosa*
  - 6 Twigs slender; terminal buds 3-15 mm long; leaves with (3-) 5-7 (-9) leaflets; lower surface of leaflets mostly glabrous, except for along the midrib and primary veins, and sometimes hirsute on the surface with acicular (single) and infrequent fascicled (2-8 rays) hairs (lacking multiradiate trichomes); small peltate scales of the lower surface of leaflets of various types, 4-lobed and/or irregular scales often more frequent than round scales; fruit husk 2-5 mm thick; nuts not 4-angled toward the apex.
    - 8 Terminal bud 5-15 mm long, predominantly pubescent (also sparsely lepidote); leaves with (3-) 5-7 (-9) leaflets; lower surface of spring leaflets slightly to densely lepidote with irregular and round peltate scales (4-lobed peltate scales uncommon).
      - 9 Fruit husk indehiscent at maturity or tardily splitting to base along 1 suture; leaves with (3-) 5 (-7) leaflets, glabrous to pubescent beneath; petiole usually green; fruits ellipsoidal, pyriform, or subglobose; bark tight ..... *C. glabra*
      - 9 Fruit husk splitting to base at maturity along 2-4 sutures; leaves with (5-) 7 leaflets, pubescent beneath; petiole reddish; fruits typically ellipsoidal; bark tight or often scaly or somewhat shaggy ..... *C. ovalis*
    - 8 Terminal bud 4-10 mm long, predominantly lepidote (also pubescent); leaves with (5-) 7 (-9) leaflets; lower surface of spring leaflets densely lepidote with 4-lobed, irregular, and round peltate scales, giving the undersurface a reflective, silvery-tan, rusty-brown, or bronze sheen.
      - 10 Lepidote scales initially silver, soon turning bronze, and giving the buds, young twigs, and undersurface of the leaves a metallic bronze sheen; fruit 2-3 cm long; [of calcareous swamps, bottomlands and slopes of the Coastal Plain of se. NC southward]..... *C. myristiciformis*
      - 10 Lepidote scales silvery-tan or rusty-brown, giving the buds, young twigs, and undersurface of the leaves a dull or slightly shiny tan or rusty-brown color; fruit 3-5 cm long; [usually of upland and acidic forests and woodlands, collectively widespread in our area].

- 11 Undersurface of the leaflets with dense, silvery-tan large peltate scales, and fewer and less conspicuous fewer small peltate scales (thus the leaves appearing overall silvery-tan); petiole and rachis hirsute with fasciculate trichomes, and also with concentrations of hairs near the leaflet insertions; [widespread in our area, of upland and acidic forests and woodlands] .....  
 .....*C. pallida*
- 11 Undersurface of the leaflets with dense, rusty-brown small peltate scales, and fewer and less conspicuous silvery-tan large peltate scales (thus the leaves appearing overall rusty-brown); petiole and rachis with few fasciculate hairs (but densely scaly), and lacking concentrations of hairs near the leaflet insertions; [of the sc. United States, east to MS, w. KY, w. TN, and perhaps AL and GA, of upland or lowland, acidic or calcareous forests and woodlands] .....*C. texana*

*Carya aquatica* (Michaux f.) Elliott, Water Hickory, Bitter Pecan. Swamp forests, where flooded during the winter months. April-May; October. Se. VA south to s. peninsular FL, west to e. TX, north inland to se. MO, s. IL, and se. OK. [= RAB, C, F, FNA, G, GW, K, WH; = *Hicoria aquatica* (Michaux f.) Britton – S]

*Carya carolinae-septentrionalis* (Ashe) Engler & Graebner, Carolina Shagbark Hickory, Carolina Hickory. Upland flats, especially those weathered from mafic rocks and with shrink-swell soils dominated by montmorillonitic clays, less typically on slopes and bottomlands. April-May; October. Sc. VA (Halifax County) south to GA, AL, and MS, and inland northward to c. TN and sc. KY. First reported for VA by Wieboldt et al. (1998). The taxonomic status of *C. carolinae-septentrionalis* has been controversial, with some workers reducing it to variety of *C. ovata* or not recognizing it at all. It seems to us morphologically and ecologically distinctive and to represent an independent evolutionary lineage. Hardin & Stone (1984) found differences in trichomes, and in a study of nut oils, Stone, Adrouny, & Flake (1969) found *C. ovata* "surprisingly distant" from *C. carolinae-septentrionalis*. There are reports that the two taxa are also phenologically separated, *C. carolinae-septentrionalis* leafing out about two weeks earlier than *C. ovata*, when growing together in the c. Piedmont of NC. Though usually ecologically and/or geographically segregated, the two species sometimes occur together or in close proximity to one another; they maintain their distinctness. [= RAB, C, G, K; = *C. ovata* (P. Miller) K. Koch var. *australis* (Ashe) Little – FNA; = *Hicoria carolinae-septentrionalis* Ashe – S; = *C. ovata* var. *carolinae-septentrionalis* (Ashe) Reveal; = *C. australis* Ashe]

*Carya cordiformis* (Wangenheim) K. Koch, Bitternut Hickory. Forests and woodlands, especially in rich, moist alluvial or slope forests. April; October. ME and s. QC west to MN and NE, south to Panhandle FL and e. TX. [= RAB, C, F, FNA, G, GW, K, Pa, W, WH; = *Hicoria cordiformis* (Wangenheim) Britton – S]

*Carya glabra* (P. Miller) Sweet, Pignut Hickory. In a wide variety of forests and woodlands. April-May; October. S. NH west to s. MI, se. IA, and se. KS, south to c. peninsular FL and e. TX. The *C. glabra*-*C. ovalis* portion of this treatment is tentative; in our area, this group has been variously treated as consisting of between 1 and 10 (or more) taxa. Here we recognize two species (*C. glabra* and *C. ovalis*) and no varieties, but further study of variation in this group is needed. Var. *megacarpa* in particular seems to show correlation of morphological traits and geographic distribution, with larger fruits (2.5-5 cm long vs. 1.5-3.5 cm long), thicker husks (ca. 3.5 mm thick vs. ca. 2 mm thick), large terminal leaflets (often to 20-25 cm long, vs. 10-17 cm long), and a primarily southern Coastal Plain distribution. glabrous. [= RAB, C, GW, K, WH; > *C. glabra* var. *glabra* – F, G; > *C. glabra* var. *megacarpa* (Sargent) Sargent – F, G; > *C. ovalis* (Wangenheim) Sargent var. *hirsuta* (Ashe) Sargent – F; < *C. glabra* – FNA, Pa; > *Hicoria glabra* (P. Miller) Britton var. *glabra* – S; > *Hicoria glabra* (P. Miller) Britton var. *hirsuta* Ashe – S; ? *Hicoria austrina* Small – S; = *C. glabra* var. *glabra* – W]

\* *Carya illinoensis* (Wangenheim) K. Koch, Pecan. Bottomlands, eastward persistent around dwellings and in pecan orchards, escaped to suburban woodlands, rural forest edges and floodplains, commonly cultivated. April-May; October. Native to the sc. United States, now more widespread in the se. United States as a result of cultivation. The spelling of the specific epithet has been a source of controversy. [= C, FNA, K, WH; = *C. illinoensis* – RAB, F, G, GW, orthographic variant; > *Hicoria pecan* (Marshall) Britton – S; > *Hicoria texana* LeConte – S]



*Carya laciniosa* (Michaux f.) G. Don, Kingnut Hickory, Big Shellbark Hickory. Moist, circumneutral, alluvial levee forests along brownwater rivers of the Coastal Plain (NC), streams of the Piedmont (NC) and Mountains (GA). April-May; October. NY and s. ON west to IA, south to NC, nw. GA, MS, and OK. This species is sometimes planted, but occurs native in nw. GA, along the Roanoke River (Halifax and Northampton counties, NC) and New Hope Creek (Durham County, NC). [= RAB, C, F, FNA, G, GW, K, Pa, W; = *Hicoria laciniosa* (Michaux f.) Sargent – S]

*Carya myristiciformis* (Michaux f.) Elliott, Nutmeg Hickory. Nonriverine swamps over calcareous substrates, including calcareous clays and coquina limestone ("marl"), oak flatwoods. April; October. Se. NC south to GA, and from wc. AL west to e. TX and se. OK; disjunct in Mexico (Nuevo León and Tamaulipas). The bronze sheen of the leaflets of this species is diagnostic. First reported for NC by Leonard (1971b). [= FNA, K; = *C. myristicaeformis* – RAB, GW, orthographic variant; = *Hicoria myristicaeformis* (Michaux f.) Britton – S]

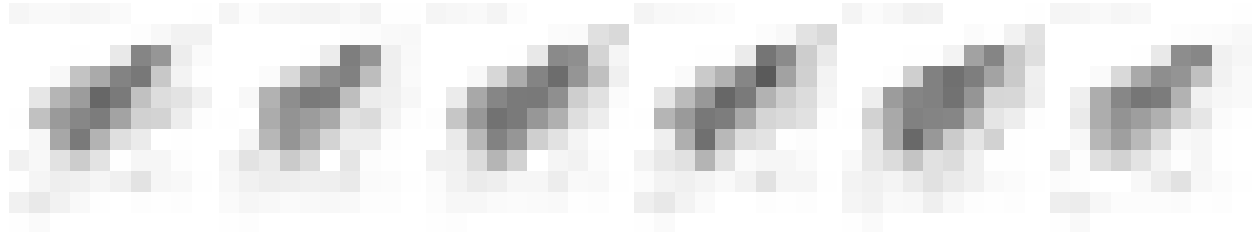
*Carya ovalis* (Wangenheim) Sargent, Red Hickory. Forests and woodlands. April-May; October. MA west to WI, south to GA, MS, and MO. [= RAB, C, K; > *C. ovalis* var. *obcordata* (Muhlenberg & Willdenow) Sargent – F, G; > *C. ovalis* var. *obovalis* Sargent –

F, G; > *C. ovalis* var. *odorata* (Marshall) Sargent – F, G; < *C. glabra* – FNA, Pa; = *Hicoria microcarpa* (Nuttall) Britton – S; = *C. glabra* (P. Miller) Sweet var. *odorata* (Marshall) Little – W]

***Carya ovata*** (P. Miller) K. Koch, Common Shagbark Hickory. Rich moist bottomlands, slopes, occasionally on dry upland flats. May; October. S. ME and s. QC west to MN and NE, south to GA and TX; also disjunct in Mexico. [= RAB, C, F, G, GW, K, W; > *C. ovata* var. *ovata* – F; > *C. ovata* var. *pubescens* Sargent – F; = *C. ovata* var. *ovata* – FNA, Pa; = *Hicoria ovata* (P. Miller) Britton – S]

***Carya pallida*** (Ashe) Engler & Graebner, Sand Hickory, Pale Hickory. Dry sandy or rocky forests and woodlands. April-May; October. S. NJ south to Panhandle FL, west to TX, inland in the interior to w. NC, KY, s. IL, and AR. [= RAB, C, F, FNA, G, K, W; = *Hicoria pallida* Ashe – S]

***Carya texana*** Buckley, Black Hickory. Dry slopes and ridges, especially calcareous. April-May; October. Reported to occur as far east as KY, TN, and MS (FNA). Jones (2005) states that w. KY material of *C. pallida* is transitional to *C. texana*. [= FNA, K; > *C. texana* var. *arkansana* (Sargent) Little – C; > *C. texana* var. *texana* – F; > *C. buckleyi* Durand var. *arkansana* (Sargent) Sargent – G; = *Hicoria texana* LeConte, misapplied – S]



***Carya tomentosa*** (Lamarck ex Poiret) Nuttall, Mockernut Hickory, White Hickory. Forests and woodlands. April-May; October. MA west to IN and IA, south to n. peninsular FL and TX. One of the most common forest trees of much of our area. There has been confusion and controversy for several centuries over the specific epithet. The oldest basionym available is *Juglans alba* Linnaeus, which apparently included disparate elements, including this taxon and *C. ovata*. Following a more circumscribed typification by Crantz in 1766, the epithet "*alba*" should have been applied to this taxon, but continued to be applied in various ways. Rehder (1945) proposed that *C. alba* should be considered a *nomen ambiguum*, but agreed that it applied correctly to what has often been called *C. tomentosa*. He argued that the use of *C. alba* should be rejected "in order to avoid confusion and ambiguity." In 2008, Ward & Wiersema (2008) formally proposed rejection of *Juglans alba* (the basionym of *Carya alba*), and the Committee has recommended its rejection unanimously (Brummitt 2010). For further discussion see Rehder (1945), Howard & Staples (1983), Wunderlin, Hansen, & Hall (1985), and Brummitt (2010). [= C, F, FNA, G, Pa, RAB, W; = *C. alba* (Linnaeus) Nuttall ex Elliott – K, WH; = *Hicoria alba* (Linnaeus) Britton – S]

***Juglans* Linnaeus (Walnut)**

A genus of about 21 species, trees and shrubs, of Mediterranean Europe to e. Asia, and North America to Andean South America. Stanford, Harden, & Parks (2000) present a molecular phylogeny and a discussion of biogeography; our two species are distantly related within the genus, with *J. nigra* most closely related to sw. North American *J. microcarpa* and *J. major*, and *J. cinerea* most closely related to several e. Asian species. References: Whittemore & Stone in FNA (1997); Stanford, Harden, & Parks (2000); Stone in Kubitzki, Rohwer, & Bittrich (1993); Stanford (1998).

- 1 Lower surface of the leaflets densely hirsute with 4-8-rayed fascicled hairs; fruit ellipsoid, densely pubescent with reddish-brown glandular hairs; leaf scars with a velvety ridge along the upper margin; leaves with (7-) 11-17 leaflets; pith dark brown; terminal buds 12-18 mm long; bark of mature trees pale; [section *Trachycaryon*]..... ***J. cinerea***
- 1 Lower surface of the leaflets hirsute with single and 2-rayed fascicled hairs; fruit spherical or nearly so, lepidote with peltate scales and occasional glandular hairs; leaf scars without a velvety ridge along the upper margin; leaves with (9-) 15-19 (-23) leaflets; pith light brown; terminal buds 8-10 mm long; bark of mature trees dark; [section *Rhysocaryon*] ..... ***J. nigra***

***Juglans cinerea*** Linnaeus, Butternut, White Walnut. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (VA): moist, nutrient-rich forests; uncommon. April-May; October. NB west to MN, south to n. GA and AR. This tree, formerly common, is afflicted with butternut canker disease, which now threatens its continued existence. [= RAB, C, F, FNA, G, K, Pa, W, WV; = *Wallia cinerea* (Linnaeus) Alefeld – S]

***Juglans nigra*** Linnaeus, Black Walnut. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA); moist, nutrient-rich forests of floodplains and slopes, calcareous hammocks; common (uncommon in the Coastal Plain of NC and SC, rare in FL). April; October. MA west to MN, south to Panhandle FL and TX. The dark brown wood is famous for cabinetry and other uses; it is one of the most prized of North American hardwoods. The nuts, though difficult to crack, are prized for their intense flavor. The husk is used as a dye. Country people dehusk the nuts by putting them in dirt or gravel driveways where the passage of car tires removes the husk but does not crack the nut. [= RAB, C, F, FNA, G, K, Pa, W, WH, WV; = *Wallia nigra* (Linnaeus) Alefeld – S]

***Pterocarya* Kunth (Wingnut)**

A genus of 6 species, trees, of e. and sw. Asia. References: Stone in Kubitzki, Rohwer, & Bittrich (1993)

\* *Pterocarya stenoptera* C. de Candolle, Japanese Wingnut. Cp (LA): uncommonly cultivated, rarely naturalized or persistent; rare, native of e. Asia (China, Japan, and Korea). April-May; August-September. Naturalized in e. LA. [= K]

**160. CASUARINACEAE** R. Brown 1814 (Casuarina Family) [in FAGALES]

A family of 4 genera and about 100 species, trees and shrubs, of Malesia, Australia, and Melanesia. References: Johnson & Wilson in Kubitzki, Rohwer, & Bittrich (1993); Rogers (1982c).

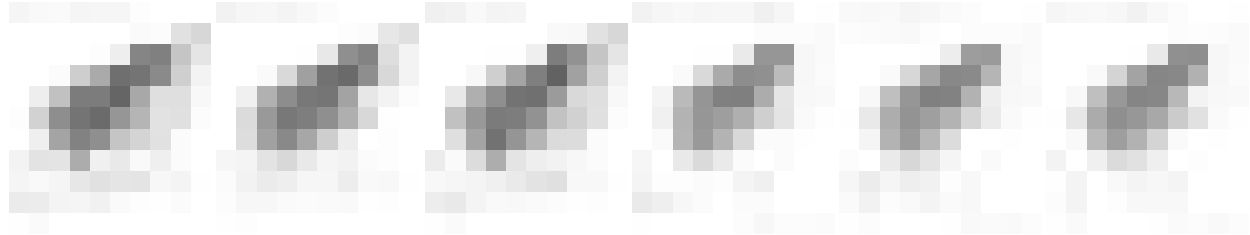
*Casuarina* Linnaeus 1759 (Casuarina, Beefwood, She-oak)

A genus of about 17 species, trees, tropical to warm temperate in s. Asia, Australia, and Polynesia. References: Johnson & Wilson in Kubitzki, Rohwer, & Bittrich (1993); Rogers (1982c)=Z.

- 1 Leaves (teeth in whorls at each node) 6-8 per node; longitudinal ridges of branchlets sharply angular; plant monoecious; branchlet segments 5-8 (-13) mm long, 0.5-0.7 (-1) mm in diameter..... *C. equisetifolia* ssp. *equisetifolia*
- 1 Leaves 10-14 (-17) per node; longitudinal ridges of branchlets flattened or rounded; plant dioecious; branchlet segments 8-20 mm long, 0.9-1.2 mm in diameter..... *C. glauca*

\* *Casuarina equisetifolia* Linnaeus ssp. *equisetifolia*, Casuarina, Australian-pine, Horsetail Casuarina, Beach She-oak, Coastal She-oak. Beaches, dunes, suburban areas, disturbed areas; native of Malaysia, s. Asia, and Oceania. *C. equisetifolia* was reported as planted and persistent on the Outer Banks of NC by Brown (1959); it is not established so far north, however. Ssp. *incana* (Bentham) L.A.S. Johnson is not known to be introduced in se. North America. [= FNA; < *C. equisetifolia* - K, S, WH, Z]

\* *Casuarina glauca* Sieber ex Sprengel, Gray She-oak, Suckering Australian-pine, Scaly-bark Beefwood. Disturbed beaches and yards; native of Australia. Reported for Panhandle FL by Kunzer et al. (2009). [= FNA, K, WH]



**162. BETULACEAE** S.F. Gray 1821 (Birch Family) [in FAGALES]

A family of 6 genera and about 150 species, primarily of subarctic to cold temperate regions of the Northern Hemisphere, but extending through Central America to n. South America. The two subfamilies recognized here are sometimes elevated to family status, as by Govaerts & Frodin (1998). References: Furlow in FNA (1997); Furlow (1990)=Z; Hardin (1971)=Y; Govaerts & Frodin (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Scales of the pistillate catkins persistent; leafy involucre absent; fruit a small winged nut; [subfamily *Betuloideae*].
- 2 Pistillate scales woody, forming a persistent conelike catkin; plant a shrub, < 4 m tall (except *A. glutinosa*)..... *Alnus*
- 2 Pistillate scales deciduous with or soon after the fruits; plant a tree, > 10 m tall at maturity..... *Betula*
- 1 Scales of the pistillate catkins caducous; leafy involucre present, conspicuous; fruit an unwinged nut; [subfamily *Coryloideae*].
- 3 Nut spherical, 1-1.5 cm in diameter, closely enveloped by the involucre..... *Corylus*
- 3 Nut ovoid, 0.4-0.6 cm long, loosely or not at all enveloped by the involucre.
- 4 Infructescence bracts flat, 1-3 lobed, not enclosing the nut; bark gray, smooth; trunk moderately to strongly fluted; buds 4-angled..... *Carpinus*
- 4 Infructescence bracts inflated, loosely enclosing the nut; bark brown, shreddy; trunk not fluted; buds not 4-angled..... *Ostrya*

*Alnus* P. Miller 1754 (Alder)

A genus of about 25-35 species, shrubs and trees, of subarctic to warm temperate regions of the Northern Hemisphere, and in montane situations south to n. South America. References: Furlow in FNA (1997); Furlow (1990)=Z; Hardin (1971)=Y; Schrader & Graves (2002)=X; Kubitzki in Kubitzki, Rohwer, & Bittrich (1993). Key based in part on Schrader & Graves (2002).

- 1 Fruit broadly winged; winter buds sessile, covered by multiple, imbricate, unequal scales; [subgenus *Alnobetula*] ..... *A. viridis* var. *crispa*
- 1 Fruit narrowly winged; winter buds stalked, covered by 2-3 equal scales.
- 2 Pistillate catkins mostly 1-1.5 (-2) cm long, subsessile and often clustered together closely; typical leaves with 8-14 principal veins on each side of the midrib; [subgenus *Alnus*].

- 3 Fruiting catkins drooping; leaves broadest at or below the middle, pale green to glaucous beneath, doubly serrate, the teeth of various sizes, usually some of them coarse; bark dark reddish-brown, shiny, with prominent light-colored lenticels ..... *A. incana* ssp. *rugosa*
- 3 Fruiting catkins erect; leaves broadest at or above the middle, green beneath, finely serrate, the teeth approximately equal in size; bark light gray or brown, with inconspicuous lenticels ..... *A. serrulata*
- 2 Pistillate catkins mostly 1.5-3 cm long, evidently pedunculate and therefore spaced; typical leaves with 5-8 principal veins on each side of the midrib.
  - 4 Flowering spring; plant a tree; leaves broadly rounded to slightly notched at the tip; [alien, rarely planted and possibly persistent in our area]; [subgenus *Alnus*] ..... *A. glutinosa*
  - 4 Flowering late summer or autumn; plant a shrub; leaves obtuse to short-acuminate at the tip; [native of e. MD, DE, and GA]; [subgenus *Clethropsis*].
    - 5 Strobili (14-) 14.5-19 (-24) mm long, <1.3× as long as wide; large shrub or tree 5.5-9.5 m tall, with a narrow crown; [of nw. GA] ..... *A. maritima* ssp. *georgiensis*
    - 5 Strobili (15.2-) 18.5-22 (-25) mm long, >1.3× as long as wide; medium to large shrub 3.5-6 (-7.5) m tall, with a narrow to broad crown; [of s. DE and e. MD] ..... *A. maritima* ssp. *maritima*

\* *Alnus glutinosa* (Linnaeus) Gaertner, Black Alder, European Alder. Disturbed areas, suburban woodlands; native of Europe. April. Sometimes cultivated, especially northward, and naturalized at least as far south as s. PA (Rhoads & Klein 1993; Rhoads & Block 2007); it has also been reported for Morgan County, TN (Chester, Wofford, & Kral 1997). [= FNA, C, F, G, K, Pa; = *Alnus alnus* (Linnaeus) Britton]

*Alnus incana* (Linnaeus) Moench ssp. *rugosa* (Du Roi) Clausen, Speckled Alder. Braided streamhead seepage swamps. May-June; July-August. *A. incana* is here treated as a circumpolar complex consisting of several subspecies. Ssp. *incana* occurs in nc. and ne. Eurasia. Ssp. *rugosa* occurs from nw. Canada east to the Maritime Provinces, south to MD, VA, and WV, and IL. Ssp. *tenuifolia* (Nuttall) Breitung occurs in w. North America, from AK south to CA and NM. [= FNA, K, Pa, Z; > *A. incana* var. *americana* Regel - C; > *A. rugosa* (Du Roi) Sprengel var. *americana* (Regel) Fernald - F; = *A. rugosa* (Du Roi) Sprengel - G, W, Y]

*Alnus maritima* (Marshall) Muhlenberg ex Nuttall ssp. *georgiensis* Schrader & Graves, Georgia Alder. Standing water of Ridge-and-Valley spring run. Endemic to a single site in Bartow County, GA. It is one of three subspecies of *A. maritima*, each endemic to a small area - ssp. *maritima* of the Delmarva Peninsula of MD and DE, ssp. *georgiensis* Schrader & Graves of nw. GA, and ssp. *oklahomensis* Schrader & Graves of sc. OK. The closest relatives of *A. maritima* are in Asia. [= X; < *A. maritima* - FNA, K]

*Alnus maritima* (Marshall) Muhlenberg ex Nuttall ssp. *maritima*, Seaside Alder, Delmarva Alder. Streambanks, ponds, shores. Endemic to six counties in the Delmarva Peninsula of MD and DE. See above for additional discussion of *A. maritima* in general. [= X; < *A. maritima* - FNA, C, F, G, K]

*Alnus serrulata* (Aiton) Willdenow, Tag Alder, Smooth Alder, Hazel Alder. Streambanks, bogs, wet thickets. February-March; August-October. NS west to s. QC, MO, and OK, south to ne. FL, Panhandle FL, and TX. [= RAB, C, FNA, G, GW, K, Pa, W, Y, Z; > *A. serrulata* var. *serrulata* - F; > *A. serrulata* var. *subelliptica* Fernald - F; = *A. rugosa* - S, misapplied]

*Alnus viridis* (Villars) Lamarck & De Candolle ssp. *crispa* (Aiton) Turrill, Green Alder, Mountain Alder. Grassy balds, shrub balds, spruce-fir forests, and rock outcrops at high elevations (1600-1900m) in the Roan Mountain Massif, Mitchell and Avery counties, NC and Carter County, locally common. May-June; July. Ssp. *crispa* has variously been considered as varietally, subspecifically, and specifically distinct from typic *A. viridis*. *A. viridis* is here treated as a circumpolar complex of 4 subspecies. Ssp. *viridis* occurs in montane portions of Europe. Ssp. *sinuata* (Regel) Á. Löve & D. Löve occurs in w. Canada and south in the montane west to nw. United States. Ssp. *fruticosa* (Ruprecht) Nyman ranges from n. CA north to coastal AK, and in ne. Asia. Ssp. *crispa* is generally far northern, ranging across n. Canada, south to MA and c. NY, and disjunct at a few localities in PA and at Roan Mountain on the NC-TN border, where it forms an extensive population. [= FNA, K, Pa, Z; = *A. viridis* var. *crispa* (Aiton) House) - CZ; = *A. crispa* (Aiton) Pursh - RAB, G, W, Y; > *A. crispa* var. *crispa* - F; < *A. alnobetula* (Ehrhart) K. Koch - S; > *Alnus mitchelliana* M.A. Curtis ex Gray]



*Betula* Linnaeus 1753 (Birch)

A genus of 35-100 species, trees, shrubs, and subshrubs, of subarctic and temperate regions of the Northern Hemisphere. Section *Betula* (including natives *B. populifolia*, *B. papyrifera*, and *B. cordifolia*) is widely distributed in the northern hemisphere. Section *Costatae* (including *B. alleghaniensis*, *B. lenta*, *B. nigra*, and *B. uber*) occurs in e. North America and e. Asia. References: Grant & Thompson (1975); Furlow in FNA (1997); Furlow (1990)=Z; Hardin (1971)=Y; Järvinen et al. (2004); Govaerts & Frodin (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Leaf blades suborbicular, the apex rounded; [section *Costatae*] ..... *B. lenta* var. *uber*
- 1 Leaf blades ovate or triangular, the apex acute to acuminate.



- 2 Bark yellowish-gray, yellowish, pink, reddish-brown, or dark brown; samara rounded or slightly retuse at its apex, the wings making up 1/2 or less of the width; fruiting peduncles sessile (peduncled in *B. nigra*); [section *Costatae*].
- 3 Inner bark of the twigs bitter, not aromatic; leaves cuneate at the base.....*B. nigra*
- 3 Inner bark of the twigs with odor and flavor of wintergreen; leaves rounded to subcordate at the base.
- 4 Bark of stems 5-30 cm in diameter (on larger trees look up for branches) yellow or yellowish-gray, exfoliating in papery shreds (bark of larger trunks becoming platey, the plates not prominently marked horizontally by old lenticels); scales of fruiting catkins 6-13 mm long, pubescent and marginally ciliate; twigs and buds slightly hairy .....*B. alleghaniensis*
- 4 Bark of stems 5-30 cm in diameter (on larger trees look up for branches) reddish-brown or dark brown, tight (bark of larger trunks becoming platey, the plates prominently marked horizontally by old lenticels); scales of fruiting catkins 5-7 mm long, glabrous; twigs and buds glabrous .....*B. lenta* var. *lenta*
- 2 Bark white to pale gray; samara strongly retuse at its apex, the wings making up over 1/2 of the width; fruiting catkins peduncled; [section *Betula*].
- 5 Leaves glabrous beneath or somewhat pubescent on the veins; bark of young stems remaining tight; leaf apex long-acuminate to attenuate; central lobe of infructescence scales shorter than the basal and lateral lobes.
- 6 Leaf apex long-acuminate, but not attenuate; infructescence scales sparsely pubescent on the outer surface; bark of mature trees creamy to bright white.....*B. pendula*
- 6 Leaf apex attenuate-acuminate; infructescence scales densely pubescent on the outer surface; bark of mature trees grayish white.....*B. populifolia*
- 5 Leaves pubescent beneath, at least on the veins; bark of young stems exfoliating; leaf apex acute to short-acuminate; central lobe of infructescence scales equal to or longer than the basal and lateral lobes.
- 7 Leaf blades 3-4 (-6) cm long, with 3-6 lateral veins on each side of the midvein.....*B. pubescens* ssp. *pubescens*
- 7 Leaf blades 5-10 (-14) cm long, with 6-12 lateral veins on each side of the midvein.
- 8 Twigs glabrous or slightly pubescent (and then glabrate in age); leaves cordate (rarely rounded) at the base; leaves with 9-12 lateral veins on each side of the midvein; bark pinkish-white .....*B. cordifolia*
- 8 Twigs densely pubescent; leaves cuneate to rounded (rarely truncate) basally; leaves with 6-9 lateral veins on each side of the midvein; bark chalky-white.....*B. papyrifera*

***Betula alleghaniensis*** Britton, Yellow Birch. Forests at medium to high elevations, rarely at low elevations. April-May; June-August. NL (Newfoundland) west to se. MB, south to DE, PA, OH, n. IN, WI, MN, and IA, and in the mountains south to w. NC, n. GA, and e. TN. [= C, FNA, Pa, S, W, WV, Y, Z; = *B. lutea* Michaux f. - RAB; > *B. lutea* var. *lutea* - F, G; > *B. lutea* var. *macrolepis* Fernald - F, G; > *B. alleghaniensis* var. *alleghaniensis* - K; > *B. alleghaniensis* var. *macrolepis* (Fernald) Brayshaw - K]

***Betula cordifolia*** Regel, Mountain Paper Birch. High elevation forests, primarily on talus slopes and adjacent forests at high elevations, especially on quartzite on the western flank of the Blue Ridge, and on sandstone talus in the Ridge and Valley in VA. May-August; July-September. NL (Newfoundland) and e. QC south to the mountains of NY; disjunct in n. MN, w. VA, w. NC, and e. TN (Chester, Wofford, & Kral 1997). The question of the appropriate treatment of *B. cordifolia* and *B. papyrifera* is difficult (and still controversial). [= FNA, G, S, Y, Z; = *B. papyrifera* Marshall var. *cordifolia* (Regel) Fernald - RAB, C, F, K, W]

***Betula lenta*** Linnaeus var. *lenta*, Sweet Birch, Cherry Birch, Black Birch, "Mahogany." Forests at low to high elevations; common (uncommon in Piedmont). March-April; June-July. S. ME west to OH, south to GA and n. AL. This species is generally restricted elevationally in North Carolina to medium elevations and lower, but in VA it reaches higher elevations, where it can be as common as *B. alleghaniensis*. Once the primary source of methyl salicylate (wintergreen flavoring), used in medicines and confections; it is now produced synthetically. [= *B. lenta* - RAB, F, FNA, G, K, Pa, S, W, WV, Z; < *B. lenta* - C, Y (also including *B. uber*)]

***Betula lenta*** Linnaeus var. *uber* Ashe, Virginia Roundleaf Birch. Mountain forests (endemic to Smyth County, VA). May-June; July-August. *B. lenta* var. *uber* is related very closely to *B. lenta* var. *lenta*, and is apparently endemic to Smyth County, VA. In addition to the characters in the key, it differs from *B. lenta* var. *lenta* in having the leaves 2-6 cm long (vs. 7-15 cm long), with 4-6 pairs of lateral veins (vs. 8-12 pairs). See Mazzeo (1974), Ogle & Mazzeo (1976), Hayden & Hayden (1984), and McAllister & Ashburner (2004) for additional information on this birch and its history. It does not breed "true" and should perhaps be considered a form of *B. lenta*. [< *B. lenta* Linnaeus - C, Y; = *Betula uber* (Ashe) Fernald - F, FNA, K, W, Z; = *B. lenta* ssp. *uber* (Ashe) E. Murray; = *B. lenta* forma *uber* (Ashe) McAllister & Ashburner]

***Betula nigra*** Linnaeus, River Birch, Red Birch. Riverbanks, streambanks, floodplains, sandbars, disturbed uplands. March-April; May-June. NH west to se. MN and e. KS, south to ne. FL, FL Panhandle, and TX. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV, Y, Z]



***Betula papyrifera*** Marshall, Paper Birch, Canoe Birch. Dry soils. NL (Newfoundland), NL (Labrador) and AK, south to NJ, WV, OH, IN, IL, IA, NE, CO, and BC; it has sometimes been attributed to the Mountains of VA, but apparently these reports are based on *B. cordifolia*. [= FNA, G, Pa, WV, Y, Z; = *B. papyrifera* var. *papyrifera* - C, F, K, W]

\* *Betula pendula* Roth, European Weeping Birch, European White Birch. Persistent and escaping from plantings; native of Europe. Reported for Watauga County, NC by Poindexter (pers. comm.). [= C, F, FNA, K, Pa]

*Betula populifolia* Marshall, Gray Birch, White Birch. Woods, thickets, in VA native in old fields and young forests in the Big Meadows area on greenstone (Madison & Page counties, VA), disturbed areas. May-June; June-July. NS to s. QC, south to s. NJ and MD, more or less disjunct in n. VA, s. ON, n. OH, and n. IN. [= RAB, C, F, FNA, G, K, Pa, W, Y, Z]

\* *Betula pubescens* Ehrhart ssp. *pubescens*, European White Birch, Downy Birch. Disturbed areas; native of Europe. Also reported as an introduction in e. GA (Jones & Coile 1988) and at scattered sites throughout PA (Rhoads & Block 2007). [= FNA, K; = *B. alba* Linnaeus – C, F, G, an ambiguous name; < *B. pubescens* – Pa]



*Carpinus* Linnaeus 1753 (Hornbeam, Ironwood, Muscle-tree, Water-beech, Blue-beech)

A genus of about 26 species, trees, in temperate regions of the Northern Hemisphere, extending southward to se. Asia and Central America. The smooth gray bark gives *Carpinus* the names "Water-beech" and "Blue-beech", the fluted, sinewy appearance of the trunk the name "Muscle-tree", and the very hard, heavy wood the name "Ironwood." References: Furlow (1990)=Z; Hardin (1971)=Y; Furlow (1987a); Furlow (1987b)=X; Furlow in FNA (1997); Govaerts & Frodin (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Leaves narrowly ovate to oblong-ovate, 3-8.5 cm long, 1-4.5 cm wide, the apex acute, secondary teeth small and blunt, the lower leaf surface lacking conspicuous dark glands; bracts of the infructescence with rounded to subacute tips and few, blunt teeth; [primarily of the Coastal Plain and lower Piedmont].....*C. caroliniana* var. *caroliniana*
- 1 Leaves ovate to elliptic, 5.8-12.5 cm long, 2.5-6.0 cm wide, usually abruptly narrowed to the tip (sometimes gradually tapered to a long, acuminate apex), the secondary teeth often almost as long as the primary teeth, sharp-tipped, the lower leaf surface with conspicuous dark-brown glands; bracts of the infructescence mostly sharp-tipped and bearing several sharp teeth; [primarily of the Mountains and Piedmont]....*C. caroliniana* var. *virginiana*

*Carpinus caroliniana* Walter var. *caroliniana*, Coastal American Hornbeam. Streambanks, riverbanks, bottomland forests, lower slopes, maritime forests. March-April; September-October. S. NJ, e. MD, and e. VA south to c. peninsular FL, west to e. TX, and north in the inland to s. MO and s. IL. The validity of 2 taxa was established by Furlow (1987a, 1987b) largely through statistical methods. The two taxa have some morphologic and phylogeographic coherence, but intergradation appears to be extensive, and individual specimens (in the herbarium) or trees (in the field) may not be readily identifiable to variety. [= C, F; = *C. caroliniana* ssp. *caroliniana* – FNA, K, X, Z; < *C. caroliniana* – RAB, G, GW, S, WH, Y]

*Carpinus caroliniana* Walter var. *virginiana* (Marshall) Fernald, Inland American Hornbeam. Rich cove forests, streambanks, riverbanks, bottomland forests, lower slopes. March-April; September-October. ME, QC and s. ON west to MN, south to e. VA, c. NC, n. GA, n. AL, n. MS, AR, and se. OK. See above for discussion of the two varieties. [= C, F; = *C. caroliniana* ssp. *virginiana* (Marshall) Furlow – FNA, K, W, X, Z; < *C. caroliniana* – RAB, G, GW, Pa, 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 lacinate; young twigs and petioles stipitate-glandular; [section *Corylus*, subsection *Corylus*].....*C. americana*
- 1 Mature involucre 4-7 cm long, extended into a tubular beak; young twigs and petioles villous, glandless; [section *Corylus*, subsection *Siphonochlamys*].....*C. cornuta* var. *cornuta*

*Corylus americana* Walter, American Hazelnut, American Filbert. Rocky woodlands, mesic to rich forests and thickets. February-March; September-October. ME west to SK, south to GA, LA, and OK. [= RAB, C, FNA, K, Pa, S, W, WV, Y, Z; > *C. americana* var. *americana* – F, G; > *C. americana* var. *indehiscens* Palmer & Steyermark – F, G]

*Corylus cornuta* Marshall var. *cornuta*, Beaked Hazelnut. Dry rocky woodlands, thickets, high elevation forests and openings, seepage swamps. February-April; August-October. The species ranges from NL (Newfoundland) west to BC, south to NJ, n. GA, e. TN (Chester, Wofford, & Kral 1997), OH, MO, CO, and CA. Var. *cornuta* occupies most of that range; var.

*californica* (A. de Candolle) Sharp [ssp. *californica* (A. de Candolle) E. Murray], a small tree, is far western and grades into var. *cornuta*. [= K, Z; < *C. cornuta* – RAB, C, F, G, Pa, S, W, WV, Y; = *C. cornuta* ssp. *cornuta* – FNA]

*Ostrya* Scopoli 1760 (Hop-hornbeam, Ironwood)

A genus of 5-9 species, trees, of temperate regions of the Northern Hemisphere. References: Furlow in FNA (1997); Govaerts & Frodin (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

*Ostrya virginiana* (P. Miller) K. Koch, American Hop-hornbeam, Ironwood. Mesic to dry forests, often rocky, especially over basic rocks, reaching high elevations. April-May; August-October. NS west to MB, south to c. peninsular FL, Panhandle FL, and TX. One of our heaviest and hardest woods. [= RAB, C, FNA, G, Pa, S, W, WV, Y, Z; > *O. virginiana* var. *lasia* Fernald – F; > *O. virginiana* var. *virginiana* – F; = *O. virginiana* var. *virginiana* – K]

167. **CUCURBITACEAE** Durande 1782 (Gourd Family) [in CUCURBITALES]

A family of about 97-120 genera and 800-1000 species, of tropical and subtropical areas, with a few extending to temperate areas. Schaefer & Renner in Kubitzki (2011); Nesom (2011b); Nesom in FNA (in prep.).

- 1 Ovaries and fruits muricate, tuberculate, or echinate; fruits 1-25 cm long at maturity.
  - 2 Plants prostrate; tendrils absent; leaves with whitish-cripsed margins; [section *Bryoniae*] .....2. *Ecballium*
  - 2 Plants climbing; tendrils present; leaves with green margins
    - 3 Corolla 5-lobed, yellow, the petals 7-25 mm long; fruit muricate or tuberculate, 10-25-seeded, dehiscent by 3 valves or somewhat irregularly; tendrils with 1-2 branches; [tribe *Joliffieae*].....1. *Momordica*
    - 3 Corolla 5-6-lobed, white, the petals 0.5-6 mm long; fruit echinate, 1- or 4-seeded, indehiscent or dehiscent by 2 pores; tendrils with 3 branches; [tribe *Sicyeae*].
      - 4 Corolla 6-lobed; fruit 4-seeded, dehiscent by 2 pores; stems and leaves glabrous or glabrescent .....4. *Echinocystis*
      - 4 Corolla 5-lobed; fruit 1-seeded, indehiscent; stem and leaves conspicuously viscid-pubescent .....5. *Sicyos*
- 1 Ovaries and fruits smooth or pubescent, but not prickly; fruits 1-70 cm long at maturity.
  - 5 Leaves pinnately lobed, the divisions rounded; fruit surface green and white, the flesh red or pink; [tribe *Benincaseae*].....8. *Citrullus*
  - 5 Leaves palmately lobed, the divisions angular and toothed; fruit surface red, green, white, black, orange, yellow, or blue, the flesh white, orange, yellow, tan, or green.
    - 6 Fruit < 3 cm long; tendrils present, simple; [native, mostly in moist forests or thickets].
      - 7 Fruit surface red at maturity; pedicel of pistillate flowers and fruits 1-3 mm long; [tribe *Cucurbitaeae*] .....11. *Cayaponia*
      - 7 Fruit surface black or dark green at maturity; pedicel of pistillate flowers and fruits > 20 mm long; [tribe *Benincaseae*] .....7. *Melothria*
    - 6 Fruit > 5 cm long; tendrils absent or present (if present, forked); [introduced, mostly in gardens, fields, or disturbed places].
      - 8 Corolla white; [bottle gourd, ivy gourd]; [tribe *Benincaseae*].
        - 9 Corolla campanulate; fruit scarlet at maturity; [ivy gourd] .....9. *Coccinia*
        - 9 Corolla salverform; fruit not scarlet at maturity; [bottle gourd] .....10. *Lagenaria*
      - 8 Corolla yellow; [cantaloupe, cucumber, luffa, squash, gourd, pumpkin].
        - 10 Corolla < 3 cm long; [cantaloupe, cucumber]; [tribe *Benincaseae*].....6. *Cucumis*
        - 10 Corolla > 5 cm long; [luffa, squash, gourd, pumpkin].
          - 11 Corolla campanulate; fruit indehiscent, the interior fleshy; [squash, gourd, pumpkin]; [tribe *Cucurbitaeae*].....12. *Cucurbita*
          - 11 Corolla salverform; fruit dehiscent, the interior very fibrous; [luffa]; [tribe *Luffeae*] .....3. *Luffa*

1. *Momordica* Linnaeus 1753 (Balsam-apple, Bitter Melon)

A genus of ca. 45-60 species, vines, of the Old World tropics. References: Nesom in FNA (in prep.); Schaefer & Renner in Kubitzki (2011).

- 1 Bract of the male flowers toothed; bract of male flowers attached at the apex of the peduncle; fruit 2.5-4 (-7) cm long .....*M. balsamina*
- 1 Bract of the male flowers entire; bract of male flowers attached near or below the midpoint of the peduncle; fruit 7-25 cm long .....*M. charantia* ssp. *charantia*

\* *Momordica balsamina* Linnaeus, Balsam-apple, Bitter Melon. Disturbed areas; native of Africa. May-September. [= FNA, K2, WH]



\* *Momordica charantia* Linnaeus ssp. *charantia*, Balsam-pear, Balsam-apple, Bitter Melon. Disturbed areas, roadsides, fence-rows; native of Africa. Reported for Panhandle FL by Anderson (2007) and Kunzer et al. (2009). An additional subspecies, ssp. *macroloba* Achigan-Dako & Blattner, is known from wc. Africa. [= FNA; < K, S, WH]

## 2. *Ecballium* A. Richard 1824 (Squirting Cucumber)

A monotypic genus, a vine, of Mediterranean Europe, n. Africa, and w. Asia. References: Nesom in FNA (in prep.); Schaefer & Renner in Kubitzki (2011).

\* *Ecballium elaterium* (Linnaeus) A. Richard, Squirting Cucumber. Disturbed areas; native of Mediterranean Europe, n. Africa, and w. Asia. [= FNA, K2]

## 3. *Luffa* P. Miller 1754 (Luffa)

A genus of 5-7 species, vines, of the tropics. References: Nesom in FNA (in prep.); Schaefer & Renner in Kubitzki (2011).

1 Fruits clavate, strongly 10-angled; petals pale yellow; leaves shallowly lobed.....*L. acutangula* var. *acutangula*  
1 Fruits cylindrical, not angled; petals deep yellow; leaves deeply lobed.....*L. aegyptiaca*

\* *Luffa acutangula* (Linnaeus) Roxburgh var. *acutangula*, Angled Luffa, Ridged Gourd, Sponge Gourd. Gardens, fields, trash heaps; cultivated in home gardens, sometimes volunteering from seed the following year; native of s. Asia. Var. *amara* (Roxburgh) Clarke is also native of s. Asia. [= FNA; < *L. acutangula* - K]

\* *Luffa aegyptiaca* P. Miller, Smooth Luffa, Sponge Gourd, Vegetable Sponge. Gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of s. Asia. [= FNA, K; ? *L. cylindrica* (Linnaeus) M. Roemer - S]

## 4. *Echinocystis* Torrey & A. Gray 1840 (Wild-cucumber)

A monotypic genus, an annual vine, of e. North America. References: Nesom in FNA (in prep.); Schaefer & Renner in Kubitzki (2011).

*Echinocystis lobata* (Michaux) Torrey & A. Gray, Wild Balsam-apple, Wild-cucumber. Bottomland forests and thickets. July-October. NB west to SK, south to GA (?) and TX. [= RAB, C, F, FNA, G, GW, K, Pa, W, WV; = *Micrampelis lobata* (Michaux) Greene - S]

## 5. *Sicyos* Linnaeus 1753 (Bur-cucumber)

A genus of about 75 species, annual or perennial vines, of Australia, Pacific Islands, tropical America. References: Nesom (2011a)=Z; Schaefer & Renner in Kubitzki (2011).

*Sicyos angulatus* Linnaeus, Bur-cucumber, Nimble-Kate, Star-cucumber. Moist forests and thickets. August-November. S. ME west to MN and se. ND, south to Panhandle FL and c. TX. [= RAB, C, F, G, GW, K, Pa, S, W, WH, WV, Z]



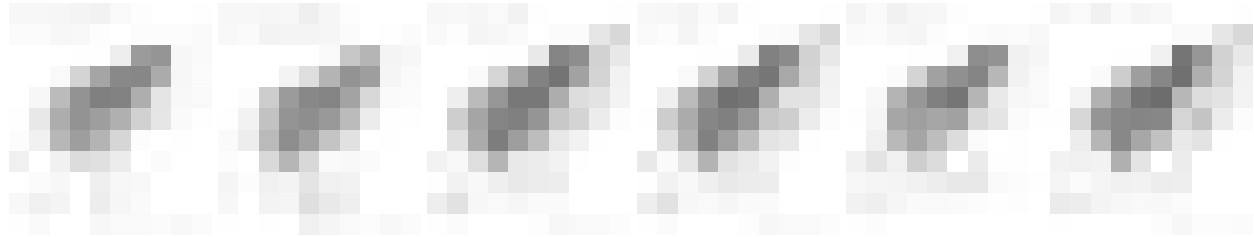
## 6. *Cucumis* Linnaeus 1753 (Cantaloupe, Muskmelon, Cucumber)

A genus of 50-60 species, herbaceous vines, native of the Old World (but see discussion under *C. melo* var. *texanus*). Infrageneric classification follows Schaefer (2007). References: Munger & Robinson (1991)=X; Schaefer (2007)=V; Kirkbride(1993)=Z; Decker-Walters et al. (2002)=Y; Silberstein et al. (1999); Stepansky, Kovalski, & Perl-Treves (1999)=U; Schaefer & Renner in Kubitzki (2011).

1 Fruits with spine-bearing tubercles (aculeae); [West Indian gherkin]; [subgenus *Cucumis*; section *Aculeatosi*].  
2 Aculei 1-2 mm long; leaves deeply 3-5-palmately lobed.....*C. anguria* var. *anguria*

- 2 Aculei 4-10 (-15) mm long; leaves slightly to deeply 3-5-palmately lobed.....*C. anguria* var. *longaculeatus*
- 1 Fruits smooth, reticulate, or hairy, lacking aculeae; [subgenus *Cucumis*; section *Cucumis*].
- 3 Leaf blade lobe broadly triangular; corolla tube of female flower 3.5-6.5 mm long; corolla tube of male flower 3.4-4.9 mm long; [cucumber] .....*C. sativus*
- 3 Leaf blade central lobe elliptic, oblong or ovate; corolla tube of female 0.8-2.8 mm long; corolla tube of male flower 0.8-2.0 mm long.
- 4 Fused portion of hypanthium or youngest fruits with appressed hairs; stem abundantly beset with retrorse prickles; fruit diameter 2.5-5 cm.....*C. melo* var. *texanus*
- 4 Fused portion of hypanthium or youngest fruits with spreading hairs; stems smooth or nearly so; fruit diameter > 10 cm.
- 5 Fruits with smooth or wrinkled rind; ripe fruits with white or green flesh, lacking musky odor..... *C. melo* var. *inodorus*
- 5 Fruits with netted, warty, or scaly rind; ripe fruits with orange (rarely green) flesh, with aromatic flavor and musky odor.....*C. melo* var. *melo*

- \* *Cucumis anguria* Linnaeus var. *anguria*, Bur Gherkin. Disturbed areas; native of Africa. [= FNA, K2; < *C. anguria* – S, V]
- \* *Cucumis anguria* Linnaeus var. *longaculeatus* J.H. Kirkbride, West Indian Gherkin. Disturbed areas; native of the Africa. Reported for GA (Jones & Coile 1988), FL (Wunderlin & Hansen 2003, as *C. anguria*), and AL (Diamond & Woods 2009, as *C. anguria*). [= K, Z; < *C. anguria* – S, V, WH]
- \* *Cucumis melo* Linnaeus var. *inodorus* Jacquin, Honeydew, Winter Melon. Sometimes cultivated in our area. [= U, X; < *Cucumis melo* Linnaeus – RAB, F, G, K, S, V; = *C. melo* ssp. *melo* var. *inodorus* – FNA; < *C. melo* ssp. *melo* – Z]
- \* *Cucumis melo* Linnaeus var. *melo*, Canteloupe, Muskmelon. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of w. Africa. [= *C. melo* ssp. *melo* var. *melo* – FNA; < *Cucumis melo* Linnaeus – RAB, F, G, K, S, V, WV; = *C. melo* var. *cantalupensis* Naudin – U, X; < *C. melo* ssp. *melo* – Z]
- Cucumis melo* Linnaeus var. *texanus* Naudin, Gulf Coast Melon. Fields, roadsides, other disturbed areas; apparently evolved into a distinct variety in the southeastern United States from Asian stock introduced at an unknown time and by unknown means. Panhandle FL south to peninsular FL, west through s. MS, s. TX, and Mexico. Decker-Walters et al. (2002) show that var. *texanus* is morphologically and molecularly distinct from the most closely related varieties, the Asian var. *chito* (*C. Morren*) Naudin and var. *dudaim* (Linnaeus) Naudin; they postulate that var. *texanus* was likely introduced from Asia in pre-Columbian times. [= FNA, Y; < *Cucumis melo* Linnaeus – RAB, F, G, K, S, V; = *C. melo* ssp. *agrestis* (Naudin) Pangalo var. *texanus* – FNA; < *C. melo* var. *chito* – U, X; < *C. melo* ssp. *agrestis* (Naudin) Pangalo – Z]
- \* *Cucumis sativus* Linnaeus, Cucumber. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of s. Asia. [= F, FNA, G, K, V, Z]



7. *Melothria* Linnaeus 1753 (Melonette)

A genus of about 12 species, vines, of the New World. References: Nesom in FNA (in prep.); Schaefer & Renner in Kubitzki (2011).

*Melothria pendula* Linnaeus, Melonette, Creeping Cucumber, Mouse Melon. Bottomland forests, moist roadsides and disturbed areas, marshes. June-November. DC, MD, and VA west to IN, south to FL and TX. [= C, F, FNA, G, GW, RAB, W; > *M. pendula* – S; > *M. pendula* var. *pendula* – K; > *M. pendula* var. *aspera* Cogniaux – K, S; > *M. pendula* var. *crassifolia* (Small) Cogniaux – K; > *M. microcarpa* Shuttleworth – S; > *M. nashii* Small – S]

8. *Citrullus* Schrader 1836 (Watermelon)

A genus of 4 species, annual or perennial herbaceous vines, of Africa, Mediterranean Europe, and w. Asia. References: Dane & Lang (2004); Nesom in FNA (in prep.); Nesom (2011b)=Z; Schaefer & Renner in Kubitzki (2011).

\* *Citrullus lanatus* (Thunberg) Matsumura & Nakai ssp. *lanatus*, Watermelon. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of tropical Africa. [< *Citrullus lanatus* (Thunberg) Matsumura & Nakai var. *lanatus* – K; < *C. vulgaris* Schrader – F, G, RAB, WV; = *C. lanatus* ssp. *lanatus* – FNA, Z; < *C. citrullus* (Linnaeus) Karsten – S; < *C. lanatus* – WH]

9. *Coccinia* Wight & Arnott 1834 (Ivy Gourd)

A genus of ca. 30 species, herbaceous or woody vines, of sub-Saharan Africa (and possibly also Asia). References: Nesom in FNA (in prep.); Schaefer & Renner in Kubitzki (2011).

\* *Coccinia grandis* (Linnaeus) Voigt, Ivy Gourd. Disturbed areas, escaped from cultivation; native of sub-Saharan Africa. May-November. [= K, WH]

10. *Lagenaria* Seringe 1825 (Bottle Gourd)

A genus of 6 species, herbaceous vines, of sub-Saharan Africa and Madagascar. References: Nesom in FNA (in prep.); Schaefer & Renner in Kubitzki (2011).

\* *Lagenaria siceraria* (Molina) Standley ssp. *siceraria*, Bottle Gourd, Calabash Gourd. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, rare as a volunteer from seed the following year; native of Africa. One of the oldest cultivated plants. [= FNA; < *L. siceraria* – K, WH; < *L. vulgaris* Seringe – RAB, F; < *L. leucantha* Rusby – G; < *Cucurbita lagenaria* Linnaeus – S]

11. *Cayaponia* Silva Manso 1836

A genus of about 45 species, herbaceous vines, of tropical, subtropical and warm-temperate America (a few in the Old World tropics). References: Schaefer & Renner in Kubitzki (2011).

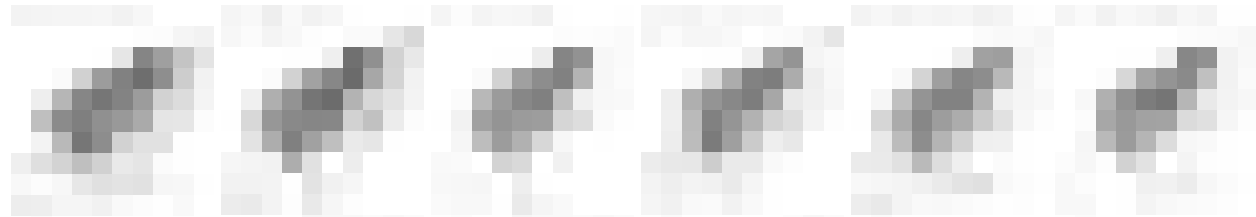
*Cayaponia quinqueloba* (Rafinesque) Shinnars. Swamp forests, river banks. June-November. E. SC south to GA, west to e. TX, north in the interior to w. TN. [= FNA, K; = *C. boykinii* (Torrey & A. Gray) Cogniaux – RAB, S; > *C. quinqueloba* GW; > *C. grandifolia* (Torrey & A. Gray) Small – GW]

12. *Cucurbita* Linnaeus 1753 (Squash, Zucchini, Pumpkin, Gourd, Vegetable Marrow)

A genus of 14-22 species, annual or perennial herbaceous vines, of the New World tropics and subtropics. References: Nesom in FNA (in prep.); Nesom (2011b)=Z; Schaefer & Renner in Kubitzki (2011).

- 1 Leaf blades distinctly longer than broad, triangular, usually unlobed; [coyote melon] ..... *C. foetidissima*
- 1 Leaf blades as wide or wider than long, deeply to shallowly lobed.
- 2 Stems and leaves variously pubescent, the hairs generally not pustulate-based.
  - 3 Fruiting peduncles relatively soft and corky-thickened, terete and not strongly ribbed, expanding gradually along their length..... *C. maxima*
  - 3 Fruiting peduncles hardened and woody, 5-ribbed, abruptly and widely expanded at point of fruit attachment ..... *C. moschata*
- 2 Stems and leaves hispid with pustulate-based hairs.
  - 4 Wild plants; fruit almost always bitter, solid ivory or green-and-white striped, usually not yellow or orange; rind smooth.
    - 5 Fruit usually solid ivory, sometimes green-and-white striped; germination within 1-4 days ..... *C. melopepo* var. *ozarkana*
    - 5 Fruit usually green-and-white striped, sometimes maturing yellow; germination within 3-7 days ..... *C. melopepo* var. *texana*
  - 4 Cultivated plants (or occurring as waifs and short-term naturalized population, usually in proximity to cultivation); fruit non-bitter (except for some ornamental gourds), variously colored, often at least partially yellow or orange; rind smooth, ribbed, or with warts.
    - 6 [scallop, pattypan, acorn, crookneck, and straightneck squashes, most ornamental gourds]..... *C. melopepo* var. *melopepo*
    - 6 [cocozelle, jack-o'-lantern pumpkins, vegetable marrows, zucchini, some ornamental gourds]..... *C. pepo*

\* *Cucurbita foetidissima* Kunth, Coyote Gourd, Buffalo Gourd, Foetid Gourd, Chili Coyote. Disturbed areas; native of sc. and sw. North America (incl. Mexico). May-August. [= FNA, K2]



\* *Cucurbita maxima* Duchesne, Hubbard Squash, Pumpkin. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of tropical America. [= F, K]

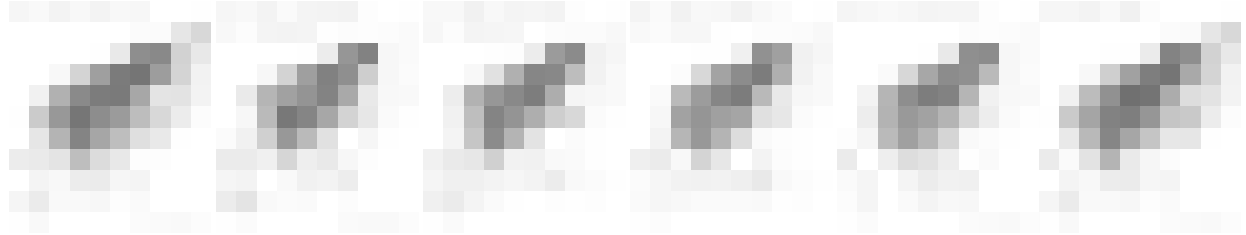
\* *Cucurbita melopepo* Linnaeus var. *melopepo*, Crookneck Squash, Straightneck Squash, Scallop Squash, Pattypan Squash, Acorn Squash, Ornamental Gourd. Gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, rarely volunteering from seed the following year; native of tropical America. May-October. [= *C. melopepo* ssp. *texana* (Scheele) G.L. Nesom var. *melopepo* – Z]

*Cucurbita melopepo* Linnaeus var. *ozarkana*, Ozark Squash. Bottomlands. {distribution} [= *C. melopepo* ssp. *texana* (Scheele) G.L. Nesom var. *ozarkana* (Decker) G.L. Nesom – Z]

*Cucurbita melopepo* Linnaeus var. *texana*, Texas Squash. Bottomlands. {distribution} [= *C. melopepo* ssp. *texana* (Scheele) G.L. Nesom var. *texana* (Scheele) G.L. Nesom – Z]

\* *Cucurbita moschata* Duchesne, Butternut Squash. Gardens, fields, trash heaps, commonly cultivated in home gardens and commercially, rarely volunteering from seed the following year; native of tropical America. May-October. [= F, K, WH; = *Pepo moschata* (Duchesne) Britton – S]

\* *Cucurbita pepo* Linnaeus, Pumpkin, Zucchini, Ornamental Gourd, Vegetable Marrow. Gardens, fields, trash heaps; commonly cultivated in home gardens and commercially, sometimes volunteering from seed the following year; native of tropical America. May-October. [= Z; < *C. pepo* – F, Pa, RAB, WV; = *C. pepo* var. *pepo* – K; < *Pepo pepo* (Linnaeus) Britton ex Small – S]



**170. BEGONIACEAE** C. Agardh 1824 (Begonia Family) [in CUCURBITALES]

A family of 2 genera and about 900-1500 species, herbs and shrubs, of tropical and subtropical (rarely warm temperate) regions. References: de Wilde in Kubitzki (2011).

**Begonia** Linnaeus (Begonia)

A genus of about 900-1500 (or more) species, herbs and shrubs, of tropical and subtropical (rarely warm temperate) regions. References: de Wilde in Kubitzki (2011).

\* *Begonia cucullata* Willdenow, Wax Begonia, Club Begonia. Disturbed places; native of South America. Escaped or persistent in e. GA (Jones and Coile 1988) and AL (Woods & Diamond 2006), south to Panhandle FL and ne. FL (Wunderlin & Hansen 2004). [= K, WH]

**172a. PARNASSIACEAE** Gray 1821 (Grass-of-Parnassus Family) [in CELASTRALES]

A family of 2 genera and about 16 species, herbs, of largely north temperate and arctic areas. Numerous anomalous features separate *Parnassia* from the Saxifragaceae; affinities with the Droseraceae, Clusiaceae, Celastraceae, and other families have been historically suggested. It is now clear that its affinities lie with Celastraceae, but APG III's (2009) inclusion of it in Celastraceae seems premature; it is here retained as separate. Considering the uncertainties of its relationships, *Parnassia* is best treated as a family, the Parnassiaceae, as suggested by numerous workers as early as 1821, and increasingly accepted in recent decades. The very distant relationship of *Parnassia* to the Saxifragaceae (sensu stricto) has been strongly reaffirmed by molecular analyses (Morgan & Soltis 1993, Soltis et al. 2000, Savolainen et al. 2000). References: Simmons in Kubitzki (2004). [including LEPUROPETALACEAE]

- 1 Plants diminutive, rosettes < 3 cm across; winter annual..... *Lepuropetalon*
- 1 Plants larger, rosettes over 8 cm across; perennial from rhizomes..... *Parnassia*

**Lepuropetalon** Elliott 1817 (Lepuropetalon)

A monotypic genus, of se. North America, Mexico, c. Chile, and Uruguay. Sometimes treated as part of a broad and polymorphic Saxifragaceae, *Lepuropetalon* has often been associated with *Parnassia* in the Parnassiaceae. Morgan & Soltis (1993) suggest a close relationship of *Lepuropetalon* and *Parnassia*, as well as the "distant relationship between both genera and the Saxifragoideae." The affinities of *Lepuropetalon* with *Parnassia* remain uncertain, however, as emphasized by Gastony & Soltis (1977) in their analysis of chromosomes and partially reiterated by Morgan & Soltis (1993). *Lepuropetalon* is here treated in the Parnassiaceae, as supported by molecular analyses (Soltis et al. 2000, Savolainen et al. 2000); treatment in a monotypic Lepuropetalaceae is perhaps equally warranted. References: Ward & Gholson (1987); Spongberg (1972); Gastony & Soltis (1977); Wilbur (1988b); Simmons in Kubitzki (2004).

*Lepuropetalon spathulatum* Elliott, Lepuropetalon. In moist open areas, such as seepage on granitic flatrocks, ditches, seasonally wet depressions. February-April. Se. NC and SC south to GA and FL Panhandle (Kunzer et al. 2009), west to e. TX and Mexico; also in Chile and Uruguay. As indicated by Ward & Gholson (1987), *Lepuropetalon* is more common than collections would indicate; the rosettes are 0.5-2 (-3) cm across, the greenish flowers are 2-3 mm across. It has been considered "the smallest terrestrial angiosperm" (Morgan & Soltis 1993). Its apparently greater abundance in the western portion of its range, where largely found by a few botanists "who have made determined efforts to establish its range" (Ward & Gholson), and

in habitats such as granitic flatrocks, which have overall received close scrutiny, may be more a reflection of its diminutive size and early season of occurrence than of its real distribution and abundance. The recent increase in collections, mostly in disturbed or human-maintained habitats, also suggests a possible increase in abundance (and range?) from its original state. It should be more vigorously sought in our area. The presence of lines of red glandular dots on the leaves and sepals is a helpful diagnostic character. [= RAB, GW, K, S]

*Parnassia* Linnaeus 1753 (Grass-of-Parnassus, Parnassia)

A genus of 15-70 species, herbs, primarily of arctic and north temperate areas. Our species (especially *P. caroliniana*) are among the most southerly of the genus in distribution. *Parnassia* (all species) are among the most beautiful of our native plants. From a distance the white flowers are attractive but not extraordinary; when observed closely, though, the delicate tracery of the green veins on the waxy white petals is astonishing. References: Gastony & Soltis (1977); Spongberg (1972); GW; Simmons in Kubitzki (2004).

**Identification notes:** Note that the five staminodia are (in our species) deeply three-lobed to the base, thus appearing as 15.

- 1 Leaf blades reniform, as wide or wider than long, the base strongly cordate; staminodia shorter than the stamens [note that the stamens elongate after the staminodia; thus at a certain early stage the stamens of *P. asarifolia* may be shorter than the staminodia; check several flowers]..... *P. asarifolia*
- 1 Leaf blades ovate, longer than wide, the base rounded, broadly cuneate, truncate, or cordate; staminodia longer than the stamens (*P. caroliniana* and *P. grandifolia*) or shorter than the stamens (*P. glauca*).
  - 2 Staminodia shorter than the stamens; [of NJ, PA, and OH northward]..... *P. glauca*
  - 2 Staminodia longer than the stamens; [of VA, WV, MO, OK southward].
    - 3 Main parallel veins of each petal (9-) 11-17 (counted at a point halfway between the base and the apex and ignoring short laterals), usually not dilated toward the apex of the petal; outer- or basal-most main vein branching pseudo-dichotomously several times; rhizome horizontal, long-creeping, the leaves scattered or loosely clustered, tending to form clonal patches to several m in diameter; ovary white; [of Coastal Plain pinelands] ..... *P. caroliniana*
    - 3 Main parallel veins of each petal 5-9 (counted at a point halfway between the base and the apex and ignoring short laterals), often strongly dilated toward the apex of the petal; outer- or basal-most main vein with numerous short laterals on the outer side, extending to the petal margin with few or no branchings; rhizome erect, short, the leaves strongly clustered, not forming large clonal patches; ovary green, sometimes white toward the base; [primarily of the Mountains, rarely also disjunct in the Coastal Plain]..... *P. grandifolia*

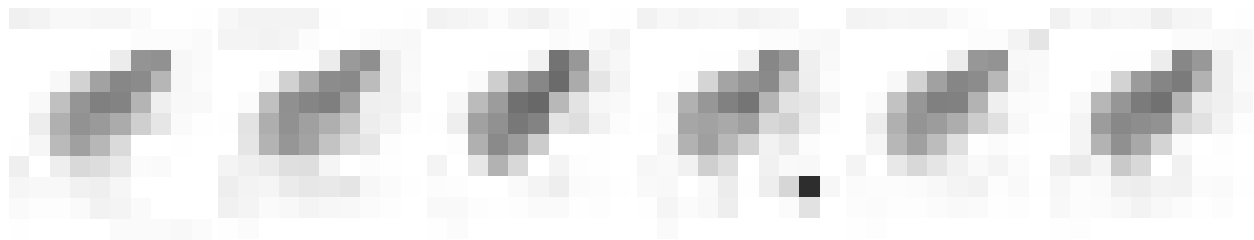
*Parnassia asarifolia* Ventenat, Kidney-leaved Grass-of-Parnassus, Appalachian Grass-of-Parnassus, Brook Parnassia. Bogs, sphagnum seeps, brookbanks, generally in more acidic habitats than *P. grandifolia*, up to elevations over 1800 m. (July-) August-October. VA, e. WV, sw. AR south to GA and e. TX, primarily in the Appalachian and Ozarkian highlands. [= RAB, C, F, G, GW, K, S, W, WV]

*Parnassia caroliniana* Michaux, Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright. Wet longleaf pine, pond pine, or pond cypress savannas (especially but not strictly where shallowly underlain by coquina limestone), sandhill seepage bogs. September-November (-December). Se. and sc. NC south through SC; disjunct in the Panhandle of FL, the distribution (at least now) fragmented and disjunctive. In NC, locally common in three small areas, centered around Maple Hill (Pender and Onslow counties), Old Dock (Columbus and Brunswick counties), and the Green Swamp (Brunswick County). Following Michaux's discovery of the species it was apparently not reported again in the Carolinas until found by H.A. Rankin near Hallsboro. His comments, quoted in Alexander (1934) are interesting. "What if our savannas are sometimes steaming, it is the condition necessary for the development for many wonderful plants which find here their most congenial surroundings. But Grass-of-Parnassus does not star the meadows during the steaming season, instead, by local tradition, the 'Eyebright,' its local name, times its first flowers to come just two weeks before frost ... As a matter of fact, I saw the first flowers this year on October 12th and our first frost came the morning of the 25th. Its chosen habitat is the wet savannas and hundreds of acres may be seen liberally dotted with its white stars, but it finds its best development in the lower places, and here it often almost covers the ground. Today, November 1st, it is in its prime and is the most conspicuous flower on many acres and in one little depression less than two feet in diameter I counted seventy-two flowers and buds." With the extensive destruction of our wet savannas (by conversion to pine tree farms, agriculture, and developed areas) and fire suppression, very few such places now remain. [= RAB, GW, K, S, WH]

*Parnassia glauca* Rafinesque, American Grass-of-Parnassus, Fen Grass-of-Parnassus. Fens. August-September. NL (Newfoundland), QC, and SK south to NJ (Ocean County), s. PA (Rhoads & Block 2007), OH, IN, IA, and SD. [= C, F, G, K, Pa]

*Parnassia grandifolia* A.P. de Candolle, Bigleaf Grass-of-Parnassus, Limeseep Parnassia. Fens, gravelly seepages, pineland seepage bogs and ecotones, primarily or solely over calcareous, mafic, or ultramafic rocks, in the outer Coastal Plain in seepage over marl on nearly vertical river bluffs on the Cape Fear River (NC) and in pineland seepage bogs. September-October. VA, WV, s. MO, and OK south to n. GA, Panhandle FL, s. MS (Sorrie & Leonard 1999), AR, and e. TX, primarily in the Appalachian and Ozarkian highlands. The discovery of populations of this species in Brunswick and Columbus counties, NC, was remarkable. In the Panhandle of FL and the West Gulf Coastal Plain of LA and TX it also occurs in wet savannas and pitcherplant bogs (MacRoberts, MacRoberts, & Jackson 2004), in FL sometimes in close proximity to *P. caroliniana*; *Parnassia* in Coastal Plain savannas should not necessarily be assumed to be *P. caroliniana*. [= RAB, C, F, G, GW, K, S, W, WH, WV]





**172b. CELASTRACEAE** R. Brown 1814 (Bittersweet Family) [in CELASTRALES]

A family of ca. 98 genera and ca. 1200 species, trees, shrubs, lianas, perennial and annual herbs, nearly cosmopolitan, especially in the tropics and subtropics. References: Brizicky (1964); Simmons in Kubitzki (2004).

- 1 Leaves spiny-toothed, coriaceous; [rare waif in our area].....*Crossopetalum*
- 1 Leaves entire to serrate (but not spiny-toothed), herbaceous to coriaceous; [collectively common in our area].
- 2 Leaves alternate; twining woody vines.....*Celastrus*
- 2 Leaves opposite; upright to trailing shrubs or climbing woody vines.
- 3 Leaves widely spaced, averaging < 1 pair per cm of stem; leaves 2.5-12 cm long, (0.5-) 1-6 cm wide; [shrubs to small trees, mostly > 0.4 m tall, collectively in many habitats] .....*Euonymus*
- 3 Leaves closely spaced, 2-4 pairs per cm of stem; leaves 1.1-2.5 cm long, 0.2-0.6 cm wide; [shrub < 0.4 m tall, native to calcareous rock outcrops, rarely naturalized elsewhere].....*Paxistima*

*Celastrus* Linnaeus 1753 (Bittersweet)

A genus of ca. 30 species, scandent shrubs, primarily in e. Asia, Malaysia, Oceania, Madagascar, and Central and South America. The one species native to e. North America is related to e. Asian species. The grammatical gender of the genus has been conserved as masculine (Brummitt 2005). References: Duncan (1969)=Z; Leicht-Young et al. (2007); Simmons in Kubitzki (2004).

- 1 Flowers in 2-3-flowered axillary cymes; mature leaves mostly obovate, averaging 1.2-1.4 (-1.7)× as long as wide; expanding leaves folded (conduplicate); capsule yellow (contrasting with the seeds); pollen white..... *C. orbiculatus*
- 1 Flowers in 6-many-flowered terminal panicles; mature leaves mostly ovate-lanceolate to elliptic, averaging (1.8-) 2.0-2.6× as long as wide; expanding leaves rolled (involute); capsule orange (similar in color to the seeds); pollen yellow .....*C. scandens*

\* *Celastrus orbiculatus* Thunberg, Oriental Bittersweet. Thickets, roadsides, forests; native of Asia. May-June; August-September. *C. orbiculatus* is grown for its attractive fruits; it has become a noxious weed in much of 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, Pa, W, Z; = *C. orbiculata* – G, K, orthographic variant]

*Celastrus scandens* Linnaeus, American Bittersweet. Mesic forests. May-June; August-September. QC west to MB and WY, south to w. SC, n. GA, AL, LA, and TX. [= RAB, C, F, G, K, Pa, S, W, Z]

*Crossopetalum* P. Browne 1756 (Christmas-berry)

A genus of about 26 species, trees and shrubs, of the West Indies and tropical America. References: Simmons in Kubitzki (2004).

\* *Crossopetalum ilicifolium* (Poiret) Kuntze, Holly-leaf Rhacoma, Christmas-berry. Disturbed, acid, peaty soil; native of subtropical FL. Presumably introduced via cattle at an agricultural experiment station near Wenona, Washington County, NC (Hayes 1946). The species has probably not persisted in our area. [= K, WH; = *Rhacoma ilicifolia* (Poiret) Trelease – S]

*Euonymus* Linnaeus 1753 (Spindle-tree, Euonymus, Strawberry-bush)

A genus of ca. 129 species, of temperate and tropical areas, trees, shrubs, and lianas. The genus name was variously spelled "*Euonymus*" and "*Evonymus*" by Linnaeus. The spelling *Euonymus* has been nomenclaturally "conserved." The genus is now considered to be grammatically masculine, and adjectival specific epithets therefore end in "-us." References: Ma & Funston (2008)= Y; Voss (1985)=Z; Simmons in Kubitzki (2004).

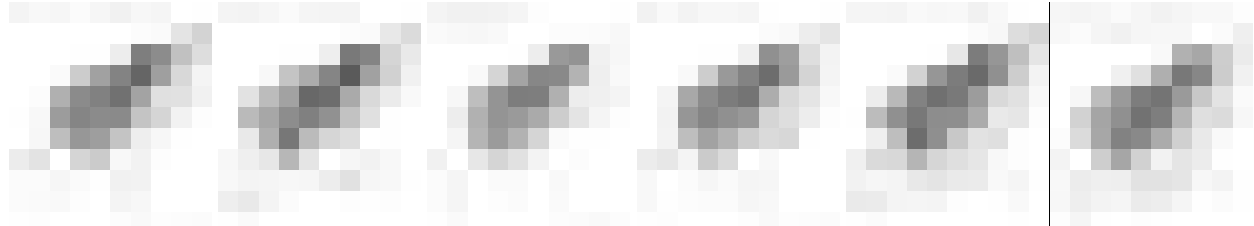
- 1 Leaf undersurface with mostly erect hairs to ca. 0.2 mm long; petioles 8-20 mm long; flowers 4-merous; [native]; [section *Euonymus*] .....*E. atropurpureus* var. *atropurpureus*
- 1 Leaf undersurface glabrous (or with some hairs on the midrib); petioles 1-33 mm long; flowers 4- or 5-merous; [introduced or native].
- 2 Leaves evergreen; flowers 4-merous; [introduced species, rarely naturalized]; [section *Ilicifolii*].
- 3 Leaves 2-5.5 cm long, 2-3.5 cm wide; capsule 5-6 mm in diameter .....*E. fortunei*
- 3 Leaves (3-) 5-10 (-12) cm long, (2-) 3-5 (-5.5) cm wide; capsule 6-9 (-12) mm in diameter .....*E. japonicus*

- 2 Leaves deciduous; flowers 4- or 5-merous; [introduced or native].
- 4 Petioles 5-33 mm long; flowers 4-merous; [introduced, rarely naturalized]; [section *Euonymus*].
  - 5 Leaf apex acute to short-acuminate; larger leaves 8-11 per cm .....*E. europaeus*
  - 5 Leaf apex long-acuminate; larger leaves with teeth 6-8 per cm .....*E. maackii*
- 4 Petioles 1-5 mm long; flowers 4- or 5-merous; [native and introduced].
  - 6 Twigs and branches with 2-4 corky wings; flowers 4-merous; capsules smooth; [introduced, rarely naturalized]; [section *Melanocarya*] .....*E. alatus*
  - 6 Twigs and small branches lacking corky wings, terete (or nearly so); flowers 5-merous; capsules muricate; [native species]; [section *Echinococcus*].
    - 7 Primary stems erect, to 20 dm tall; upper leaves widest at or below the middle; petioles mostly 1-3 mm long; [widespread in our area] .....*E. americanus*
    - 7 Primary stems trailing or decumbent, the tips and flowering branches ascending to 3 (-6) dm tall; upper leaves widest at or beyond the middle; petioles mostly 3-5 mm long; [of the Mountains].....*E. obovatus*

\* *Euonymus alatus* (Thunberg) Siebold, Winged Euonymus. Suburban woodlands; native of e. Asia. April-June; September-October. Reported for NC (Jackson Co.) by Pittillo & Brown (1988). [= C, F, G, Pa, V, W, Y; = *Euonymus alata* - K, Z; > *Euonymus alatus* var. *alatus*; > *Euonymus alatus* var. *apterus* Regel]

*Euonymus americanus* Linnaeus, Strawberry-bush, Heart's-a-bustin'-(with-love). Mesic to submesic forests. May-June; September-October. Se. NY west to s. OH and se. MO, south to n. peninsular FL and TX. A variety, var. *angustifolia* (Pursh) A. Wood, with narrowly lanceolate to linear leaves, has been named and occurs in our area; it is of uncertain status (Brizicky 1964). [= RAB, C, F, G, Pa, S, W, WH, WV; = *Euonymus americana* - K]

*Euonymus atropurpureus* Jacquin var. *atropurpureus*, American Wahoo, Burning Bush. Bottomland forests, riverbanks, mostly on rich alluvial sediments, or on slopes over mafic or calcareous rocks. May-July; August-October. NY west to ND, south to Panhandle FL and TX. Var. *cheathamii* Lundell is endemic to TX. [= *E. atropurpurea* var. *atropurpurea* - K; < *Euonymus atropurpureus* - RAB, C, F, G, Pa, S, W, WH, WV; < *Euonymus atropurpurea* - Z]



\* *Euonymus europaeus* Linnaeus, European Spindle-tree. Suburban woodlands, uncommonly cultivated, rarely naturalized; native of Europe. May-June; September-October. [= C, F, G, Pa; = *Euonymus europaea* - K, Z]

\* *Euonymus fortunei* (Turczaninow) Handel-Mazzetti, Wintercreeper, Chinese Spindle-tree. Bottomlands, swamps, upland suburban woodlands; native of China. May-June; October-December. Sometimes climbing into the canopy. [= F, G, Y, Z; > *Euonymus kiautschovica* - K; > *E. fortunei* (Turczaninow) Handel-Mazzetti var. *radicans* (Siebold ex Miquel) Rehder - K; ? *E. hederaceus* Champ. ex Benth - K2]

\* *Euonymus japonicus* Thunberg, Japanese Spindle-tree. Disturbed areas, especially on barrier islands; native of Japan. Widely planted on barrier islands and in other maritime situations because of its resistance to salt damage (Brown 1959). [= C, Y; = *E. japonica* - K]

\* *Euonymus maackii* Ruprecht, Winterberry. Cultivated, rarely naturalized; native of n. China. May-June; September-November. [= WH, Y; > *Euonymus bungeanum* Maximowicz - K; ? *E. hamiltonianus* Wallich var. *hamiltonianus* - K2; < *E. hamiltonianus* - Pa]

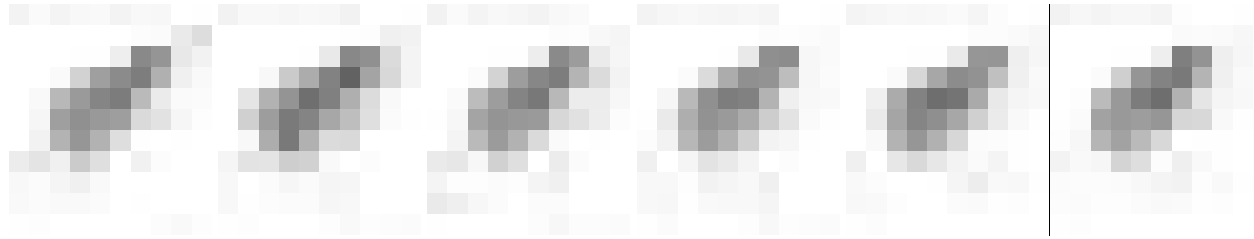
*Euonymus obovatus* Nuttall, Running Strawberry-bush. Cove forests, northern hardwood forests, other mesic forests, especially in boulderfields, where sometimes quite abundant locally. May-June; September-October. W. NY west to s. MI, south to sw. NC, ne. GA, TN, and MO. [= RAB, C, F, G, Pa, S, W; = *Euonymus obovata* - K, Z]

***Paxistima* Rafinesque 1838 (Mountain-lover)**

A genus of 2 species, rhizomatous shrubs, of temperate North America. The only other species in the genus is *P. myrsinites* (Pursh) Rafinesque of the Western Cordillera; its two subspecies are ssp. *myrsinites*, ranging from BC and AB south to AZ and NM, and ssp. *mexicana* Navaro & Blackwell of mountainous Mexico (Coahuila, Nuevo León, and Tamaulipas). For discussion of the long confusion and controversy over the appropriate spelling of the genus, see Navaro & Blackwell (1990) and Uttal (1986). The first validly published spelling of the name was "*Paxistima*," and this spelling should be retained. References: Navaro & Blackwell (1990)=Z; Simmons in Kubitzki (2004).

*Paxistima canbyi* A. Gray, Cliff-green, Canby's Mountain-lover, Ratstripper. On calcareous bluffs and cliffs (generally near the top of the cliffs or bluffs, rarely far below the crest), mostly on limestone and dolostone, but rarely on greenstone or shale; in NC naturalized at the site of a plant nursery and possibly also native (see discussion below). April-May; August-September. The species is a Central Appalachian endemic: sc. PA (Bedford County) (Rhoads & Klein 1993; Rhoads & Block 2007), e. WV, w. VA, s. OH, e. KY, ne. TN, and w. NC (where questionably native). The only collection definitely known from NC is that from an old nursery site (Hardin 1963). Navaro & Blackwell (1990) note that "the presence of *P. canbyi* in North Carolina was, however,

noticed as long ago as 1883 by Chapman, and *P. canbyi* is likely native to North Carolina." Small (1933) reports it from "n. NC." Casting doubt on its native status in NC is the species' habitat: limestone ravines and bluffs, a very rare habitat in NC. [= RAB, C, K, Pa, W, Z; = *Pachystima canbyi* – F, WV (the name not validly published); = *Pachystima canbyi* – G, S (the name not validly published)]



175. **Oxalidaceae** R. Brown 1818 (Wood-sorrel Family) [in Oxalidales]

A family of 5-6 genera and 600-775 species, herbs, shrubs, vines, and small trees, nearly cosmopolitan (especially temperate).  
References: Cocucci in Kubitzki (2004).

*Oxalis* Linnaeus 1753 (Wood-sorrel, Oxalis)

A genus of about 500-700 species, herbs, shrubs, and vines. References: Ward (2004a)=Z; Eiten (1963)=Y; Lourteig (1979)=X; Nesom (2009b)=V; Nesom (2009c)=U; Robertson (1975)=Q; Cocucci in Kubitzki (2004). Taxonomy and key based in part on Nesom (2009b).

- 1 Plant acaulescent; leaves basal; flowers white, pink, or purple.
  - 2 Leaflets obdeltoid.
    - 3 Leaflets green; plants with bulbs and bulblets.....*O. intermedia*
    - 3 Leaflets purple; plants with scale-clad rhizomes.....*O. triangularis*
  - 2 Leaflets obcordate.
    - 4 Flowers solitary; plants rhizomatous; tips of sepals plane; [section *Oxalis*].....*O. montana*
    - 4 Flowers in umbels; plants bulbous; tips of sepals with orange callosities; [section *Ionoxalis*].
      - 5 Sepals conspicuously appressed-pubescent; leaflets with reddish-brown callosities mostly along the margins; [naturalized].....*O. articulata*
      - 5 Sepals glabrous or sparsely pubescent; leaflets with reddish-brown callosities **either** scattered over the surface **or** only at the apical notch; [native or naturalized]
        - 6 Leaflets 25-45 mm long; leaflets with reddish-brown callosities scattered over the surface; [naturalized] .....*O. debilis*
        - 6 Leaflets 8-15 mm long; leaflets with reddish-brown callosities only at the apical notch; [native] .....*O. violacea*
- 1 Plant caulescent; leaves alternate; flowers yellow; [section *Corniculatae*].
  - 7 Stems evenly strigose from base to peduncles and pedicels
    - 8 Flowers 1-3 (-8) per umbelliform cymes; flowers homostylous; petals 5-11 mm long, yellow, without red lines .....*O. dillenii*
    - 8 Flowers (2-) 3-5 (-8) per umbelliform cyme; flowers distylous; petals (10-) 12-16 (-17) mm long, yellow with prominent red lines in the corolla throat.....*O. texana*
  - 7 Stems pilose to villous to nearly glabrous, rarely strigose and then only on peduncles or pedicels.
    - 9 Petals 10-20 mm long, red-lined in the throat.
      - 10 Corolla throats strongly red-lined within; petals 14-20 mm long; flowers 1 or (2-) 3-8 in umbelliform cymes above the level of the leaves; stems densely and pilose with stiffly spreading non-septate hairs; stoloniform rhizomes lignescent or ligneous and numerous on an individual plant.....*O. priceae*
      - 10 Corolla throats yellow, very faintly to strongly red-lined within; petals 10-18 mm long; flowers 1 or 2-4 (-8) in regular or irregular cymes, above or within the level of the leaves; stems nearly glabrous to sparsely or densely pilose or villous with septate hairs or a mixture of septate and non-septate hairs; stoloniform rhizomes usually 1 or few, herbaceous or lignescent.
        - 11 Plants arising from slender, lignescent, stoloniform rhizomes without tubers; leaflets with upper shoulders usually rounded, margins often with a narrow purple margin; flowers produced above the level of the leaves; petals 10-14 mm long, throat yellow to very faintly or weakly red-lined within .....*O. grandis*
        - 11 Plants arising from slender, herbaceous, stoloniform rhizomes at intervals producing white, horizontal, fusiform tubers or tuberlike thickenings; leaflets with upper shoulders flattened, margins green; flowers produced mostly within the level of the leaves; petals 12-18 mm long, throat strongly red-lined within.....*O. illinoensis*
    - 9 Petals 4-9 (-11) mm long, yellow, without red lines in the throat.
      - 12 Stems repent, rooting at most nodes; seeds brown, transverse ridges not white; stipules oblong with distinct flanges and free auricles. ....*O. corniculata*
      - 12 Stems erect, usually arising singly from the base, rarely decumbent, not or very rarely rooting at the nodes, from a short, thin, often herbaceous to slightly lignescent rhizome etc. ; seeds all brown or with white transverse ridges; stipules absent or so reduced to be barely evident.
        - 13 Stems (5-) 8-30 (-35) cm, sparsely pilose with non-septate hairs to almost completely glabrous, arising from a taproot, often producing lignescent stolons; flowers 1 or 2 (-3, rarely 4-5) in umbelliform cymes; capsules glabrous to sparsely puberulent, not villous .....*O. florida*

- 13 Stems 20-60 (-90) cm long, sparsely to very sparsely pilose with nonseptate hairs or a mixture of nonseptate and septate hairs or densely villous with septate hairs, arising singly from the base from a short herbaceous to lignescent rhizome; flowers usually (3-) 5-7 (-15) in regular (rarely irregular) cymes; capsules villous to puberulent and villous to glabrate..... *O. stricta*

\* *Oxalis articulata* Savigny in Lamarck. Roadsides, old gardens; native of South America. [= V; > *O. rubra* St. Hilaire – RAB, K, Q, WH; ? *Ionoxalis martiana* (Zuccarini) Small – S, misapplied; > *O. articulata* Savigny ssp. *rubra* (St. Hilaire) Lourteig]

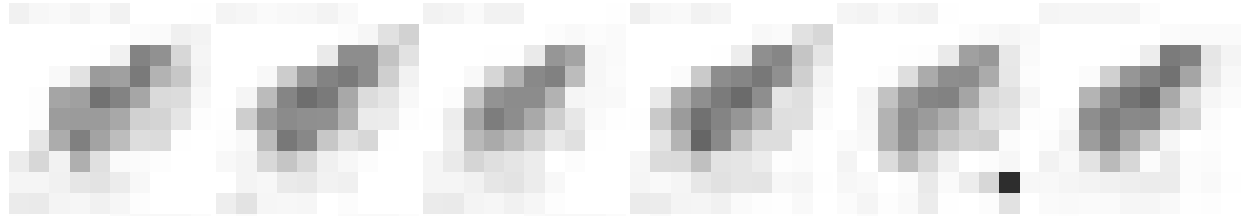
\* *Oxalis corniculata* Linnaeus, Creeping Lady's-sorrel. Gardens, fields, disturbed areas, sometimes more natural areas including pinelands, dunes; probably native of New World tropics and subtropics, possibly including the deeper South. February-December. Now nearly worldwide in distribution. [= RAB, C, F, K, Pa, Q, WV, Y; = *O. repens* Thunberg – G; > *Xanthoxalis corniculata* (Linnaeus) Small – S; > *Xanthoxalis langloisii* Small – S; < *O. corniculata* – WH; > *O. corniculata* var. *corniculata* – Z; > *O. corniculata* var. *atropurpurea* Planchon – Z]

\* *Oxalis debilis* Kunth. Disturbed areas; native of South America. See Kartesz (1999). [= V; > *O. corymbosa* A.P. de Candolle – Q, Z; > *Oxalis debilis* Kunth var. *corymbosa* (A.P. de Candolle) Lourteig – K, WH]

*Oxalis dillenii* Jacquín, Southern Yellow Wood-sorrel. Roadsides, pastures, lawns, a wide variety of other habitats. February-May (-October). NS west to SK, south to FL, TX, NM; introduced elsewhere. [= C, K; > *O. dillenii* – RAB; > *O. florida* var. *florida* – RAB; > *O. florida* Salisbury var. *filipes* (Small) H.E. Ahles – RAB; = *O. stricta* Linnaeus – G, WV, misapplied; > *O. dillenii* ssp. *filipes* (Small) Eiten – Pa; > *O. dillenii* ssp. *dillenii* – Q, W, Y, Z; > *O. florida* – F; > *Xanthoxalis brittoniae* (Small) Small – S]

*Oxalis florida* Salisbury. Floodplain forests, moist fields, ditches, bluffs, and moist slopes. March-May (-August). VT and CT south to FL, west to LA, AR, and MO. [= *Oxalis priceae* Small ssp. *colorea* (Small) Eiten – K, Q, Y; = *O. recurva* Elliott var. *recurva* – F; < *O. recurva* – G; = *O. florida* Salisbury var. *recurva* (Elliott) H.E. Ahles – RAB; = *O. macrantha* (Trelease) Small – C; > *Xanthoxalis colorea* Small – S; > *Xanthoxalis recurva* Elliott Small – S; > *O. filipes* – F; > *Xanthoxalis filipes* (Small) Small – S; > *O. dillenii* Jacquín ssp. *filipes* (Small) Eiten – Q, W, Y, Z; < *O. lyonii* Pursh – WH]

*Oxalis grandis* Small, Great Yellow Wood-sorrel. Rich moist forests, rocky bluffs. May-August. PA, OH, and IN, south to SC, GA, AL, MS. [= RAB, C, F, G, K, Pa, Q, W, Y; = *Xanthoxalis grandis* (Small) Small – S]



*Oxalis illinoensis* Schwegman, Illinois Wood-sorrel. Dry to dry-mesic forests and bluffs, often but not necessarily calcareous. S. IN and s. IL south through KY to c. TN. [= K]

\* *Oxalis intermedia* A. Richard, West Indian Wood-sorrel. Moist disturbed areas; native of West Indies. April-September. [= V; < *O. latifolia* Kunth – WH]

*Oxalis montana* Rafinesque, American Wood-sorrel, White Wood-sorrel. Spruce-fir forests, northern hardwood forests, at high elevations. May-July. QC and NY west to SK, south to GA, NC, and TN. Closely related to the Eurasian *O. acetosella*, and sometimes treated as a geographic subspecies or phase (see synonymy). [= F, K, S, WV; < *O. acetosella* Linnaeus – RAB, C, G, Pa, W; = *O. acetosella* ssp. *montana* (Rafinesque) Hultén ex D. Löve – Q]

*Oxalis priceae* Small, Sadie Price's Yellow Wood-sorrel. Rich woodlands. KY and TN south to GA, Panhandle FL, AL, MS, and se. LA; disjunct in c. NC. [= *Oxalis priceae* Small ssp. *priceae* – K, Q, Y; = *O. recurva* Elliott var. *macrantha* (Trelease) Wiegand – F; < *O. recurva* – G; > *Xanthoxalis priceae* Small – S; > *Xanthoxalis hirsuticaulis* (Small) Small – S; > *Xanthoxalis macrantha* (Trelease) Small – S, misapplied; < *O. lyonii* Pursh – WH]

*Oxalis stricta* Linnaeus, Common Yellow Wood-sorrel. Disturbed areas, also in a variety of natural habitats. May-October. Widespread in North America, now widespread nearly worldwide. [= RAB, C, K, Pa, Q, W, WV, Y, Z; > *O. europaea* Jord. var. *europaea* – F; > *O. europaea* var. *bushii* (Small) Wiegand – F; = *O. europaea* – G; > *Xanthoxalis stricta* (Linnaeus) Small – S; > *Xanthoxalis bushii* Small – S; > *Xanthoxalis rufa* Small – S; > *Xanthoxalis cymosa* (Small) Small – S; < *O. corniculata* – WH]

\* *Oxalis texana* (Small) Fedde. Disturbed areas; native of sc. United States (LA, AR, and TX). March-May (-June). Reported for GA (GANHP, Kartesz 1999); not in GA (Ward 2004). [= V; = *O. priceae* Small ssp. *texana* (Small) Eiten – K, Q, Y; = *O. lyonii* Pursh – X]



\* *Oxalis triangularis* A. St.-Hilaire. Disturbed areas; native of Brazil and Argentina. April-May. [= V; < *Oxalis triangularis* A. St.-Hilaire ssp. *papilionacea* (Hoffmannsegg ex Zuccarini) Lourteig – WH]

*Oxalis violacea* Linnaeus, Violet Wood-sorrel. Dry to moist forests. March-May. MA, VT, MI, SD, and CO south to FL, TX, and AZ. [= RAB, C, G, K, Pa, Q, V, W, WH, Z; > *O. violacea* var. *violacea* – F, WV; > *O. violacea* var. *trichophora* Fassett – F, WV; = *Sassia violacea* (Linnaeus) Holub; = *Ionoxalis violacea* (Linnaeus) Small – S]

**181. RHIZOPHORACEAE** R. Brown 1814 (Red Mangrove Family) [in MALPIGHIALES]

A family of about 15 genera and 120 species, of tropical areas of the Old and New World.

***Rhizophora*** Linnaeus (Red Mangrove)

A genus of 8-9 species, trees and shrubs, of tropical shores.

***Rhizophora mangle*** Linnaeus, Red Mangrove. Cp (FL, GA, NC, SC): beaches; rare. Well-established from n. FL southward into the West Indies and beyond in tropical America. The distinctive floating seedlings of *Rhizophora* occasionally wash up as jetsam on beaches of GA, NC, and SC, particularly following hurricanes. Dave Owen (pers. comm. and photograph) has provided photographic evidence from Bear Island, Onslow County, NC, 11 June 1996. These propagules (repeatedly introduced naturally) may sprout and grow for some time, forming a young sapling with leaves, but do not currently survive in or north of NC because of frost. [= GW, K, S, WH]



**184. EUPHORBIACEAE** A.L. de Jussieu 1789 (Spurge Family) [in MALPIGHIALES]

A family of about 313-322 genera and 8100-9000 species, trees, shrubs, vines, and herbs, nearly cosmopolitan in distribution, as defined broadly. Molecular systematics suggests that various units traditionally included in the Euphorbiaceae should be segregated (Soltis et al. 2000, Chase et al. 2002). In our flora, this includes *Phyllanthus* (in Phyllanthaceae). References: Webster (1967), Webster (1994); Govaerts, Frodin, & Radcliffe-Smith (2000). [also see *PHYLLANTHACEAE*]

- 1 Shrub or tree (woody).
  - 2 Leaves entire.
    - 3 Leaf blades 2-5× as long as wide; petioles 0.2-1.0 cm long; plant a native shrub; [subfamily *Euphorbioideae*].....*Ditrysinia*
    - 3 Leaf blades 1-1.5× as long as wide; petioles 2-6 cm long; plant an alien tree; [subfamily *Acalyphoideae*] .....*Triadica*
  - 2 Leaves crenate, serrate, or palmately lobed.
    - 4 Leaves elliptic or lanceolate, with crenate or serrate margins.
      - 5 Petiole lacking glands; [subfamily *Acalyphoideae*] .....*Sapium*
      - 5 Petiole with 2 glands at summit; [subfamily *Euphorbioideae*] .....*Stillingia*
    - 4 Leaves ovate or orbicular in outline, palmately lobed.
      - 6 Inflorescence a panicle; petals absent; [subfamily *Acalyphoideae*] .....*Ricinus*
      - 6 Inflorescence a dichasium; petals present; [subfamily *Crotonoideae*] .....*Vernicia*
- 1 Herb.
  - 7 Leaves palmately deeply divided into 3-many lobes.
    - 8 Leaves peltate; calyx green or purple; plant glabrous; stamens 100-1000; [subfamily *Acalyphoideae*].....*Ricinus*
    - 8 Leaves cordate at base; calyx petaloid, white; plant glabrous or with conspicuous stinging trichomes; stamens 8-10; [subfamily *Crotonoideae*].
      - 9 Plant with stinging trichomes; stamens connate ..... *Cnidoscolus*
      - 9 Plant lacking stinging trichomes; stamens separate ..... *Manihot*
  - 7 Leaves generally not lobed, entire or serrate (rarely pinnately lobed in *Euphorbia*).
    - 10 Plant with copious white latex; flowers enclosed in a cyathium; [subfamily *Euphorbioideae*].....*Euphorbia*
    - 10 Plant without white latex (the sap clear, or slightly milky in *Stillingia*); flowers not enclosed in a cyathium.
      - 11 Pubescence of stellate trichomes and/or scales; [subfamily *Crotonoideae*] ..... *Croton*
      - 11 Pubescence of simple trichomes, or glabrous.
        - 12 Flowers in terminal spikes; stout perennial with several to many stems arising from a subterranean crown [subfamily *Euphorbioideae*] ..... *Stillingia*
        - 12 Flowers strictly axillary or both axillary and terminal, in small clusters, racemes, or spikes; finer perennial or annual, not typically with > 1 stem arising from a subterranean crown.
        - 13 Ovules and seeds 2 per locule (the capsule thus 6-seeded); flowers in small axillary clusters of 2-4..... [see *Phyllanthus* – *PHYLLANTHACEAE*]

- 13 Ovules and seeds 1 per locule (the capsule thus 3-seeded, or fewer by abortion); flowers in axillary spikes or in racemes borne in leaf axils or opposite the leaves; [subfamily *Acalyphoideae*].
- 14 Pistillate flowers lacking a leafy bract; plant with stinging trichomes; styles undivided ..... *Tragia*
- 14 Pistillate flowers subtended by a conspicuous leafy bract; plant lacking stinging trichomes; styles lacinate
  - 15 Leaves alternate; carpels 3 (sometimes fewer by abortion)..... *Acalypha*
  - 15 Leaves opposite; carpels 2 ..... *Mercurialis*

*Acalypha* Linnaeus 1753 (Copperleaf, Three-seeded Mercury)

A genus of about 430-462 species, shrubs, herbs, and trees, of primarily tropical and subtropical regions (rarely warm temperate). References: Levin in FNA (in prep.); Levin (1999b)=Z; Levin (1999a); Govaerts, Frodin, & Radcliffe-Smith (2000)=Y. Key based in part on Levin in FNA.

- 1 Bracts of pistillate flowers with linear tips or lobes longer than the broad basal portion; pistillate flowers all or chiefly in terminal spikes, the staminate flowers in axillary clusters (except sometimes in *A. arvensis*).
  - 2 Pistillate inflorescences with the bracts densely crowded, completely hiding the inflorescence axis; bracts of pistillate flowers with lobes consisting of deltate bases bearing long linear tips, long-hirsute with nonglandular hairs to 2 mm long..... *A. arvensis*
  - 2 Pistillate inflorescences with the bracts loosely arranged, the axis visible between the bracts; bracts of pistillate flowers with the lobes linear throughout, glabrous or pubescence with nonglandular hairs < 0.25 mm long (glandular hairs may be longer).
    - 3 Leaves cordate at base; fruit tuberculate, but not pubescent..... *A. ostryifolia*
    - 3 Leaves rounded to widely cuneate at base; fruit pubescent with pustular-based trichomes..... *A. setosa*
- 1 Bracts of the pistillate flowers with deltate or lanceolate tips or lobes; pistillate and staminate flowers all in axillary inflorescences, the staminate flowers above and pistillate flowers below in each inflorescence.
  - 4 Bracts subtending the pistillate flowers (5-) 7-9 (-11) lobed, usually stipitate-glandular; petiole 0.5-1.5× as long as the leaf blade; stems with only short, incurved trichomes.
    - 5 Fruit 2-seeded; seeds 2.4-3.2 mm long..... *A. deamii*
    - 5 Fruit 3-seeded; seeds 1.2-2.0 mm long..... *A. rhomboidea*
  - 4 Bracts subtending the pistillate flowers 9-15 (-16) lobed, stipitate-glandular or merely pubescent; petiole 0.2-0.5× as long as the leaf blade; stems with short incurved trichomes, with or without longer, straight, spreading trichomes as well.
    - 6 Bracts subtending the pistillate flowers usually stipitate-glandular, the bract lobes ovate to deltoid, the longest <2 mm long ..... *A. gracilens*
    - 6 Bracts subtending the pistillate flowers usually with non-stipitate, pointed hairs, the bract lobes linear to oblong, the longest usually > 3 mm longbroadly ..... *A. virginica*

\* *Acalypha arvensis* Poeppeg & Endlicher. Disturbed ground; native of West Indies, Mexico, and Central America. [= FNA, K, WH]

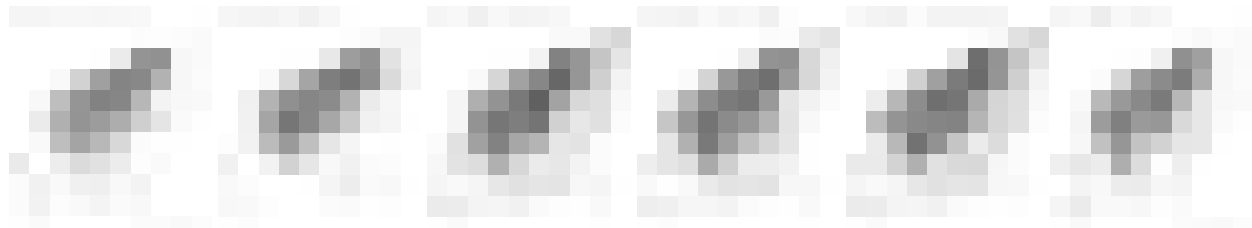
*Acalypha deamii* (Weatherby) H.E. Ahles, Big-seeded Copperleaf, Two-seeded Copperleaf. Alluvial forests, especially on sandy levees. W. PA (Rhoads & Block 2007), s. OH, and s. IN south to w. TN (Chester, Wofford, & Kral 1997) and AR; apparently disjunct in c. VA (where now known from 23 counties, mainly in the Piedmont), but perhaps only overlooked elsewhere. This plant is up to a meter tall and occurs in moist bottomland forests. [= C, FNA, K, Pa, Z; = *A. rhomboidea* var. *deamii* (Weatherby) Weatherby - F, G; = *A. virginica* Linnaeus var. *deamii* Weatherby - Y]

*Acalypha gracilens* A. Gray, Shortstalk Copperleaf. Woodlands, disturbed ground. Late June-November. ME west to WI, south to FL and TX. The related *A. monococca* (Engelmann ex A. Gray) Lill. W. Miller & Gandhi is of broadly Ozarkian distribution and warrants specific status (Levin 1999a, 1999b). Var. *fraseri* is generally more southern and is considered to differ in having more elongate staminate spikes, to 3-4 cm long (vs. 0.5-1.5 cm long). It may have merit, but was not recognized by Levin (1999a, 1999b). [= RAB, FNA, K, Pa, S, W, Z; > *A. gracilens* var. *gracilens* - C, F, G; > *A. gracilens* var. *fraseri* (Müller of Aargau) Weatherby - C, F, G; = *A. virginica* Linnaeus var. *gracilens* (A. Gray) Müller of Aargau - Y; = *A. gracilens* ssp. *gracilens*]

*Acalypha ostryifolia* Riddell ex J.M. Coulter, Rough-pod Copperleaf. Disturbed ground. Late June-November. NJ west to IN and NE, south to FL, TX, Mexico, and the West Indies. [= FNA, K, W, Y; = *A. ostryaefolia* - RAB, C, F, G, S, orthographic variant]

*Acalypha rhomboidea* Rafinesque, Rhombic Copperleaf. Woodlands, disturbed ground. Late June-November. NS and ME west to ND, south to Panhandle FL and e. TX. [= RAB, C, FNA, G, GW, K, Pa, S, W, Z; = *A. rhomboidea* var. *rhomboidea* - F; = *A. virginica* Linnaeus var. *rhomboidea* (Rafinesque) Cooperrider - Y]

\* *Acalypha setosa* A. Richard in R. Sagra, Cuban Copperleaf. Disturbed ground; native of west Indies, Mexico, Central America, and n. South America. June-November. [= RAB, FNA, K, S, Y]



*Acalypha virginica* Linnaeus, Virginia Copperleaf. Woodlands and disturbed ground. Late June-November. ME west to IN, IL, MO, and KS, south to c. GA and TX. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, Z; = *A. virginica* Linnaeus var. *virginica* - Y]



*Cnidoscolus* Pohl 1827 (Spurge-nettle)

A genus of about 75 species, herbs, of America. References: McVaugh (1944)=Y; Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

*Cnidoscolus stimulosus* (Michaux) Engelm. & A. Gray, Spurge-nettle, Tread-softly, Finger-rot, Bull-nettle. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC), Mt (NC, SC): sandhills, dry sandy woodlands, other dry sandy soils; common (rare in Piedmont and Mountains). Late March-August; May-September. Se. VA south to s. FL, west to e. LA, mostly on the Coastal Plain, but farther inland southward. Beset with stinging trichomes. Allied to *C. urens* of Mexico, Central America, and n. South America, and sometimes treated as a variety of it. [= RAB, C, F, G, K, W, WH, Y; = *Bivonea stimulosa* (Michaux) Rafinesque – S; = *C. urens* (Linnaeus) Arthur var. *stimulosus* (Michaux) Govaerts – Z]

*Croton* Linnaeus 1753 (Croton, Doveweed, Rushfoil)

A genus of about 1250 species, herbs, shrubs, and (rarely) trees, of nearly cosmopolitan distribution. Webster (1992, 1993) considered the 2 taxa traditionally treated as *Crotonopsis* to be closely related to sections within *Croton*, such as section *Gynamblosis*; his reasoning has been supported by molecular phylogenetic studies and all recent floristic treatments and is followed here. References: van Ee & Berry in FNA (in prep.); van Ee, Riina, & Berry (in press); van Ee & Berry (2009)=X; Webster (1992)=Z; Webster (1993)=Y; Govaerts, Frodin, & Radcliffe-Smith (2000).

- 1 Evergreen shrub, (1-) 2-3 m tall; pistillate flowers with well-developed, greenish petals; [subgenus *Quadrilobi*; section *Alabamenses*] ..... *C. alabamensis* var. *alabamensis*
- 1 Herbaceous or suffrutescent, 0.1-1.2 m tall; pistillate flowers lacking petals; [subgenus *Geiseleria*].
  - 2 Leaves with coarsely serrate margins; 1-2 glands present near the junction of the petiole and the leaf blade; [subgenus *Geiseleria*; section *Geiseleria*]..... *C. glandulosus* var. *septentrionalis*
  - 2 Leaves with entire margins; glands absent at the junction of the petiole and the leaf blade.
  - 3 Leaves sessile or with short petioles (to 3.2 mm long), the petiole < 1/5 the length of the leaf blade; fruit 1-locular, indehiscent; seed 1 per fruit, 2-2.5 mm long; [subgenus *Geiseleria*; section *Crotonopsis*].
    - 4 Inflorescences 1-4 cm long, with 3-6 pistillate flowers arranged loosely toward the base; staminate flowers usually > 1 mm in diameter; stellate-lepidote trichomes of the fruit numerous, with radii much longer than the fused portion and often ascending (giving the fruit a fuzzy appearance when viewed under magnification); stellate trichomes of the upper leaf surface sparse, the radii not overlapping the radii of nearby stellae, the radii 5-8 per trichome; leaves 1-3 mm wide ..... *C. michauxii*
    - 4 Inflorescences usually < 1 cm long, with 1-2 pistillate flowers crowded at the base (appearing sessile in the axil of the subtending leaf); staminate flowers usually < 1 mm in diameter; stellate-lepidote trichomes of the fruit sparse, with radii fused for all or most of their lengths, appressed; stellate trichomes of the upper leaf surface denser, the radii usually overlapping the radii of nearby stellae, the radii often only 1-3 per trichome (as viewed near the midvein); leaves 1.5-4 (-15) mm wide ..... *C. willdenowii*
  - 3 Leaves with relatively long petioles (2-90 mm long), at least some of the petioles 1/3 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 Petals of the staminate flowers lepidote; [of dry longleaf pinelands]; [subgenus *Geiseleria*; section *Argyranthemii*] ..... *C. argyranthemus*
    - 5 Petals of the staminate flowers glabrous or villous; [of various other habitats].
  - 6 Stem leaves mostly 2× or more as long as wide; lobes of the calyx of the pistillate flowers 5-9 (-12); [subgenus *Geiseleria*; section *Heptallon*].
    - 7 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*
    - 7 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. elliotii*
  - 6 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.
    - 8 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]; [subgenus *Geiseleria*; section *Drepadenium*]..... *C. punctatus*
    - 8 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]; [subgenus *Geiseleria*; section *Heptallon*].
      - 9 Fruit 2-locular; seeds 1 per fruit; styles 2, each 2-lobed; [of limestone outcrops or weedy situations] ..... *C. monanthogynus*
      - 9 Fruit 3-locular; seeds 3 per fruit; styles 3, each 2-lobed or 4-lobed; [of fields or weedy situations].....

..... *C. lindheimerianus* var. *lindheimerianus*

***Croton alabamensis*** E.A. Smith ex Chapman var. *alabamensis*, Alabama Croton. Dry to mesic limestone glades, woodlands, and wooded ravines. March-April. Endemic to scattered populations in c. AL; alleged populations in sc. TN (Chester, Wofford, & Kral 1997) are apparently based on mislabeled specimens (Wurdack 2006). Var. *texensis* S. Ginzburg is endemic to c. TX (Ginzburg 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, Silver Croton, Sandhill Croton, Healing Croton. Sandhills. C. GA and s. AL south to c. peninsular FL; w. LA and sw OK south through e. and c. TX to Nuevo León and Tamaulipas. [= K1, K2, S, WH]

\* *Croton bonplandianus* Baillon. Cp (VA): chrome ore piles; native of South America. Reported for chrome ore piles at Newport News, VA and Canton, MD (Reed 1964). [= K] {not keyed; rejected}

\* ***Croton capitatus*** Michaux, Woolly Croton, Hogwort, Capitatus Croton. Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV), Cp (DE, FL, GA, NC, SC): fields, disturbed areas; common (uncommon in NC, SC, and VA, rare in DE and WV), native of sc. United States, the exact limits of the original native distribution unclear. July-October. [= F, S; = *Croton capitatus* Michaux var. *capitatus* – C, G, K1, K2; < *Croton capitatus* – RAB, Pa, W, WH]

***Croton elliotii*** Chapman, Pondshore Croton, Elliott's Croton. Cp (FL, GA, SC): shores and exposed drawdown zones of clay-based Carolina bays and limesink ponds (dolines); rare (GA Special Concern, SC Rare). Se. SC south to Panhandle FL, west to se. AL. [= K, S, WH]

\* ***Croton glandulosus*** Linnaeus var. *septentrionalis* Müller of Aargau, Doveweed, Tooth-leaved Croton, Sand Croton. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, roadsides, disturbed areas; common (uncommon in DE and WV). May-October. *C. glandulosus* is widespread in tropical and subtropical America; var. *septentrionalis* is the northernmost variety, distributed from PA west to MN, south to FL, TX, and ne. Mexico (its exact pre-Columbian range is speculative because of its weedy nature). [= RAB, C, F, G, K, S, W; < *Croton glandulosus* var. *glandulosus* – WH; < *Croton glandulosus* – Pa, WV]

***Croton lindheimeri*** (Engelmann & A. Gray) Alph. Wood. In GA and westward. [= *Croton capitatus* Michaux var. *lindheimeri* (Engelmann & A. Gray) Müller of Aargau – K; = *C. engelmannii* Ferguson – S] {not yet keyed}

\* ***Croton lindheimerianus*** Scheele var. *lindheimerianus*, Lindheimer's Croton. Pd (NC): fields and other disturbed soils; rare, adventive from farther west. June-October. [= K; < *Croton lindheimerianus* – Pa, RAB]

***Croton michauxii*** G.L. Webster, Sand Rushfoil, Michaux's Croton, Narrowleaf Rushfoil. Cp (FL, GA, SC, VA?): sandhills, disturbed sandy soils; common (uncommon in GA, rare north of GA). June-October. SC south to s. FL, west to TX, north in the interior to MO, IL, and IA. Fernald (1950) alleges that this species extends as far north as VA, but the documentation is unknown to me. [= K, WH, Z; = *Crotonopsis linearis* Michaux – RAB, C, F, G, S; = *Croton michauxii* G.L. Webster var. *michauxii* – X]

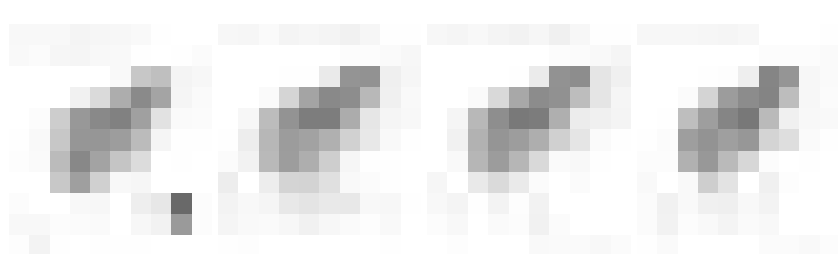
***Croton monanthogynus*** Michaux, Prairie-tea, One-seed Croton. Mt (GA, NC, VA, WV), Pd (GA, SC, VA\*), Cp (GA, VA\*): limestone outcrops, blackland prairies, disturbed dry soil; rare. June-October. Sw. VA, OH, IN, IA, NE, and CO, south to nw. GA, FL, TX, and Mexico; adventive as a weed at scattered locations east of the Blue Ridge. [= RAB, C, F, G, K, S, W, WV]

***Croton punctatus*** Jacquin, Silverleaf Croton, Beach-tea, Gulf Croton. Cp (FL, GA, NC, SC): beach dunes, coastal grasslands, usually with *Uniola paniculata* and/or *Spartina patens*; common. Late May-November. NC (Dare County) south to s. FL, west to TX, and south into Central and South America. [= RAB, K, S, WH]

\* ***Croton texensis*** (Klotzsch) Müller of Aargau var. *texensis*, Texas Croton. Cp (DE): disturbed areas; rare, native of c. North America. [= K] {not yet keyed; add to synonymy}

\* *Croton trinitatis* Millspaugh. Ballast piles; native of Central and South America. Collected once, in Pensacola, Escambia County, FL. [= FNA] {rejected as a component of the flora; not keyed}

***Croton willdenowii*** G.L. Webster, Glade Rushfoil, Outcrop Rushfoil, Broadleaf Rushfoil, Willdenow's Croton. Pd (GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA), Mt (GA, NC, SC): granitic flatrocks, diabase barrens, calcareous barrens, thin soils around other rock outcrops, disturbed sandy soil; common (uncommon in VA, rare in DE and FL). June-October. CT, se. PA (Rhoads & Block 2007), IL, and se. KS, south to ne. FL, Panhandle FL, and TX. Van Ee & Berry (2009) argue that this taxon is only varietally distinct from *Croton michauxii* (see synonymy). [= K, WH, Z; = *Crotonopsis elliptica* Willdenow – RAB, C, F, G, Pa, S, W; = *Croton michauxii* G.L. Webster var. *elliptica* (Willdenow) van Ee & P.E. Berry – X]



***Dityrsinia*** Rafinesque 1825 (Sebastian-bush)

A monotypic genus, a shrub, of the Southeastern United States Coastal Plain. Perhaps as close to *Gymnanthes* as to *Sebastiania*. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.



*Ditrysinia fruticosa* (W. Bartram) Govaerts & Frodin, Sebastian-bush. Swamp forests, other wet to moist, mostly shaded, habitats. May-June; July-October. Se. NC south to c. peninsular FL, west to e. TX. [= Z; = *Sebastiania fruticosa* (W. Bartram) Fernald – GW, K, WH; = *Sebastiania ligustrina* (Michaux) Müller of Aargau – RAB; = *Sebastiania ligustrina* – S (orthographic error)]



*Euphorbia* Linnaeus 1753 (Spurge)

A genus of ca. 1900 species, herbs, shrubs, and trees, nearly cosmopolitan in distribution. Infrageneric classification follows Yang et al. (2012) and Horn et al. (2012). References: Huft (1979)=Z; Park (1998)=Y; Bridges & Orzell (2002)=X; Yang et al. (2012); Horn et al. (2012); Zimmermann, Ritz, & Hellwig (2010); Govaerts, Frodin, & Radcliffe-Smith (2000)=Q.

- 1 Leaves strictly opposite, oblique or inequilateral at base; branches prostrate (less usually erect) ..... **Key A (subgenus *Chamaesyce*, section *Anisophyllum*, subsection *Hypericifoliae*)**
- 1 Leaves alternate or opposite, not oblique or asymmetric at base; branches usually erect.
  - 2 Bracteal leaves lobed or toothed (rarely linear), usually marked with red or white at the base or purple-spotted; glands of the cyathia usually 1 (rarely more), bilabiate, lacking petaloid appendages ..... **Key B (subgenus *Chamaesyce*, section *Poinsettia*)**
  - 2 Bracteal leaves entire, not marked with red (white-margined in *E. marginata*); glands of the cyathia 4-5, not bilabiate, with or without petaloid appendages.
    - 3 Glands of the cyathia 5 (or 7-10 on the central cyathium in *E. pubentissima*), with petaloid appendages 0.1-5.0 mm long (measured along a radius), these white, maroon, red, pink, or green; stipules present, glandlike, often minute ..... **Key C (subgenus *Chamaesyce*, section *Alectorocotonum*)**
    - 3 Glands of the cyathia 4 (except 5 in *E. purpurea*), oval, reniform, or crescent-shaped, lacking petaloid appendages (the glands themselves yellowish or green); stipules absent or vestigial ..... **Key D (subgenus *Esula*)**

**Key A – subgenus *Chamaesyce*, section *Anisophyllum*, subsection *Hypericifoliae***

- 1 Young stems and leaves glabrous; leaves **either** entire **or** serrulate, at least at the apex (use 10× magnification).
  - 2 Leaves serrulate, at least at the apex (use 10× magnification); seeds with 2-4 transverse ridges.
    - 3 Seeds 1.0-1.3 mm long, with 3-4 transverse ridges ..... [*E. glyptosperma*]
    - 3 Seeds 0.8-1.0 mm long, with 2-3 (-4) transverse ridges ..... *E. hyssopifolia*
  - 2 Leaves absolutely entire; seeds smooth.
    - 4 Stipules united into a triangular scale-like structure (this often lobed or fringed), thus appearing as 2 stipules at each node ..... *E. serpens*
    - 4 Stipules separate, lacerate, appearing as 4 stipules at each node.
      - 5 Leaves **either** 1.5-2× **or** 4-5× as long as wide, not fleshy; mature seeds 1.0-1.2 (-1.4) mm long, angled; [of inland sandhills or coastal dunes].
        - 6 Leaves 1.5-2× as long as wide, green throughout; [more widespread] ..... *E. cordifolia*
        - 6 Leaves 4-5× as long as wide, the leaf margin red; [FL] ..... *E. cumulicola*
      - 5 Leaves 2-3× as long as wide, often somewhat fleshy; mature seeds (1.3-) 1.5-2.6 mm long, rounded; [of barrier island dunes and other sandy coastal habitats].
        - 7 Mature seeds (1.3-) 1.5-1.9 mm long; cyathia terminal on the stems and also axillary ..... *E. bombensis*
        - 7 Mature seeds (2.0-) 2.2-2.6 mm long; cyathia terminal on the stems ..... *E. polygonifolia*
  - 1 Young stems and leaves pubescent (at least in lines along the stems); leaves serrulate, at least at the apex (use 10× magnification).
    - 8 Ovary and capsule glabrous.
      - 9 Seeds 0.8-1.0 mm long, light gray, the faces with 2-3 (-4) horizontal, low, blunt ridges, sometimes connected by 1-2 cross ridges; stems glabrous when young (uncommonly puberulent along 1 side of the branchlets); capsule 1.5-2.0 mm long ..... *E. hyssopifolia*
      - 9 Seeds 1.0-1.3 mm long, dark gray, faces without ridges, though irregularly and finely wrinkled; stems puberulent when young on 1 side only; capsule 2.0-2.5 mm long.
        - 10 Stems ascending or suberect, puberulent when young ..... *E. nutans*
        - 10 Stems prostrate or widely spreading, spreading-hirsute ..... *E. vermiculata*
    - 8 Ovary and capsule pubescent.
      - 11 Stems with 2 types of trichomes, the longer 3-5 mm long; cyathia in axillary and terminal cymes, at least some of the peduncles > 10 mm long ..... *E. hirta*
      - 11 Stems with 1 type of trichome, these < 2 mm long; cyathia solitary or several in axils, the peduncles < 5 mm long.
        - 12 Capsules spreading-villous, especially or solely on the angles; styles 0.2-0.3 mm long, bifid nearly to the base; seeds sharply quadrangular-angled, the faces with 3-4 transverse ridges ..... *E. prostrata*
        - 12 Capsules minutely appressed-puberulent, on the entire surface (though sometimes primarily on the lower portion); styles 0.3-0.7 mm long, bifid only in the upper half or third; seeds quadrangular but not angled, the faces with inconspicuous transverse ridges or nearly smooth.
          - 13 Involucre cleft on 1 side half its length; leaves mostly obovate, 1.5-2× as long as wide; styles 0.5-0.7 mm long, filiform; seed faces nearly smooth; adventitious roots formed at middle nodes along the stem ..... *E. humistrata*

- 13 Involucre cleft on 1 side a fourth to a third its length; leaves mostly oblong, 2-3× as long as wide; styles 0.3-0.4 mm long, clavate; seed faces transversely ridged; adventitious roots not formed.....*E. maculata*

**Key B – subgenus *Chamaesyce*, section *Poinsettia***

- 1 Principal stem leaves opposite, dentate, neither lobed nor linear; plant pubescent .....*E. dentata*  
 1 Principal stem leaves alternate, either lobed or linear; plant usually glabrous  
 2 Cyathial gland 2-lipped, the opening elongate; bracteal leaves red or green at base; seeds not angular .....*E. cyathophora*  
 2 Cyathial gland with a circular opening; bracteal leaves purple-spotted or green; seeds angular.....*E. heterophylla*

**Key C – subgenus *Chamaesyce*, section *Alectroctonum***

- 1 Upper stem leaves and bracteal leaves with white margins, ovate, the apex acute; [alien, cultivated and rarely persisting or a waif] .....  
 .....*E. marginata*  
 1 Upper stem leaves and bracteal leaves entirely green, obovate, elliptic, narrowly elliptic, or oblanceolate, the apex rounded or obtuse; [native].  
 2 Petaloid appendages (0.5-) 1.0-4.4 mm long (measured along a radius), about as long as wide or longer, white; stems (1.5-) 3-9 (-11) dm tall, erect; leaves not ciliate-margined.  
 3 Nodes below the umbel (25-) 35-60 (-115); cyathia (5-) 6.5-8.0 (-11.0) mm wide (across the appendages); stems (1-) 3-10 from a crown, each (1.2-) 2.5-5 (-7) mm in diameter at the base; plants (2-) 4-9 (-1.3) dm tall; leaves ascending, leathery, sessile or subpetiolate; plants flowering June-September; [NH and MA west to s. ON, MI, WI, MN, and NE, south to se.VA, c. NC, n. GA, s. AL, and e. TX] .....*E. corollata*  
 3 Nodes below the inflorescence (6-) 15-26 (-41); cyathia (3.5-) 4.0-5.5 (-6.5) mm wide (across the appendages); stems usually 1-2 (-3) from a crown, each (0.8-) 1.5-2.8 (-3.5) mm in diameter at the base; plants (1.5-) 3-5 (-6.5) dm tall; leaves usually reflexed (*E. pubentissima*) or usually ascending (*E. discoidalis*), thin, petiolate or subpetiolate; plants flowering March-July; [c. MD, VA, and c. and sw. TN, south to Panhandle FL and s. MS, west to e. TX].  
 4 Leaves 1.9-7.2 cm long, 0.1-0.5 cm wide, averaging > 10× as long as wide; primary inflorescence rays usually 3; [e. and c. GA (or e. SC?) south and west to Panhandle FL and e. TX] .....*E. discoidalis*  
 4 Leaves (1.6-) avg. 3.8 (-6.1) cm long, 0.5-2.2 cm wide, averaging < 4× as long as wide; primary inflorescence rays usually 5; [c. MD, VA, and c. and sw. TN, south to Panhandle FL and s. MS] .....*E. pubentissima*  
 2 Petaloid appendages 0.05-0.6 mm long (measured along a radius), shorter than wide, green, red, white, or pink; stems (0.8-) 1.5-4.5 (-6) dm tall, erect, ascending or decumbent; leaves ciliate-margined (*E. mercurialina* and *E. curtisii*) or not.  
 5 Leaf margins ciliate; cyathia 3.5-5.9 mm wide (across the appendages), green; leaves not fleshy, 1.7-2.2 (-3)× as long as wide, not especially variable; [of mesic forests with rich soils] .....*E. mercurialina*  
 5 Leaf margins not ciliate (except some marginal hairs in *E. curtisii*); cyathia 2.0-3.4 mm wide (across the appendages), green or maroon; leaves slightly to strongly fleshy, 0.7-20× as long as wide, often very variable in shape, even on the same plant; [of more or less xeric sandhill woodlands with acidic, sandy soils].  
 6 Stems usually 10-18 per crown, decumbent to weakly ascending; leaves opposite (scales on the lower stem sometimes alternate), fleshy, blue-green with a narrow, thickened, red-hyaline margin; branching dichotomous from the base of the plant (the branches typically equal, though sometimes unequal) .....*E. ipecacuanhae*  
 6 Stems 1-4 (-9) per crown, erect to strongly ascending; leaves alternate, opposite, or in whorls of 3 (at least some alternate on a plant), less fleshy, green to blue-green, without a red margin (or with a very narrow, slightly red-hyaline, but not thickened margin in *E. exserta*); branching alternate below the inflorescence (rarely dichotomous or trichotomous), the branches typically unequal.  
 7 Cyathia and capsules green; petaloid appendages white or pink; leaves thin-textured, green, finely pubescent with appressed white hairs (0.1-0.3 mm long) on the lower surface and margins (visible at 10× or greater); branching primarily alternate; leaves primarily alternate (typically opposite or 3-whorled below the inflorescence); cyathia unisexual, plants usually unisexual (dioecious) .....*E. curtisii*  
 7 Cyathia and capsules maroon; petaloid appendages maroon-red; leaves slightly fleshy, somewhat blue-green, glabrous; branching primarily opposite; leaves primarily opposite (usually some alternate on upper branches); cyathia bisexual, plants bisexual .....  
 .....*E. exserta*

**Key D – subgenus *Esula***

- 1 Principal stem leaves finely serrulate (especially toward the apex); [subgenus *Esula*, section *Tithymalus*].  
 2 Ovary and capsule smooth .....*E. helioscopia*  
 2 Ovary and capsule verrucose-roughened.  
 3 Seeds smooth or very obscurely reticulate, 2-2.5 mm long .....*E. obtusata*  
 3 Seeds distinctly alveolate, 1.5-1.8 mm long .....*E. spathulata*  
 1 Principal stem leaves entire.  
 4 Stem leaves opposite, decussate (each succeeding pair turned by 90 degrees); seeds 4-6 mm long; [subgenus *Esula*, section *Lathyris*] .....  
 .....*E. lathyris*  
 4 Stem leaves alternate (or mostly so); seeds 1-3 mm long.  
 5 Stem leaves linear to narrowly oblong, averaging ca. 10× as long as wide; [subgenus *Esula*, section *Esula*].  
 6 Stem leaves 1-3 cm long, 1-3 mm wide .....*E. cyparissias*  
 6 Stem leaves 3-8 cm long, 4-8 mm wide .....*E. esula*  
 5 Stem leaves oblanceolate, obovate, elliptic, or oblong, 1-10 cm long, 5-30 mm wide, averaging 1-5× as long as wide.  
 7 Principal stem leaves elliptic to oblong, (5-) 7-10 cm long; rhizomatous perennial to 1 m tall; seeds smooth, 3-5 mm long; rays of the umbel usually 5-8; [subgenus *Esula*, section *Tithymalus*] .....*E. purpurea*

- 7 Principal stem leaves oblanceolate to obovate, 1-2 cm long; annual, or perennial by basal offshoots, to 0.4 m tall; seeds pitted, 1.3-2.0 mm long; rays of the umbel 3 (-5); [subgenus *Esula*, section *Esula*].
- 8 Seeds pitted only on one face, the inner face furrowed ..... *E. pepus*
- 8 Seeds pitted on both the inner and outer faces.
- 9 Seeds finely pitted with numerous, evenly distributed, circular pits; bracteal leaves broader than long; glands of the cyathia crescent-shaped, the horns slender, elongate, and caudate ..... *E. commutata*
- 9 Seeds coarsely pitted with transversely elongate pits in 4 vertical rows (appearing nearly transversely rugose); bracteal leaves longer than broad; glands of the cyathia crescent-shaped, the horns short and blunt ..... *E. falcata*

***Euphorbia bombensis*** Jacquin, Southern Seaside Spurge, Dixie Sandmat. Cp (FL, GA, NC, SC, VA): open sands of dunes, dune blowouts and overwashes, often growing with perennial grasses such as *Uniola paniculata*, but preferring open sands with little competition, sometimes mixed with the more common *E. polygonifolia*; common (uncommon in GA, NC, and SC, rare in VA). June-October. E. VA south to s. FL along the Atlantic, from s. FL to TX and Mexico along the Gulf of Mexico, and south into n. South America. Johnson (1992) contrasts the habitat of this species with that of the closely similar *E. polygonifolia*; *E. bombensis* prefers areas behind the foredune, while *E. polygonifolia* prefers the pioneer situation on the upper beach and foredune front. [= Q; = *Chamaesyce bombensis* (Jacquin) Dugand – K, WH, Z; = *Euphorbia ammamioides* Kunth – RAB, C, F, G; > *Chamaesyce ingallsii* Small – S]

***Euphorbia commutata*** Engelm ex A. Gray, Woodland Spurge, Tinted Spurge. Mt (GA, NC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, GA, VA): rich forests and rock outcrops, over calcareous or mafic rocks; uncommon (rare in Coastal Plain, rare in NC). March-July. PA west to s. ON and MN, south to FL and TX. The southern var. *erecta* J.B.S. Norton may be worthy of recognition; we 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, Pa, Q, W, WH, WV; > *E. commutata* var. *commutata* – C, G; > *E. commutata* var. *erecta* J.B.S. Norton – C, G; = *Galarhoeus commutatus* (Engelmann) Small – S]

***Euphorbia cordifolia*** Elliott, Heartleaf Sandmat. Cp (FL, GA, NC, SC): open sands of very dry sandhills; uncommon (rare north of FL). July-October. Se. NC south to s. FL and west to se. OK (Singhurst, Buthod, & Holmes 2012) and s. TX. [= RAB, Q; = *Chamaesyce cordifolia* (Elliott) Small – K, S, WH, Z]

***Euphorbia corollata*** Linnaeus, Eastern Flowering Spurge. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, VA), Cp (DE, VA): woodlands and forests; common. June-September. NH and MA west to s. ON, MI, WI, MN, and NE, south to se. VA, c. NC, n. GA, s. AL, and e. TX. Huft (1979) considered *E. marilandica* a sporadic growth form of *E. corollata*. [= K, Pa, WV, Y, Z; = *E. corollata* var. *corollata* – RAB; > *E. corollata* var. *corollata* – C, F; > *E. marilandica* Greene – C, F, G; >> *E. corollata* – G, W (also see *E. pubentissima*); = *Tithymalopsis corollata* (Linnaeus) Klotzsch – S; < *E. corollata* var. *corollata* – Q (also see *E. discoidalis*)]

***Euphorbia cumulicola*** (Small) Oudejans. Cp (FL): dunes and scrub; rare. Peninsular FL; w. Panhandle FL (Escambia County). [= Q; = *Chamaesyce cumulicola* Small – K, S, WH]

***Euphorbia curtisii*** Engelm, White Sandhills Spurge, Curtis's Spurge. Cp (FL, GA, NC, SC): sandhills; common. Late March-June. Sc. and se. NC to ne. FL and w. Panhandle FL, on the Coastal Plain. Less variable in leaf shape than *E. ipecacuanhae* or *E. exserta*. [= RAB, GW, K, Q, WH, Y, Z; > *Tithymalopsis curtisii* (Engelmann) Small – S; > *Tithymalopsis eriogonoides* Small – S]

***Euphorbia cyathophora*** Murray, Painted Leaf, Fire-on-the-mountain. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA): disturbed habitats, dunes; common (uncommon in GA, NC, SC, and VA). June-October. E. VA, KS, and CA south into the New World tropics, the original range obscure. [= C, K, Q; > *E. heterophylla* Linnaeus var. *heterophylla* – RAB, F, misapplied; > *E. heterophylla* var. *graminifolia* Engelm – RAB, F; = *E. heterophylla* – G; > *Poinsettia cyathophora* (Murray) Klotzsch & Garcke – S; > *Poinsettia heterophylla* – S, misapplied]

\* ***Euphorbia cyparissias*** Linnaeus, Cypress Spurge, Graveyard Spurge. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, VA): roadbanks, graveyards, waste places; common (uncommon in DE and WV), native of Europe. March-May (occasionally later). [= RAB, C, F, G, K, Pa, Q, W, WV; = *Galarhoeus cyparissias* (Linnaeus) Small ex Rydberg – S; = *Tithymalus cyparissias* (Linnaeus) Lamarck]

\* ***Euphorbia davidii*** Subils, David's Spurge. Mt (NC), Pd (NC): disturbed areas; rare, native of sw. United States, Mexico. Introduced in se. TN (Chester, Wofford, & Kral 1997). [= K, Q; ? *E. dentata* var. *gracillima* Millsbaugh] {not yet keyed}

\* ***Euphorbia dentata*** Michaux, Painted Leaf, Wild Poinsettia, Toothed Spurge. Mt (GA, NC, VA, WV), Pd (NC, SC, VA), Cp (VA): disturbed areas, hedgerows, thickets, railroad cinders; common, native of w. North America. July-October. [= RAB, C, F, G, Pa, Q, W, WV; ? *E. dentata* var. *dentata* – K; = *Poinsettia dentata* (Michaux) Klotzsch & Garcke – S]

***Euphorbia discoidalis*** Chapman, Summer Spurge. Cp (FL, GA): sandhills; uncommon. E. and c. GA (or e. SC?) south and west to Panhandle FL and e. TX. Park (1998) includes in synonymy *E. corollata* var. *angustifolia* Elliott, which has a stated type locality in e. SC. [= K, WH, Y; = *Tithymalopsis discoidalis* (Chapman) Small – S; < *E. corollata* var. *corollata* – Q] {augment}

\* ***Euphorbia esula*** Linnaeus var. *esula*, Wolf's-milk, Leafy Spurge. Mt (WV), Pd (VA): disturbed areas; rare, native of Eurasia. May-September. [= K; < *E. esula* – C, F, G, Pa, WV; = *E. esula* ssp. *esula* – Q; < *Tithymalus esula* (Linnaeus) Scopoli]

***Euphorbia exigua*** Linnaeus, Dwarf Spurge. Disturbed areas; rare, native of { }. In PA and WV (Kartesz 1999). [= K, WV; ? *E. exigua* ssp. *exigua* – Q] {not yet keyed}

***Euphorbia exserta*** (Small) Coker, Maroon Sandhills Spurge, Coastal Sand Spurge. Sandhills. 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 *E. exserta* and *E. gracilior* as distinct from one another, differing in the involucre (purple in *E. exserta* and green in *E. gracilior*) and the appendages (rudimentary and purple in *E. exserta* and semicircular and white in *E. gracilior*). [= K, Q, WH, Z; = *E. gracilior* Cronquist – RAB; > *Tithymalopsis exserta* Small – S; > *Tithymalopsis gracilis* (Boissier) Small – S; > *E. exserta* – Y; > *E. gracilior* – Y]

\* ***Euphorbia falcata*** Linnaeus. Disturbed areas; native of Europe. [= C, F, G, K, Pa, WV; > *E. falcata* ssp. *falcata* – Q]

*Euphorbia floridana* Chapman, Florida Spurge. Sandhills, scrub. May-September. Panhandle FL and sw. GA west to s. MS. Reported for sw. GA by Bridges & Orzell (2002) and Jones & Coile (1988). [= K, Q, WH, X; = *Galarhoeus floridanus* (Chapman) Small - S] {not yet keyed}

*Euphorbia glyptosperma* Engelm. Ridge-seed Spurge. East to sc. TN (Chester, Wofford, & Kral 1997). In VA, WV, LA (Q). [= C, F, G, Q; = *Chamaesyce glyptosperma* (Engelmann) Small - K]

\* *Euphorbia graminea* Jacquin. Landscaped areas, other disturbed areas. Native of tropical America. Naturalized in FL Panhandle, FL peninsula. [= *Agaloma graminea* (Jacquin) D.B. Ward] {not yet keyed; not mapped}

\* *Euphorbia helioscopia* Linnaeus, Wartweed. Pd (GA, NC, SC, VA), Mt (VA), Cp (DE, VA): disturbed areas, roadsides, cultivated ground; rare, native of Europe. Late March-June. [= RAB, C, F, G, K, Pa; = *Galarhoeus helioscopia* (Linnaeus) Haworth - S; > *E. helioscopia* ssp. *helioscopia* - Q]

*Euphorbia heterophylla* Linnaeus, Fiddler's Spurge, Mexican Fireplant. Cp (FL, GA): disturbed areas; uncommon. All year. [= K, Q; > *Poinsettia heterophylla* (Linnaeus) Klotzsch & Garcke ex Klotzsch - S; > *Poinsettia geniculata* Ortega - S; = *Poinsettia heterophylla* (Linnaeus) Klotzsch & Garcke ex Klotzsch - S, WH]

\* *Euphorbia hexagona* Nuttall ex Sprengel, Six-angle Spurge. Pd (DE): disturbed areas; rare, native of c. North America. [= K] {not yet keyed; add to synonymy}

*Euphorbia hirta* Linnaeus, Pillpod Sandmat. Cp (FL, GA, NC, SC), Pd (GA, SC, VA): fields, disturbed ground, waste areas, in and around greenhouses; rare, perhaps only adventive in the northern part of our area. (January-) June-October (-December). E. NC, c. SC, south to s. FL, west to TX, and south into Central and South America. Reported for Goldsboro, NC and Abbeville, Abbeville County, SC (C.N. Horn, pers.comm. 2008). [= RAB, C, G, Q; = *Chamaesyce hirta* (Linnaeus) Millspaugh - K, S, WH, Z]

*Euphorbia humistrata* Engelm. Spreading Sandmat. Cp (FL, VA\*), Mt (VA\*, WV\*), Pd (GA\*, VA\*): floodplain forests, exposed river shores, rocky riverside gravel bars, disturbed areas; uncommon (rare in FL, GA, and WV, rare in VA Mountains and Coastal Plain), some of the easternmost occurrences apparently adventive from farther west. ON and MN south to Panhandle FL and TX; scattered eastward, apparently as an adventive. [= C, F, G, Q, WV; = *Chamaesyce humistrata* (Engelmann) Small - GW, K, S, WH, Z]

*Euphorbia hypericifolia* Linnaeus, reported for SC (Kartesz 1999), FL, GA, LA (Q). {Investigate} [= Q; = *Chamaesyce hypericifolia* (Linnaeus) Millspaugh - K, S] {not yet keyed}

*Euphorbia hyssopifolia* Linnaeus, Hyssopleaf Sandmat. Cp (FL, GA, SC): disturbed ground; common. May-October. SC south to s. FL, west to LA; also in w. TX, s. NM, and n. Mexico, and south to s. South America. Its status in our area has been muddled by confusion with *E. nutans*. [= Q; = *Chamaesyce hyssopifolia* (Linnaeus) Small - GW, K, WH, Z]

*Euphorbia inundata* Torrey ex Chapman var. *inundata*, Flatwood Spurge. Wet pine flatwoods, savannas, seepage slopes. Ne. FL and se. GA (Bridges & Orzell 2002); Panhandle FL west to s. MS. Var. *garrettii* Bridges & Orzell is endemic to c. and s. FL peninsula. [= WH, X; < *E. inundata* - K, Q; < *Galarhoeus inundatus* (Torrey ex Chapman) Small - S] {not yet keyed}

*Euphorbia ipecacuanhae* Linnaeus, Carolina Ipecac. Sandhills, other dry, barren sands. February-May (and later, especially in response to fire). CT (formerly), NY (Long Island), NJ, and se. PA (Rhoads & Block 2007) south to ec. GA, on the Coastal Plain. The leaves are extremely variable in size and shape, from linear to rotund. Huft (1979) considered *E. arundelana* Bartlett (reported from MD, SC, and GA) a sporadic form of *E. ipecacuanhae*. Park (1998) suggested that *E. ipecacuanhae* is actually a member of *Chamaesyce* (treated by Park as a subgenus), rather than of *Euphorbia*. [= RAB, C, G, K, Pa, Q, Z; > *E. ipecacuanhae* - F; > *E. arundelana* Bartlett - F; = *Tithymalopsis ipecacuanhae* (Linnaeus) Small - S]

\* *Euphorbia lathyris* Linnaeus, Caper Spurge, Myrtle Spurge, Mole Plant. Mt (NC, SC, VA, WV), Pd (VA), Cp (VA): roadsides, disturbed areas; uncommon (rare in NC and SC, rare in VA Piedmont, rare in VA Coastal Plain), native of Europe. May-August. [= RAB, F, K, Pa, Q, W, WV; = *E. lathyris* - C, G, an orthographic variant; = *Galarhoeus lathyris* - S]

*Euphorbia maculata* Linnaeus, Milk-purslane, Spotted Spurge. Cp (DE, FL, GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): gardens, fields, disturbed places, crevices in pavement or sidewalks; common. January-December. QC west to ND, south to s. FL and TX; introduced in various places worldwide. [= C, G, Pa, Q, W; = *Chamaesyce maculata* (Linnaeus) Small - GW, K, S, WH, Z; > *Euphorbia supina* Rafinesque - RAB, F, WV]

\* *Euphorbia marginata* Pursh, Snow-on-the-mountain. Cp (FL, GA, NC, SC, VA), Pd (GA, VA), Mt (VA, WV): roadsides, disturbed areas; uncommon (rare in FL), native w. North America. July-November. [= RAB, C, F, G, K, Pa, Q, WH, WV; = *Lepadena marginata* (Pursh) Nieuwland - S; = *Agaloma marginata* (Pursh) A. & D. Löve]

*Euphorbia mercurialina* Michaux, Cumberland Spurge, Mercury Spurge. Mt (GA), Pd (GA?, NC, SC, VA\*): rich moist forests over mafic or calcareous rocks; rare. May-June. S. KY south through e. TN to nw. GA and n. AL; disjunct in sc. NC, where found in 1992. Apparently introduced in VA. [= C, F, G, K, Q, W, Y, Z; = *Tithymalopsis mercurialina* (Michaux) Small - S]

*Euphorbia nutans* Lagasca y Segura, Eyebane. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, gardens, waste places, disturbed ground; common. May-October. NH west to MI and ND, south to Panhandle FL and TX; introduced in various places worldwide. [= C, Pa, Q, W = *Chamaesyce nutans* (Lagasca y Segura) Small - GW, K, WH, Z; = *Euphorbia maculata* Linnaeus - RAB, F, WV, misapplied; = *Euphorbia preslii* Guss. - G; = *Chamaesyce hyssopifolia* (Linnaeus) Small - S, in part, misapplied]

*Euphorbia obtusata* Pursh, Woodland Spurge. Pd (NC, SC, VA), Cp (NC, SC, VA), Mt (NC, SC, VA, WV): rich bottomland forests; uncommon (rare in Mountains). April-July. Sc. PA west to IN and IA, south to SC and TX. [= RAB, C, F, G, Pa, W, WV; < *E. spathulata* Lamarck - K, Q; = *Galarhoeus obtusatus* (Pursh) Small - S]

*Euphorbia ophthalmica* Persoon. GA and PA (Kartesz 1999), widespread in FL (WH), but not in North America (Q). [= Q; = *Chamaesyce ophthalmica* (Persoon) Burch - K; ? *Chamaesyce gemella* (Lagasca y Segura) Small] {not yet keyed}

\* *Euphorbia peplus* Linnaeus, Petty Spurge. Mt (NC, VA, WV), Pd (VA), Cp (DE): disturbed areas; rare, native of Eurasia. June-September. Naturalized in Watauga County, NC (Poindexter, pers. comm.). [= C, F, G, K, Pa; = *Galarhoeus peplus* (Linnaeus) Haworth - S; > *E. peplus* var. *minima* A.P. de Candolle - Q; > *E. peplus* var. *peplus* - Q; = *Tithymalus peplus* (Linnaeus) Hill]

\* *Euphorbia platyphyllos* Linnaeus, Broadleaf Spurge. Disturbed areas. Naturalized in e. TN in Knox County (B.E. Wofford, pers. comm., 2012), and scattered other locations in e. North America. June-August. [= C; = *Euphorbia platyphylla* – F, G, orthographic variant; = *Galarhoeus platyphylla* (Linnaeus) Small – S, orthographic variant; = *Galarhoeus platyphyllos* (Linnaeus) Small; = *Tithymalus platyphyllos* (Linnaeus) Hill] {not yet keyed}

*Euphorbia polygonifolia* Linnaeus, Northern Seaside Spurge, Northern Sandmat. Cp (DE, FL, GA, NC, SC, VA): open sands of dunes, upper beach, dune blowouts and overwashes, sometimes growing with perennial grasses such as *Uniola paniculata*, but preferring open sands with little competition, sometimes mixed with the less common *E. bombensis*; common (rare in FL). May-October. NS to ne. FL along the Atlantic Ocean; disjunct to the Great Lakes. See *E. bombensis* for discussion of the habitats of these related species. [= RAB, C, F, G, Pa, Q; = *Chamaesyce polygonifolia* (Linnaeus) Small – K, S, WH, Z]

\* *Euphorbia prostrata* Aiton, Prostrate Sandmat. Pd (GA, NC, SC, VA), Cp (FL, NC, SC, VA), Mt (NC, SC, VA, WV): crevices of pavement or sidewalks, disturbed places; rare, probably native of tropical America and only naturalized in our area. January-December. [= C, Q; = *Chamaesyce prostrata* (Aiton) Small – K, S, WH, Z; = *Euphorbia chamaesyce* Linnaeus – RAB, F, G, misapplied]

*Euphorbia pubentissima* Michaux, Southeastern Flowering Spurge. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): dry woodlands, sandhills; common (uncommon in FL, rare in WV). March-July. C. MD, VA, and c. and sw. TN, south to Panhandle FL and s. MS. [= K, Y, Z; > *E. corollata* Linnaeus var. *zinniflora* (Small) H.E. Ahles – RAB; >< *E. corollata* Linnaeus var. *corollata* – RAB, in part; = *E. corollata* var. *paniculata* Boissier – C, F, Q; > *E. zinniflora* Small – F, WV; > *E. apocynifolia* Small – F; > *E. corollata* var. *mollis* Millspaugh – F; < *E. corollata* – G, W; > *Tithymalopsis zinniflora* (Small) Small – S; > *Tithymalopsis apocynifolia* (Small) Small – S; > *Tithymalopsis paniculata* (Boissier) Small – S; = *Agaloma pubentissima* (Michaux) D.B. Ward]

*Euphorbia purpurea* (Rafinesque) Fernald, Glade Spurge, Darlington Spurge, Purple Spurge. Mt (NC, VA, WV), Pd (DE), Cp (DE): rich moist forests in bottomlands or on slopes, in rich soil around rock outcrops, in swamps or seeps, especially over calcareous rocks (such as dolomite) or mafic rocks (such as amphibolite); rare. May-September. NJ, PA, and OH south to w. NC. [= RAB, C, F, G, K, Pa, Q, W, WV; = *Galarhoeus darlingtonii* (A. Gray) Small – S]

*Euphorbia serpens* (Kunth) Small. Cp (FL, GA): dry sandy hammocks; rare. July-October. Allegedly in se. PA (Rhoads & Klein 1993). [= C, F, G, Pa, Q; = *Chamaesyce serpens* (Kunth) Small – K, S, WH]

*Euphorbia serpyllifolia* Persoon var. *serpyllifolia*. Cp (FL): disturbed areas; rare, native of the Great Plains. July-October. Also in GA, PA, and DE (Kartesz 1999). In NC, GA, SC (Q) {investigate} [= Q; = *Chamaesyce serpyllifolia* (Persoon) Small ssp. *serpyllifolia* – K; < *Chamaesyce serpyllifolia* – Pa, WH] {not yet keyed}

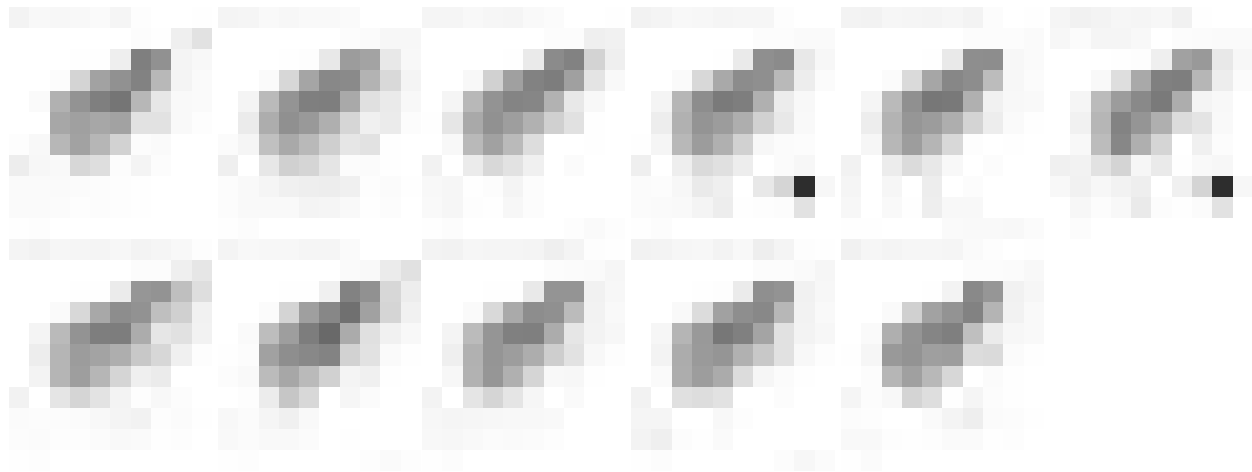
*Euphorbia spathulata* Lamarck, Prairie Spurge, Warty Spurge. Mt (NC?, VA), Cp\* (FL\*): rocky woodlands, disturbed areas; rare. May-June. MN and WA south to w. VA, AL, LA, TX, and Mexico. [= C, W, WH; ? *E. dictyosperma* Fischer & Meyer – F, G; < *E. spathulata* – K, Q (also see *E. obtusata*); ? *Galarhoeus arkansanus* (Engelmann & A. Gray) Small ex Rydberg – S]

*Euphorbia speciosa* I, Ouachita Spurge. Under study by Mark Mayfield. Endemic to the Interior Highlands; disjunct to Cumberland River bluffs in Smith and Clay counties (D. Estes, pers. comm. 2012).

*Euphorbia telephioides* Chapman. Cp (FL): pine flatwoods; rare. Endemic to FL Panhandle (Bay, Franklin, and Gulf counties). [= K, WH; = *Galarhoeus telephioides* (Chapman) Small – S] {not yet keyed; add to synonymy}

*Euphorbia tetrapora* Engelm. GA and AL west to TX. [= K, Q] {not yet keyed; add to synonymy}

*Euphorbia vermiculata* (Rafinesque) House, Hairy Spurge. Mt (VA, WV): disturbed areas; rare. Widespread and common in PA (Rhoads & Klein 1993; Rhoads & Block 2007). [= C, F, G, Pa, Q, WV; = *Chamaesyce vermiculata* (Rafinesque) House – K]



*Manihot* P. Miller 1754 (Cassava)

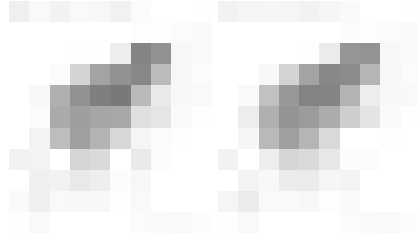
A genus of about 100 species, trees, shrubs, and herbs, of tropical and subtropical America. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

- 1 Leaf lobes 3-7, each broadest toward the tip, narrowing evenly toward the acuminate apex; calyx of male flowers < 10 mm long; fruit wing-angled .....*M. esculenta*
- 1 Leaf lobes 9-13, each constricted near the tip and then broadening again; calyx of male flowers 12-15 mm long; fruit not winged .....

.....*M. grahamii*

\* *Manihot esculenta* Crantz, Manioc, Tapioca. Disturbed areas; native of tropical America. Naturalized on the Gulf Coast, as in AL and s. FL. [= K, WH, Z; = *Jatropha manihot* Linnaeus – S]

\* *Manihot grahamii* Hooker, Hardy Tapioca, Graham's Cassava. Suburban forests, vacant lots, other disturbed areas, uncommonly grown as an ornamental, rarely naturalizing; native of tropical America. Introduced in sw. GA (Jones & Coile 1988; Carter, Baker, & Morris 2009), FL Panhandle, peninsular FL, west to LA. [= K, WH, Z]



*Mercurialis* Linnaeus 1753 (Mercury)

A genus of about 8 species, herbs, of the Old World. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

\* *Mercurialis annua* Linnaeus, Annual Mercury, Boys-and-girls. Disturbed areas, waif on ballast; native of Mediterranean Europe. This species has been reported as a rare "ballast weed" from Charleston, SC and Mobile, AL (Wiggins 1932); some of the occurrences presumably represent non-persistent waifs. [= C, F, G, K, S, Z] {not yet keyed}

*Ricinus* Linnaeus 1753 (Castor-bean)

A monotypic genus, a shrub or tree, native to Africa and w. Asia, now pantropical. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

\* *Ricinus communis* Linnaeus, Castor-bean, Castor-oil Plant, Palma Christi. Waste places, gardens; native of the tropics, probably Africa. July-October. The seeds are dangerously poisonous, formerly the source of an oil used as a purgative and machine lubricant. In FL and farther south in the tropics, *R. communis* is a small to medium tree. [= RAB, C, F, G, K, Pa, S, WH, Z]

*Sapium* P. Browne (Milktree)

A genus of 21 species, trees and shrubs, of the Neotropics. The most recent monographers of *Sapium* and related genera (Kruijt 1996; Esser 2002) separate *Triadica* from *Sapium* sensu stricto. This conclusion is corroborated by molecular phylogenetic analysis (Wurdack, Hoffmann, & Chase 2005). References: Kruijt (1996)=Z; Govaerts, Frodin, & Radcliffe-Smith (2000)=Y. [also see *Triadica*]

\* *Sapium haemospermum* Müller of Aargau, Milk-tree. Disturbed areas; native of n. South America. Known in our area only from Escambia County, FL, where not recently seen. [= Y, Z; ? *S. caribaeum* Urban – K; ? *S. glandulosum* (Linnaeus) Morong – S, WH]

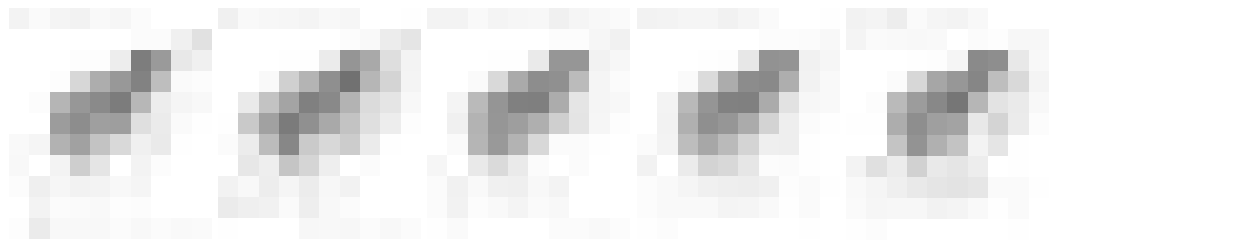
*Stillingia* Garden ex Linnaeus 1767 (Queen's-delight)

A genus of about 30 species, herbs, shrubs, and small trees, of tropical to subtropical regions of America, Madagascar, and se. Asia. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

1 Stems woody, single; leaves < 1 cm wide; [of pineland ponds and other aquatic habitats]..... *S. aquatica*  
1 Stems herbaceous, several from a crown; leaves > 1 cm wide; [of dry habitats]..... *S. sylvatica* ssp. *sylvatica*

*Stillingia aquatica* Chapman, Corkwood, Water Toothleaf. Ponds in pine flatwoods. May-September. Se. SC south to s. FL, west to sw. AL. [= RAB, K, S, WH, Z]

*Stillingia sylvatica* Garden ex Linnaeus ssp. *sylvatica*, Queen's-delight. Sandhills, dryish coastal plain woodlands. May-July; June-September. Se. VA south to s. FL, west to TX and NM, north in the interior to KS. Ssp. *tenuis* (Small) D.J. Rogers is in s. FL. [= K, Z; < *S. sylvatica* – RAB, C, G, WH; > *S. sylvatica* var. *sylvatica* – F; > *S. sylvatica* – S; > *S. spathulata* (Müller of Aargau) Small – S]



**Tragia** Linnaeus 1753 (Noseburn)

A genus of about 100-170 species, of tropical to warm temperate regions of the Old and New Worlds. References: Miller & Webster (1967)=Z; Govaerts, Frodin, & Radcliffe-Smith (2000)=Y.

- 1 Plant vining and trailing; larger leaf blades on a plant > 5 cm wide and > 8 cm long, deeply cordate at the base.....*T. cordata*
- 1 Plant not vining, erect; larger leaf blades on a plant < 3.5 cm wide and < 8 cm long, cuneate, rounded, truncate, or shallowly cordate at the base.
  - 2 Leaf base cuneate at base; leaf blade 3-20× as long as wide .....*T. urens*
  - 2 Leaf base cordate, subcordate, truncate, or broadly rounded at base; leaf blade 1-3× as long as wide.
    - 3 Petioles 1-4 mm long; leaves rounded to acute at the tip; stamens 2 (-3).....*T. smallii*
    - 3 Petioles 3-35 mm long; leaves acute to acuminate at the tip; stamens 3 (-5).
      - 4 Pedicels of the staminate flowers 0.7-1 mm long, the lower persistent part 0.3-0.6 mm long; [rare disjunct eastward from a sc. US distribution] .....*T. betonicifolia*
      - 4 Pedicels of the staminate flowers 1.5-2 mm long, the lower persistent part 1-1.8 mm long; [widespread in our area] .....*T. urticifolia*

**Tragia betonicifolia** Nuttall. Glades and dry bluffs. MO and KS south to w. LA and TX; disjunct eastward in KY, TN, and possibly AL. [= K2, Y, Z; = *T. urticifolia* Michaux var. *texana* Shinnery]

**Tragia cordata** Michaux, Heartleaf Noseburn. Rocky calcareous woodlands, calcareous prairies. C. KY, s. IN to s. MO, south through c. TN, rarely to e. TN (Meigs County, in the Ridge and Valley Province) (Chester, Wofford, & Kral 1997), n. AL (Jackson Co.) (D. Spaulding pers. comm.) to sc. and sw. GA, Panhandle FL, and e. TX. [= C, K, WH, Y, Z; = *T. macrocarpa* Willdenow – S]

**Tragia smallii** Shinnery, Gulf Coast Noseburn. Sandhills. Sw. GA south to c. peninsular FL, west to e. TX. Reports of *T. betonicifolia* from GA are based on misapplication of that name to material representing *T. smallii*. [= K, WH, Y, Z; = *T. betonicaefolia* Nuttall – S, misapplied; = *T. betonicifolia* Nuttall, misapplied]

**Tragia urens** Linnaeus, Southeastern Noseburn, Wavyleaf Noseburn. Sandhills, sandy woodlands, other woodlands. May-October. Se. VA south to s. FL and west to TX, mostly on the Coastal Plain, but ranging into the mountains southward. [= RAB, C, F, G, K, S, W, WH, Y, Z; = *T. linearifolia* Elliott – S]

**Tragia urticifolia** Michaux, Nettleleaf Noseburn. Dry woodlands and rock outcrops, particularly over mafic or calcareous rocks. May-October. Sc. VA west to MO, KS, and CO, south to c. peninsular FL, Panhandle FL, and AZ. [= RAB, F, G, K, W, WH, Y, Z; = *T. urticaefolia* – S, orthographic variant]

**Triadica** Loureiro 1790 (Chinese Tallow-tree)

A genus of 1-3 species, native to tropical and subtropical Asia. The most recent monographers of *Sapium* and related genera (Kruijt 1996; Esser 2002) place our naturalized species in the genus *Triadica*, native to Asia; *Sapium* (excluding *Triadica*) is a genus of 21 species restricted to the neotropics. This conclusion is corroborated by molecular phylogenetic analysis (Wurdack, Hoffmann, & Chase 2005). References: Kruijt (1996)=Z; Esser (2002)=Y; Govaerts, Frodin, & Radcliffe-Smith (2000)=X.

\* **Triadica sebifera** (Linnaeus) Small, Chinese Tallow-tree, Popcorn Tree. Marsh edges, shell deposits, disturbed areas; native of e. Asia. May-June; August-November. With *Euphorbia* and *Cnidioscolus*, one of our few Euphorbiaceous genera with milky sap. *Triadica sebifera* has become locally common from Colleton County, SC southward through the tidewater area of GA, and promises to become a serious weed tree (as it is in parts of LA, TX, and FL). [= K, S, X, Y, Z; = *Sapium sebiferum* (Linnaeus) Roxburgh – RAB, GW, WH]



*Vernicia* Loureiro 1790 (Tung-oil Tree)

A genus of 3 species, trees, native of se. Asia. References: Govaerts, Frodin, & Radcliffe-Smith (2000)=Z.

\* *Vernicia fordii* (Hemsley) Airy-Shaw, Tung-oil Tree, Tung Tree. Planted for the oil and for ornament; native of central and western China. Naturalized on the Gulf Coastal Plain from former plantations; planted and showing a tendency to naturalize in the Coastal Plain of NC (Mount Olive, Wayne Co.). [= K, Z; = *Aleurites fordii* Hemsley – WH]

**189. PHYLLANTHACEAE** Martinov 1820 (Leaf-flower Family) [in MALPIGHIALES]

A family of about 60 genera and 1800 species, trees, shrubs, and herbs, mainly tropical. References: Webster (1994); Chase et al. (2002).

- 1 Shrub; petals present; stamens 5-6.....*Phyllanthopsis*
- 1 Tree or annual herb; petals absent; stamens 3.
  - 2 Tree; nectary disc absent; seed coat fleshy .....*Glochidion*
  - 2 Annual herb; nectary disc present; seed coat dry.....*Phyllanthus*

*Glochidion* J.R. Forster & G. Forster (Needlebush, Cheesetree)

A genus of 200-300 species, shrubs and trees, of Asia, Australia, and nearby islands. References: Levin in FNA (in prep.).

\* *Glochidion puberum* (Linnaeus) Hutchinson. Disturbed areas; native of China, Japan, and Taiwan. Fearn & Urbatsch (2001) discuss in detail its naturalization in s. AL (Mobile County). [= K2]

*Phyllanthopsis* (Scheele) Vorontsova & Petra Hoffman 2008 (Maidenbush)

A genus of 2 species, shrubs, of sc. North America (United States and Mexico). Generic boundaries have been troublesome (see synonymy). References: Vorontsova & Hoffman (2008); Wurdack et al. (2004).

*Phyllanthopsis phyllanthoides* (Nuttall) Vorontsova & Petra Hoffman, Maidenbush. Barrens, including river-scour barrens, on limestone or other calcareous rock. C. MO, AR, and OK, south to c. TX; disjunct in c. AL and ec. TN. [= *Leptopus phyllanthoides* (Nuttall) G.L. Webster – K; = *Andrachne phyllanthoides* (Nuttall) Coulter – F, G]

*Phyllanthus* Linnaeus 1753 (Leaf-flower)

A genus of about 1200-1300 species, trees, shrubs, and herbs, of tropical, subtropical and warm temperate regions of the Old and New Worlds. Heterogeneous and perhaps to be divided. References: Levin in FNA (in prep.); Rossignol, Rossignol, & Haicour (1987)=Z; Webster (1970)=Y; Govaerts, Frodin, & Radcliffe-Smith (2000)=X.

- 1 Plant with “normal” arrangement of branches and leaves (leaves uniformly distributed on the stem and branches, alternate and either distichous or spirally arranged, the ultimate branches not deciduous, flowers produced on ultimate and penultimate orders of branches); [subgenus *Isocladus*].
  - 2 Leaves arranged distichously; stipules typically auriculate; [section *Loxopodium*].
    - 3 Stems terete; filaments free; seeds 0.8-1.0 mm long; [widespread in our area].....*P. caroliniensis* ssp. *caroliniensis*
    - 3 Stems flattened and winged; filaments connate; seeds 1.3-1.5 mm long; [of e. LA westward].....*P. evanescens*
  - 2 Leaves arranged spirally; stipules not auriculate; [section *Paraphyllanthus*].
    - 4 Plant herbaceous, with a single or few stems; seeds 1.7-1.8 mm long; calyx lobes 2.8-3.5 mm long (when in fruit); [endemic to FL Gulf Coast].....*P. liebmannianus* ssp. *platylepis*
    - 4 Plant suffruticose, with many stems clustered from the plant base; seeds 1.1-1.5 mm long; calyx lobes 1.5-2.5 mm long (when in fruit); [of e. LA westward].....*P. polygonoides*
- 1 Plant with “phyllanthoid” arrangement of branches, leaves, and flowers (leaves lacking on the main stem, the penultimate order of branches with scales arranged spirally, the ultimate order of branches deciduous, bearing normal leaves alternately and distichously, flowers produced only on the ultimate, deciduous branches).
  - 5 Stamens 5, filaments free; fruiting pedicels capillary, 3-7 mm long; seeds densely papillose; [subgenus *Kirganelia*].....*P. tenellus*



- 5 Stamens 3, filaments connate into a column 0.1-0.15 mm long; fruiting pedicels thicker and often also shorter; seeds variously ribbed or striate; [subgenus *Phyllanthus*]
- 6 Fruiting pedicels 0.5 mm long; seeds with 12-15 transverse ridges and sometimes 1-3 pits; male flowers borne toward the tip of the branchlets, female flowers toward the base; [section *Urinaria*].....*P. urinaria* ssp. *urinaria*
- 6 Fruiting pedicels > 0.5 mm long; seeds longitudinally ribbed or striate; female flowers borne toward the tip of the branchlets, male flowers toward the base; [section *Phyllanthus*].
- 7 Cymules bisexual (each with 1 female and 1 male flower); calyx lobes of male flowers 4 (-5) ..... *P. abnormis* var. *abnormis*
- 7 Cymules unisexual; calyx lobes usually 6 ..... *P. fraternus*

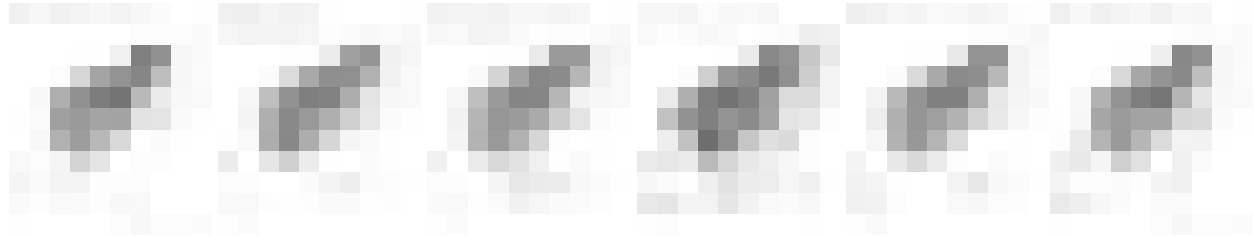
*Phyllanthus abnormis* Baill. var. *abnormis*, Drummond’s Leaf-flower Dunes. All year. Ne. FL south to s. peninsular FL; TX south into Mexico. Another variety occurs along the Rio Grande River in TX. [= FNA, K, X, Y; > *P. garberi* Small – S; < *P. abnormis* – WH]

\* *Phyllanthus amarus* Schumacher, Gale-of-wind, Carry-me-seed. Reported for NC and SC (Radford, Ahles, & Bell 1968) and for AL and MS (Kartesz 2010); it appears that these reports represent misidentified material and are actually *P. tenellus* (Webster 1970). {rejected; not keyed or mapped}

*Phyllanthus caroliniensis* Walter ssp. *caroliniensis*, Carolina Leaf-flower. Roadsides, moist woodlands, forests, and fields, often in seasonally wet, muddy places. July-November. PA and IL south to c. peninsular FL and TX, and south to Argentina and Paraguay, the original range not clear, and perhaps introduced in part of the area. Ssp. *saxicola* (Small) G.L. Webster (sometimes treated as a species) is restricted to s. FL, the Bahamas, and Greater Antilles. [= FNA, K, X, Y; < *P. caroliniensis* – RAB, F, G, Pa, W, WV; = *P. caroliniensis* var. *caroliniensis* – C; < *P. carolinensis* – GW, orthographic error; = *P. caroliniensis* – S]

*Phyllanthus evanescens* Brandege. Coastal prairies, disturbed areas. LA (St. Charles Parish) west to TX; south into Mexico and Central America. March-November. [= FNA; > *Phyllanthus pudens* L.C. Wheeler – K, X, Y]

\* *Phyllanthus fraternus* G.L. Webster. Disturbed areas; native of India and Pakistan. S. FL, MS, LA. Introduced in SC (Kartesz 1999, 2010). [= FNA, K, WH, X, Y]



*Phyllanthus liebmannianus* Müller of Aargau ssp. *platylepis* (Small) G.L. Webster. Wet hammocks. Late March-late June. Endemic to the “Big Bend” area of the FL Gulf Coast (Dixie, Levy, and Taylor counties). Apparently closely related to *P. liebmannianus* ssp. *liebmannianus* of the western Gulf Coast (Tamaulipas south to Yucatan and Belize). [= FNA, K, WH, X, Y; = *Phyllanthus platylepis* Small – S]

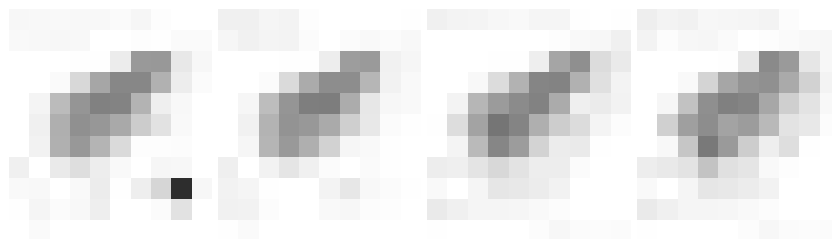
*Phyllanthus niruri* Linnaeus. Reports of *P. niruri* Linnaeus from NC and SC (Ahles, Bell, & Radford 1958) have proved to be *P. tenellus* (Webster 1970). {rejected; not keyed or mapped}

*Phyllanthus pentaphyllus* Wright, Fivepetal Leaf-flower. Unlikely to be correctly labeled from Darlington County, SC (as also indicated by RAB), is here excluded.

*Phyllanthus polygonoides* Nuttall ex Sprengel. Grasslands, calcareous glades. April-October. E. LA west to NM, south into Mexico. [= FNA, K, X, Y]

\* *Phyllanthus tenellus* Roxburgh, Mascarene Island Leaf-flower. Disturbed areas, in and around greenhouses; native of the Mascarene Islands. This species appeared in FL in the 1920’s, s. GA in the 1940’s, SC in the 1950’s, NC in the 1960’s, and TN in the 1970’s (Kral 1981). Reported from a single collection from VA, as a “contaminant in a container plant” (Virginia Botanical Associates 2007). [= FNA, GW, K, WH, Y; = *P. amarus* – RAB, misapplied (misidentified); > *P. tenellus* var. *tenellus* – X]

\* *Phyllanthus urinaria* Linnaeus ssp. *urinaria*, Chamber Bitter. Gardens and roadsides, apparently preferring nitrogen-rich soils; native of tropical Southeast Asia, now scattered in the tropics and subtropics of both hemispheres. March-November. This species appeared in the 1940’s to 1960’s in FL, GA, AL, LA, TX, and NC, and in the 1970’s in TN (Kral (1981)). [= FNA, X, Z; < *P. urinaria* – GW, K, WH, Y]



190. ELATINACEAE Dumortier 1829 (Waterwort Family) [in MALPIGHIALES]

A family of 2 genera and about 35 species, herbs. References: Tucker & Grissom in FNA (in prep.); Tucker (1986).

*Elatine* Linnaeus 1753 (Waterwort)

A genus of about 10-25 species, aquatic, tropical and temperate. References: Tucker & Grissom in FNA (in prep.); Tucker (1986).

- 1 Seeds mostly straight, the areoles elliptic, the rounded ends not dovetailing into adjacent rows, the longitudinal ridges thus appearing straight and distinct; seeds basal-axile, extending lengthwise through the capsule, not overlapping; leaves 1-5 mm long; flowers mostly 2-merous.....  
..... *E. minima*
- 1 Seeds mostly curved, the areoles 6-sided, the angular ends dovetailing into the adjacent rows, the longitudinal ridges thus appearing broken or irregular; seeds axile, attached along an elevated placenta at different levels, therefore overlapping; leaves 1-15 mm long; flowers mostly 3-merous.
  - 2 Leaves obovate to broadly spatulate, rounded at the tip, 3-8 mm long, the larger 1.5-5 mm wide; seeds with 20-30 pits in each row.....  
..... *E. americana*
  - 2 Leaves linear-lanceolate to narrowly spatulate, emarginate to truncate to rounded at the tip, 1-15 mm long, the larger 0.5-3 mm wide; seeds with 9-25 pits in each row.
    - 3 Leaves 1.5-4 mm long, 0.7-1.8 mm wide; seeds with 9-15 pits per row .....*E. brachysperma*
    - 3 Leaves 2.8-15 mm long, 0.5-3 mm wide; seeds with 16-25 pits per row ..... *E. triandra*

*Elatine americana* (Pursh) Arnott, American Waterwort. Cp (DE, VA), Mt (NC, SC): tidal flats, lakes; rare. July-October. Widespread in ne. United States, s. to NC and MO. The only known site for this species in NC is an artificial lake; it is uncertain whether it should be considered native or introduced. [= F, FNA, K, Pa, S; < *E. triandra* Schkuhr – RAB, W; = *E. triandra* var. *americana* (Pursh) Fassett – C, G, GW]

*Elatine brachysperma* A. Gray, Shortseed Waterwort. Pd (GA): {habitat not known}; rare. It has been reported for nc. GA (Jones & Coile 1988). [= F, FNA, K; = *E. triandra* Schkuhr var. *brachysperma* (A. Gray) Fassett – C, G]

*Elatine minima* (Nuttall) Fischer & C.A. Meyer, Tiny Waterwort. Cp (DE, VA), Pd (NC, SC): tidal flats, lakes, mud flats; rare. July-October. First found in NC in 1990, *E. minima* is widespread in ne. United States, south to VA, NC, and SC (Horn, pers. comm. 2004). The only known site for this species in NC is the spillway of an artificial lake (Lake Butner, Granville County); it is uncertain whether it should be considered native or exotic in NC. It may have been introduced by waterfowl or humans. [= C, F, FNA, G, K, Pa]

*Elatine triandra* Schkuhr, Three-stamen 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 may represent *E. rubella* Rydberg (Horn, pers. comm. 2004). [= F, FNA, PA; = *E. rubella* Rydberg – K, apparently misapplied; = *E. triandra* var. *triandra* – C, G]

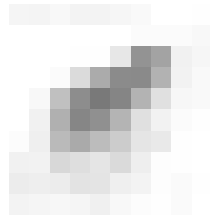
196. *CHRYSOBALANACEAE* R. Brown 1818 (Coco-plum Family) [in MALPIGHIALES]

A family of about 18 genera and 530 species, trees and shrubs, of tropical and subtropical areas, especially tropical America. References: Prance & Sothers (2003); Prance (1970).

*Licania* Aublet (Gopher-apple)

A genus of about 218 species, trees and shrubs, mainly of tropical America, but with a few species in Africa and Asia. References: Prance (1970)=X; Prance (1972)=Y; Prance & Sothers (2003)=Z.

*Licania michauxii* Prance, Gopher-apple, Ground-oak. Sandhills, dry sandy pinelands. May-June; September-October. Se. SC south to s. FL, west to LA, becoming abundant and ubiquitous in dry sandy habitats in the southern part of its range. *L. michauxii* is one of 49 species of subgenus *Moquilea*, section *Moquilea*, which is distributed from se. North America through Central America and the West Indies to South America; our species may be most closely related to *L. retifolia* Blake, a small tree of sw. Mexico and El Salvador (Prance 1970; Prance & Sothers 2003). A rare upright shrub form (to over 15 dm tall) has been found in Brevard County, FL, suggesting that *L. michauxii* evolved from a taller and more upright ancestor (Ward & Taylor 1999). [= K, X, Y, Z; = *Chrysobalanus oblongifolius* Michaux – RAB; > *Geobalanus oblongifolius* (Michaux) Small – S; > *Geobalanus pallidus* Small – S]



HALORAGACEAE

199. PASSIFLORACEAE A.L. de Jussieu ex Kunth 1817 (Passionflower Family) [in MALPIGHIALES]

A family of about 27 genera and 935 species, vines, shrubs, trees, and herbs, of tropical and warm temperate regions, especially America and Africa. Here circumscribed to include Turneraceae, following Angiosperm Phylogeny Group (2009). References: Feuillet & MacDougal in Kubitzki, Bayer, & Stevens (2007); Arbo in Kubitzki, Bayer, & Stevens (2007).

- 1 Corona present, of several series of frills; stamens elevated on an androgynophore; herbaceous vine or woody liana ..... *Passiflora*
- 1 Corona absent; stamens not elevated on an androgynophore; upright herb..... *Piriqueta*

*Passiflora* Linnaeus 1753 (Passionflower)

A genus of about 525 species, vines, shrubs, and trees, largely of tropical America, with a few species in warm temperate America and Asia. References: Ulmer & MacDougal (2004)=Z; Vanderplank (2000)=Y; Feuillet & MacDougal in Kubitzki, Bayer, & Stevens (2007).

**Identification notes:** *Passiflora* flowers are structurally striking. There are 5 sepals and either 0 or 5 petals; a **corona** of numerous linear structures is present, arranged in 1-several series. The ovary, 3 styles, and 5 stamens are basally adnate and elevated on an **androgynophore**. Most species have **glands** on the leaves which function as extrafloral nectaries; these can be seen as paired glands on the leaf petiole (in all our species except *P. lutea*), and some species also have **laminar glands** on the leaf blade, near the margin.

- 1 Sepals 25-35 mm long, green on the outer surface, white on the inner surface; petals 30-40 mm long, lavender, violet, or mauve; berry 40-70 mm long; corona in 2-3 series, the longer 15-30 mm long; [subgenus *Passiflora*; supersection *Passiflora*]..... *P. incarnata*
- 1 Sepals 5-20 mm long, green, pale yellow or white; petals 5-11 mm long, greenish yellow to white (or absent in *P. gracilis* and *P. pallida*); berry 6-40 mm long; [subgenus *Decaloba*].
- 2 Petiole lacking paired glands; leaf blade lacking laminar glands; berry 7-12 mm long; [subgenus *Decaloba*; supersection *Decaloba*]..... *P. lutea*
- 2 Petiole with paired glands, variously positioned near the junction of the petiole and leaf blade, or toward the base of the petiole; leaf blade usually with at least a few laminar glands; berry **either** 6-15 mm long **or** 25-40 mm long.
- 3 Sepals 5-10 mm long; petals absent; corona in 2 series the outer 3-7 mm long; berry 6-10 (-15) mm long; [native, of ne. FL southward]; [subgenus *Decaloba*, supersection *Sieca*] ..... *P. pallida*
- 3 Sepals 10-20 mm long; petals **either** 4-11 mm long **or** absent; corona in 1-2 series, the longer 5-11 mm long; berry 20-40 mm long; [alien]; [subgenus *Decaloba*, supersection *Bryonioides*].
- 4 Petals absent; sepals 10-14 mm long, 2-4 mm wide; corona in 2 series, the outer (longer) 6-9 mm long, the inner ca. 1 mm long; berry 20-30 mm long, scarlet when ripe; leaves 3-lobed, entire, with petiolar glands toward the base of the petiole ..... [*P. gracilis*]
- 4 Petals present, 4-11 mm long; sepals 13-20 mm long, 5-8 mm wide; corona in 1 series, 5-11 mm long; berry 30-40 mm long, purple or black when ripe; leaves 3 (-5)-lobed, serrate, with petiolar glands in the upper half of the petiole ..... *P. morifolia*

\* *Passiflora caerulea* Linnaeus, Blue Passionflower, Common Passionflower. Cultivated, sometimes escaped in disturbed areas, native of South America. Naturalized in s. AL and se. LA. [= K2] {not yet keyed}

\* *Passiflora gracilis* Jacquin ex Link, Annual Passionflower. Native of Mexico, Central America, and n. South America. Reported for SC (Kartesz 1999). {investigate – not in SC Plant Atlas} [= K2, Y, Z]

*Passiflora incarnata* Linnaeus, Maypops. Roadsides, fencerows, thickets, fields. May-July (-later); July-October. S. NJ, DE, MD, sw. PA, OH, and OK, south to s. FL and s. TX. Certainly one of our most interesting and beautiful flowers. [= RAB, C, F, G, K2, S, W, WH3, WV, Z]

*Passiflora lutea* Linnaeus, Eastern Yellow Passionflower. Woodlands, forests, thickets, maritime forests. June-September; August-October. DE, PA, OH, IN, IL, MO, and e. KS, south to c. peninsular FL, s. AL, s. MS, s. LA, and s. TX. Sometimes divided into two varieties, the more eastern var. *lutea* (west to WV and AL) with pilose calyx, petioles, and stems, and more western var. *glabriflora* Fernald (east to WV and AL) with glabrous calyx, petioles, and stems. It is not clear that this is anything more than a minor polymorphism. [= RAB, K1, K2, Pa, S, W, WH3, Z; > *P. lutea* var. *lutea* – C, F, G, WV; > *P. lutea* var. *glabriflora* Fernald – C, F, G, WV]

\* *Passiflora morifolia* Masters. Thickets; native of South America. May-July; July-October. [= RAB, K2, Z; > *P. morifolia* – Y; > *P. warmingii* Masters – S, Y]

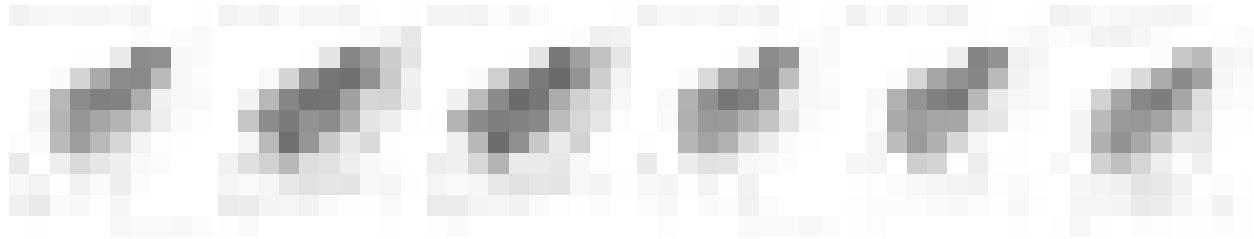
*Passiflora pallida* Linnaeus, West Indian Corksystem Passionflower. Hammocks, shell middens. Ne. FL (Dixie and Duval counties) south to s. FL; West Indies; Yucatan. Ulmer & MacDougal (2004) state that the Florida and West Indian component of what has been broadly treated as *P. suberosa* warrants specific status. [= S; < *P. suberosa* Linnaeus – K2, WH3, Y, Z]

*Piriqueta* Aublet 1775

A genus of about 20-50 species, herbs and shrubs, of tropical and subtropical America, with a single species in s. Africa. References: Arbo (1990, 1995)=Z; Maskas & Cruzan (2000).

*Piriqueta caroliniana* (Walter) Urban var. *caroliniana*. Longleaf pine sandhills, sandy soils of roadsides, woodland edges, and disturbed areas. May-September. SC south to s. FL; Cuba and Hispaniola; and in Central and n. South America. Arbo (1990; 1995) treats *P. caroliniana* as a subspecies of *P. cistoides*, but the morphological distinctions seem strong and the two taxa have widely overlapping distributions in the Neotropics. Maskas & Cruzan (2000) discuss variation and evolutionary taxa in this complex in the southeastern United States and the Bahamas. [< *P. caroliniana* – RAB; < *P. cistoides* (Linnaeus) Grisebach ssp. *caroliniana* (Walter) M.M. Arbo – K1, K2, WH, Z; = *P. caroliniana* – S]

\* *Piriqueta cistoides* (Linnaeus) Grisebach. Reported for GA (Kartesz 1999), but the documentation is untraceable. [= *P. cistoides* ssp. *cistoides* – K1, K2, Z] {not keyed; rejected pending better documentation}



201. SALICACEAE de Mirbel 1815 (Willow Family) [in MALPIGHIALES]

A family of 55 genera and about 1010 species, trees, shrubs, and subshrubs, nearly cosmopolitan. Now circumscribed to include the Flacourtiaceae. References: Argus, Eckenwalder, & Kiger in FNA (2010).

- 1 Leaf blades 0.8-2 (-3)× as long as wide; stamens 5-80; buds covered by several, overlapping scales; flowering catkins arching or drooping.....*Populus*
- 1 Leaf blades (2-) 3-30× as long as wide; stamens 1-9; buds covered by a single scale; flowering catkins usually erect or ascending .....*Salix*

*Populus* Linnaeus 1753 (Poplar, Aspen, Cottonwood)

A genus of about 35 species, trees, largely north temperate. References: Eckenwalder in FNA (2010); Eckenwalder (1977)=Z; Eckenwalder (1984)=Y; Eckenwalder (1996); Hamzeh & Dayanandan (2004).

- 1 Winter buds not viscid; stamens 5-20.
  - 2 Stamens 12-20; scales of the catkins deeply fimbriate; petioles terete; [section *Leucoides*].....*P. heterophylla*
  - 2 Stamens 5-12; scales of the catkins dentate or with only 3-7 linear-triangular lobes; petioles strongly flattened laterally (90 degrees to the plane of the leaf blade), especially near the junction with the blade; [section *Populus*].
    - 3 Petioles strongly flattened laterally; leaves glabrous when mature (pubescent when young in *P. grandidentata*); [native trees].
      - 4 Leaf margins coarsely crenate- or undulate-toothed, with fewer than 12 (-15) teeth per side, the sinuses of the larger teeth 1.5-6 mm deep; leaves puberulent beneath when young (glabrate in age); buds gray-pubescent.....*P. grandidentata*
      - 4 Leaf margins finely crenulate-serrulate, with (12-) 15-35 (-45) teeth per side, the sinuses 0.5-1.0 mm deep; leaves glabrous; buds glossy brown .....*P. tremuloides*
    - 3 Petioles terete or nearly so; leaves densely pubescent (*P. alba*) or glabrescent (*P. ×canescens*); [exotic trees].
      - 5 Leaves of vigorous shoots palmately 3-5 (-7)-lobed (and also toothed); leaves densely white-tomentose beneath when young and mature .....*P. alba*
      - 5 Leaves of vigorous shoots merely toothed; leaves glabrescent when mature.....*P. ×canescens*
- 1 Winter buds viscid (sticky and shiny as if recently varnished); stamens (15-) 20-80.
  - 6 Petiole terete or dorsally flattened (in the plane of the leaf blade), and often also channeled above; leaf blades dark green above, glaucous white beneath; leaf margin not translucent, finely serrate with teeth < 1 mm deep; [section *Tacamahaca*].
    - 7 Petioles 7-10 cm long; leaves ovate, broader below the midpoint; leaf base rounded to subcordate; twigs terete or slightly angled in cross-section .....*P. balsamifera*
    - 7 Petioles < 2 cm long; leaves obovate, broader past the midpoint; leaf base cuneate to rounded; twigs strongly angled in cross-section.....*P. simonii*
  - 6 Petiole laterally flattened (90 degrees to the plane of the leaf blade), especially near the junction with the blade; leaf blades light green above, often paler beneath but not distinctly whitened; leaf margin translucent, finely to coarsely serrate with teeth > 1 mm deep.
    - 8 First-year branches reddish-brown; leaves noticeably paler beneath; flattened portion of petiole < 2× as deep as wide; early leaves with > 20 teeth per side, the largest < 2.5 mm deep; [probable intersectional hybrid of section *Aegeiros* and section *Tacamahaca*] .....*P. ×jackii*
    - 8 First-year branches yellow- to orange- brown; leaves nearly the same color above and below; flattened portion of petiole > 2× as deep as wide; early leaves usually with < 20 teeth per side, the largest < 2.5 mm deep; [section *Aegeiros*].
      - 9 Stigmas 3-4; stamens (30-) 40-80; [native tree, common] .....*P. deltoides* ssp. *deltoides*
      - 9 Stigmas 2-3; stamens (15-) 20-30; [alien trees, rare out of cultivation].
      - 10 Floral disk 2-4 mm wide; stigmas 2-3; ovules and seeds 6-14 (-20) per placenta .....*P. ×canadensis*
      - 10 Floral disk 1-2 mm wide; stigmas 2; ovules and seeds 4-8 per placenta .....*P. nigra*

\* *Populus alba* Linnaeus, Silver Poplar, White Poplar. Disturbed areas, suburban woodlands; native of Europe. March-April. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, WV]

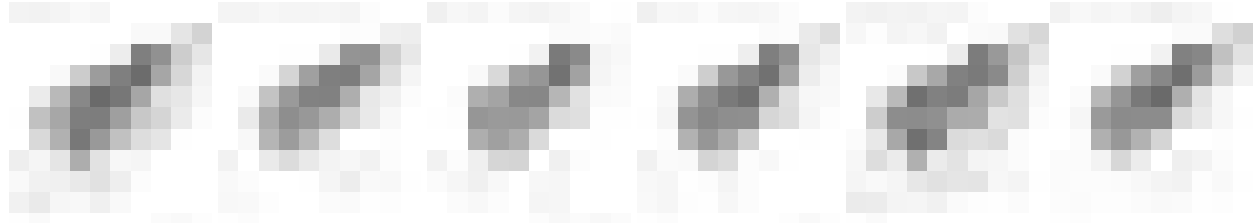
*Populus balsamifera* Linnaeus, Balsam Poplar, Hackmatack, Tacamahac. Floodplains, disturbed areas. NL (Labrador) and AK south to PA, WV, OH, IN, IL, IA, SD, CO, ID, and OR; scattered farther south by introduction. Ranges south to s. PA (Rhoads & Block 2007), e. and c. KY (Clark et al. 2005), and to VA (according to Kartesz 1999). Also reported for n. GA (Jones & Coile 1988) and provisionally for SC (Kartesz 1999). Many of the attributions of this species to states in our area are based on misidentifications. [= C, FNA, G, Pa, WV; = *P. balsamifera* ssp. *balsamifera* – K; > *P. balsamifera* var. *balsamifera* – F; > *P. balsamifera* var. *magnifica* Victorin – F; > *P. balsamifera* var. *subcordata* Hylander; > *P. balsamifera* var. *michauxii* (Dode) Henry]

\* *Populus ×canadensis* Moench (pro sp.) [*P. deltoides* × *nigra*], Hybrid Black Poplar. Disturbed areas. Reported for a county in c. GA (Jones & Coile 1988) and for NC and VA (Kartesz 1999). [= C, FNA, K, Pa]

\* *Populus* × *canescens* (Aiton) Sm. (pro sp.) [*P. alba* × *tremula*], Gray Poplar. Roadsides, disturbed areas; native of Europe. March-April. Occurs at scattered locations in TN, n. GA (Jones & Coile 1988), se. PA (Rhoads & Block 2007), and NC, SC, and VA (Kartesz 1999). See Poindexter (2006). [= C, FNA, K, Pa; = *P. canescens* (Aiton) Sm. – F, G]

*Populus deltoides* Bartram ex Marshall var. *deltoides*, Eastern Cottonwood. Riverbanks, bottomland forests (not found along blackwater streams). March-April. Var. *deltoides* ranges from QC west to MN, south to n. peninsular FL, Panhandle FL, and TX. Var. *occidentalis* Rydberg [ssp. *monilifera* (Aiton) Eckenwalder] is more western, primarily of the Great Plains. [= C, GW; < *P. deltoides* – RAB, G, Pa, W, WH, WV; > *P. deltoides* var. *deltoides* F; > *P. deltoides* var. *missouriensis* (A. Henry) A. Henry – F; = *P. deltoides* ssp. *deltoides* – FNA, K, Z; = *P. balsamifera* Linnaeus – S, misapplied]

*Populus grandidentata* Michaux, Bigtooth Aspen. Dry, rocky, upland forests. April-May. NS west to MN, south to w. NC, sc. TN, and n. MO. [= RAB, C, F, FNA, G, K, Pa, S, W, WV]



*Populus heterophylla* Linnaeus, Swamp Cottonwood. Blackwater and brownwater swamp forests. March-April. CT west to MI, south to Panhandle FL and LA, scattered and irregular in distribution, absent from the Appalachians. [= RAB, C, FNA, G, GW, K, Pa, S, WH]

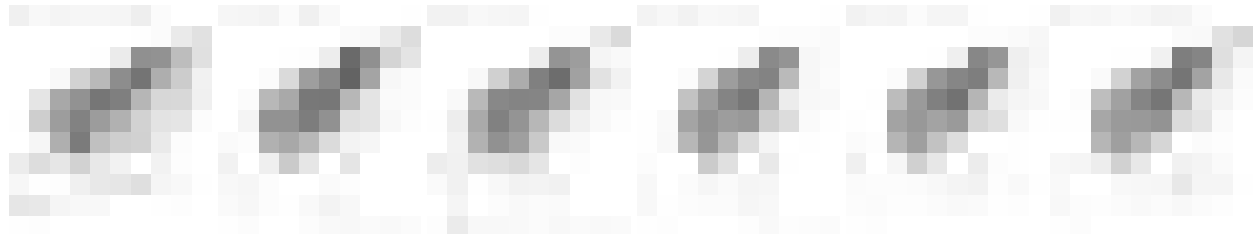
\* *Populus* × *jackii* Sargent [probably *P. balsamifera* × *deltoides*], Balm-of-Gilead. Bottomlands, riverbanks, streambanks, spread from cultivation. April. This cultivar is of uncertain origin, considered by some to be a hybrid *P. balsamifera* × *deltoides*, by others to be an atypical pistillate clone of *P. balsamifera* Linnaeus. The cultivar 'gileadensis' is distinguished from the typical form by the petioles densely and stiffly pubescent (vs. petioles glabrous). *P.* × *jackii* is locally abundant along the New River in Watauga, Ashe, and Alleghany counties, NC and downstream into VA. [= C, FNA, K, Pa, Y; = *P. candidans* Aiton – RAB, G, S, misapplied; > *P.* × *gileadensis* Rouleau – F, W, WV]

\* *Populus nigra* Linnaeus, Black Poplar, Lombardy Poplar. Disturbed suburban areas; native of s. Europe. Cultivated in many forms, including the columnar "Lombardy Poplar;" short-lived and only weakly spreading to disturbed areas in the vicinity of plantings. [= C, F, FNA, G, K, Pa; > *P. italica* (Du Roi) Moench – S; > *P. nigra* var. *italica* Du Roi – WV]

\* *Populus simonii* Carrière, Chinese Poplar, Simon's Poplar. Riverbanks; native of China. Naturalized in the Mountains of NC. [= FNA]

*Populus* × *smithii* Boivin [*P. grandidentata* × *tremuloides*]. {habitat}. South to MD and WV. [= C, FNA, K] {not yet keyed}

*Populus tremuloides* Michaux, Quaking Aspen. Heath balds, rocky woodlands, exposed rock outcrops, clearings, floodplains. April-May. NL (Labrador) west to AK, south to NJ, n. VA, nw. NC (where perhaps not native), WV, MO, and (in the Rockies) to TX and Mexico. [= C, FNA, G, K, Pa, S, W, WV; > *P. tremuloides* var. *tremuloides* – F]



*Salix* Linnaeus 1753 (Willow)

A genus of about 400 species, trees, shrubs, and subshrubs, mostly north temperate and boreal. References: Argus in FNA (2010); Argus (1986)=Z; Dorn (1995)=Y; Argus (1997); Chen et al. (2010). Key adapted from Z and FNA.

- 1 Leaves mostly alternate, but some opposite or subopposite; [subgenus *Vetrix*, section *Helix*].....*S. purpurea*
- 1 Leaves all alternate.
  - 2 Bud apex sharp-pointed; bud scale margin free and overlapping; leaf blades 2.5-16× as long as wide; [subgenus *Protitea*].
    - 3 Leaf blades (4-) 7-10 (-16)× as long as wide; leaf undersurface glaucous or not; [section *Humboldtianae*].
      - 4 Leaves glaucous beneath; pistils borne on stipes averaging 2 mm long (range 1-5 mm); stipules usually prominent and persistent, to 15 mm long; leaf blades (4-) avg. 7.5 (-13)× as long as wide ..... *S. caroliniana*
      - 4 Leaves not (or thinly) glaucous beneath; pistils borne on stipes averaging 1 mm long (range 0.5-1.5 mm); stipules usually small and caducous, to 12 mm long; leaf blades (4-) avg. 9 (-16)× as long as wide ..... *S. nigra*
    - 3 Leaf blades 2.5-5 (-6)× as long as wide; leaf undersurface glaucous.
      - 5 Leaf apex acuminate to caudate; branchlets yellow; [midwestern species east and south to KY and WV]; [section *Humboldtianae*] ....  
.....*S. amygdaloides*
      - 5 Leaf apex acute; branchlets reddish brown or green; [rare plant of sphagnous seepage of s. AL, s.GA, and FL]; [section *Floridanae*] .  
.....*S. floridana*

- 2 Bud apex blunt; bud scale margin fused; leaf blades 2-30× as long as wide.
- 6 Leaves green or pale green beneath.
- 7 Leaves linear, (7-) 11-19 (-30)× as long as wide; leaf margin distinctly glandular-denticulate; stomates present on the upper leaf surface; pistils pubescent to glabrescent; stamens 2, the staminate floral bracts tawny, the aments on leafy branches; [subgenus *Longifoliae*, section *Longifoliae*].....*S. exigua* var. *sericans*
- 7 Leaves lanceolate or elliptic-lanceolate, 2-6× as long as wide; leaf margin serrate; stomates usually absent on the upper leaf surface; pistils glabrous; stamens 3, or if 2 (*S. eriocephala*), the staminate floral bracts dark brown, the aments sessile with a few leafy bracts.
- 8 Stipules not glandular on their margins; pistillate floral bracts present after flowering; petioles not glandular; stamens 2; [subgenus *Vetrix*, section *Cordatae*].....*S. eriocephala* var. *eriocephala*
- 8 Stipules glandular on their margins (stipules caducous and often absent in *S. pentandra*); pistillate floral bracts deciduous after flowering; petioles glandular near the junction with the blade; stamens 3-9; [subgenus *Salix*, section *Salicaster*].
- 9 Stipules persistent and prominently glandular; young leaves and twigs with reddish-brown hairs, glabrescent or glabrous later; leaves long-acuminate; capsules 5-7 mm long.....*S. lucida*
- 9 Stipules caducous, inconspicuously glandular; young leaves and twigs glabrous; leaves short-acuminate; capsules 8-9 mm long.....*S. pentandra*
- 6 Leaves glaucous beneath.
- 10 Leaf margin entire or crenate (to slightly and irregularly serrate); [subgenus *Vetrix*, section *Cinerella*].
- 11 Leaves glabrate (sparsely pubescent when young), not revolute.....*S. discolor*
- 11 Leaves permanently pubescent, at least on the lower surface (densely villous or tomentose when young), revolute.
- 12 Leaf margin entire and undulate; pistillate aments 1-3.5 cm long; pistils borne on stipes mostly < 2 mm long; staminate aments 0.5-2 cm long; shrubs, < 2 m tall.
- 13 Leaves stipulate; leaf blades (5-) avg. 7 (-13) cm long, (12-) avg. 17 (-35) mm wide; staminate aments 1-2 cm long; pistillate aments 2-3.5 cm long.....*S. humilis*
- 13 Leaves exstipulate; leaf blades (2.5-) avg. 4 (-5) cm long, (5-) avg. 7 (-10) mm wide; staminate aments 0.5-1.1 cm long; pistillate aments 1-2 cm long.....*S. occidentalis*
- 12 Leaf margin crenate or irregularly serrate (rarely nearly entire); pistillate aments 3-8 cm long; pistils borne on stipes mostly > 2 mm long; staminate aments 2-5 cm long; shrubs to small trees, mostly 3-15 m tall.
- 14 Trees or tall shrubs, to 15 m tall; decorticated wood of 1-4 year old branches smooth or with a few ridges usually < 5 mm long.....*S. caprea*
- 14 Shrubs, 3-7 (12) m tall; decorticated wood of 1-4 year old branches with numerous ridges, many of them longer than 2 cm.
- 15 Leaves tomentose beneath with a mixture of white and rusty hairs.....*S. atrocinerea*
- 15 Leaves tomentose beneath with white or gray hairs.....*S. cinerea*
- 10 Leaf margin serrulate or serrate.
- 16 Shrubs to 6 m tall; leaves lacking stomates on the upper surface; [native to our area]; [subgenus *Vetrix*].
- 17 Stipules prominent, 5-15 mm long; branches flexible; mature leaves glabrous or glabrescent beneath; staminate aments borne on short, leafy branches; [section *Cordatae*].....*S. eriocephala* var. *eriocephala*
- 17 Stipules absent or of small glands (rarely to 4 mm long on vigorous shoots); branches brittle; mature leaves short-sericeous beneath; staminate aments sessile, sometimes with a few leafy bracts; [section *Griseae*].....*S. sericea*
- 16 Trees; leaves with stomates on the upper surface; [introduced in our area]; [subgenus *Salix*].
- 18 Leaf margin coarsely and irregularly serrate; leaves glabrous beneath; leaf blade 4-7 (-10)× as long as wide; petioles (7-) 10-20 mm long, glabrous; [section *Salix*].....*S. fragilis*
- 18 Leaf margin minutely and uniformly serrulate; leaves long-sericeous or glabrate beneath; leaf blade 5-13× as long as wide; petioles 3-12 mm long, tomentose or sericeous.
- 19 Leaves long-sericeous beneath; branches ascending (rarely pendulous); leaves narrowly lanceolate, with length/width ratio of 5-6.5; petioles 3-6 mm long; petioles 3-6 mm long, sericeous; flowering branchlets 1-1.5 cm long; [section *Salix*].. *S. alba*
- 19 Leaves glabrate beneath; branches normally pendulous; leaves very narrowly lanceolate, with length/width ratio of 6.5-13; petioles 7-12 mm long; petioles 7-12 mm long, tomentose; flowering branchlets ca. 0.3 cm long; [section *Subalbae*].
- 20 Branches yellowish, yellow-green, or yellow-brown.....*S. xsepulchralis*
- 20 Branches yellow-brown to red-brown, or gray-brown.
- 21 Pistillate catkins on branchlets that are (0-) 2-4 mm long; ovary beak abruptly tapered to styles; anthers 0.4-0.5 mm long.....*S. babylonica*
- 21 Pistillate catkins on branchlets that are 3-14 mm long; ovary beak gradually tapered to styles; anthers 0.5-0.8 mm long.
- 22 Petioles glabrous, pilose, or velvety to glabrescent on the upper surface; branches yellow-brown, gray-brown, or red-brown; staminate catkins loosely flowered, stout, nectaries connate connate and shallowly cup-shaped.....*S. xpendulina*
- 22 Petioles short-silky on the upper surface; branches yellow-brown; staminate catkins moderately densely flowered, slender, nectaries distinct.....*S. xsepulchralis*

\* *Salix alba* Linnaeus, European White Willow. Disturbed areas; native of Eurasia. March-April. [= RAB, C, F, FNA, G, K, Pa, S, W, Z]

*Salix amygdaloides* Andersson, Peachleaf Willow. Floodplains and other wet places. April-May. QC west to BC, south to PA, n. WV, w. KY, MO, TX, NM, NV, AZ, and OR. [= C, F, FNA, G, K, Pa, Z]

\* *Salix atrocinerea* Brotero, Common Sallow, Olive-leaf Willow, Large Gray Willow. Disturbed areas; native of w. Europe. April. Also reported as naturalized in KY (Clark et al. 2005) and PA (Kartesz 1999). [= FNA, K, Pa; = *S. cinerea* Linnaeus ssp. *oleifolia* (Smith) Macreight - Z; < *S. cinerea* - RAB, C, F, G]

\* *Salix babylonica* Linnaeus, Weeping Willow. Disturbed areas; native of Asia. March-April. Note that many trees identified as *S. babylonica* may actually be one of two commonly cultivated hybrids, *S. xpendulina* and *S. xsepulchralis*, with *S. babylonica* as one parent. [= RAB, C, F, FNA, G, K, W, WH, WV, Z; < *S. babylonica* complex - Pa]

*Salix bebbiana* Sargent, Long-beaked Willow, Gray Willow. Upland and wetland thickets. Widespread and rather common in PA (Rhoads & Klein 1993; Rhoads & Block 2007) and also occurs in MD (Argus 1986) and NJ. [= C, FNA, K, Pa, Z; > *S. bebbiana* var. *bebbiana* – F] {subgenus *Salix*, section *Fulvae*} {not yet keyed}

\* *Salix caprea* Linnaeus, Goat Willow, Great Sallow. Disturbed areas; native of Eurasia. April. [= C, F, FNA, G, K, Pa, Z]

*Salix caroliniana* Michaux, Carolina Willow, Coastal Plain Willow. Riverbanks, sandbars, other wet sites. March-April. Widespread in the Southeast, *S. caroliniana* has a somewhat peculiar range, with three main centers of distribution, the Coastal Plain from VA south to s. FL, the Interior Low Plateau of TN, KY, and n. AL, and the Ozark-Ouachita Highlands of AR and MO. [= RAB, C, F, FNA, G, GW, K, Pa, WH, WV, Z; = *S. longipes* Andersson – S]

\* *Salix cinerea* Linnaeus, Gray Willow. Disturbed areas; native of Eurasia. April. [= FNA, K, Pa; = *S. cinerea* ssp. *cinerea* – Z; < *S. cinerea* – RAB, C, F, G, WV (circumscription uncertain but apparently including *S. atrocinerea*)]

*Salix cordata* Michaux. Reported as occurring south to MD and PA (Kartesz 1999), apparently in error. [= C, FNA, K; > *S. cordata* var. *cordata* – F] {rejected; not mapped; not keyed}

*Salix discolor* Muhlenberg, Pussy Willow. Calcareous wetlands, disturbed areas; apparently native in DE, VA, and WV, introduced only in NC. March-April. NL (Newfoundland) and AB south to DE, w. VA, WV, KY, MO, SD, and MT. [= C, FNA, K, Pa, S, Z; > *S. discolor* var. *discolor* – F, G, WV; > *S. discolor* var. *latifolia* Andersson – F, G, WV; > *S. discolor* var. *prinoidea* (Pursh) Andersson – WV]

\* *Salix elaeagnos* Scopoli, Hoary Willow, Rosemary Willow, Diamond Willow. Reported for SC (Kartesz 1999), apparently in error. [= FNA, K] {subgenus *Vetrix*, section *Canae*} {rejected; not mapped; not keyed}

*Salix eriocephala* Michaux, Heart-leaved Willow. Mesic forests, seepage areas, ditches, alluvial area. April-May. NL (Newfoundland) west to ND, south to w. FL and s. KS (Dorn 1995). [= FNA, Pa; < *S. eriocephala* – C, K, W, WH, Z; > *S. rigida* Muhlenberg var. *rigida* – F, G; > *S. rigida* var. *angustata* (Pursh) Fernald – F; > *S. rigida* var. *vestita* (Andersson) Ball – G; = *S. cordata* Muhlenberg – S, misapplied; < *S. rigida* – WV; = *S. eriocephala* ssp. *eriocephala* var. *eriocephala* – Y]

*Salix exigua* Nuttall var. *sericans* (Nees) G.L. Nesom, Sandbar Willow. Sandbars, riverbanks, creekbanks. March-mid May and June-August. *S. exigua* occurs throughout North America except most of the Southeast, south to DE, se. VA, w. VA, e. TN, MS, LA, TX, and Mexico; var. *sericans* is the more eastern variety of the complex (Nesom 2002). [< *Salix exigua* – W, Z; > *S. exigua* ssp. *interior* (Rowlee) Cronquist var. *angustissima* (Andersson) Reveal & Broome – C, Pa; > *S. interior* Rowlee var. *interior* – F, G; = *S. interior* Rowlee – FNA, GW, K, S, WV]

*Salix floridana* Chapman, Florida Willow. Sphagnum seepages. March-April. C. GA and s. AL south to c. peninsular and Panhandle FL. [= FNA, GW, K, S, WH, Z]

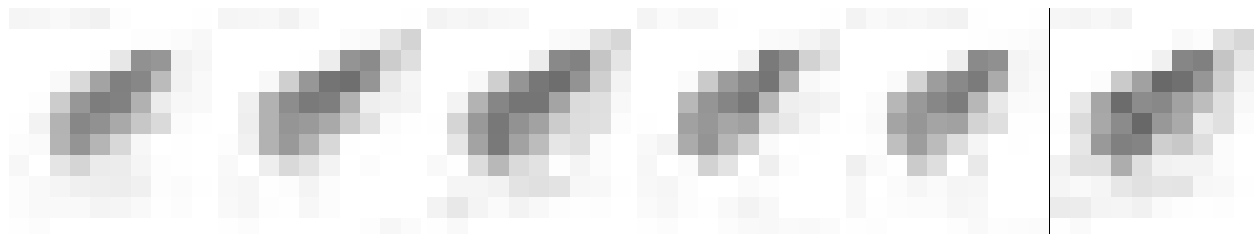
\* *Salix fragilis* Linnaeus, Crack Willow, Brittle Willow. Low areas; native to Asia Minor, introduced to Europe and thence to here. [= C, F, G, K, Pa, S, WV, Z; = *S. fragilis* Linnaeus – FNA]

*Salix humilis* Marshall, Upland Willow, Prairie Willow. 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. March-May. NL (Newfoundland) and MB, south to FL and TX. [= C, G, S, WH; < *S. humilis* – RAB, GW (also see *S. occidentalis*); = *S. humilis* var. *humilis* – FNA, K, Pa, W, Z; > *S. humilis* var. *humilis* – F, WV; > *S. humilis* var. *hyporhysa* Fernald – F, WV]

\* *Salix lucida* Muhlenberg, Shining Willow. Seepages, low areas. May. Uncertainly indigenous to the one known VA population in Roanoke County. [= C, FNA, Pa, W, WV, Z; > *S. lucida* var. *lucida* – F, G; = *S. lucida* ssp. *lucida* – K]

\* *Salix matsudana* Koidzumi, Corkscrew Willow. Disturbed areas; doubtfully naturalized, native of e. Asia. Reported for VA (Fairfax and Fauquier counties). [= K] {not keyed}

*Salix nigra* Marshall, Black Willow. Riverbanks, sandbars, other moist areas. March-April. NB, MN, NE, and CO, south to ne. FL, Panhandle FL, LA, and TX. [= RAB, F, FNA, G, GW, K, Pa, S, W, WH, WV, Z; ? *S. nigra* var. *nigra* – C]

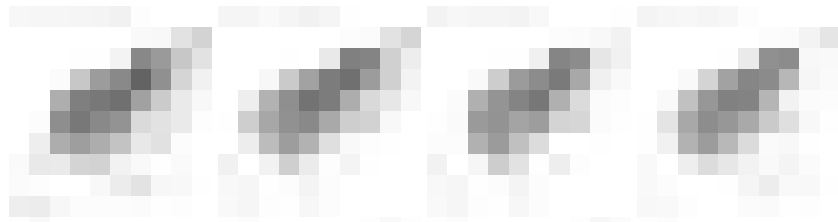


*Salix occidentalis* Walter, Dwarf Upland Willow, Sage Willow. Upland areas, often over mafic (amphibolite) or ultramafic (olivine) rocks. March-May. This species is less widespread than the related *S. humilis*, with a distribution centered in the central Appalachians. ME to ND, south to GA, LA, and OK. [= C; < *S. humilis* – RAB, GW; = *S. humilis* var. *microphylla* (Andersson) Fernald – F, W, Z; = *S. tristis* Aiton – G, S, WV; = *S. humilis* var. *tristis* (Aiton) Griggs – FNA, K, Pa]

\* *Salix xpendulina* Wenderoth [*S. babylonica* × *euxina*], Weeping Willow. Disturbed areas; a hybrid introduced from Europe. March-April. [= FNA, K; < *S. babylonica* complex – Pa]

\* *Salix pentandra* Linnaeus, Bay Willow. Disturbed areas, perhaps not established; native of Eurasia. April. [= C, F, FNA, G, K, Pa, Z]

*Salix petiolaris* Sm., Meadow Willow. {research} [= Pa]



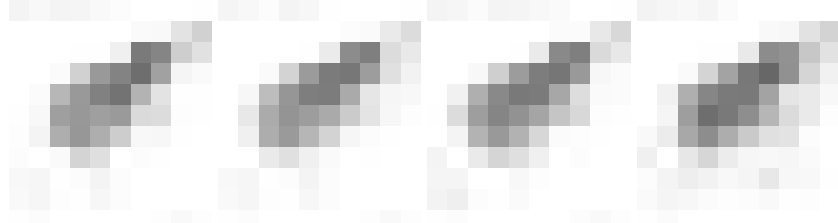
\* *Salix purpurea* Linnaeus, Basket Willow, Purple Willow, Purple Osier. Disturbed areas; native of Europe. April. [= RAB, C, F, FNA, G, K, Pa, S, WV, Z]

\* *Salix xrubens* Schrank (pro sp.) [*S. alba* × *fragilis*]. Scattered localities in NC, KY, VA, MD, NJ... {research} [= Pa]

\* *Salix xsepulcralis* Simonkai [*S. alba* × *babylonica*], Weeping Willow. Disturbed areas; a hybrid introduced from Europe. March-April. [= FNA, K; < *S. babylonica* complex – Pa]

*Salix sericea* Marshall, Silky Willow. Bogs, peaty swamps, banks of small streams. March-April. *S. sericea* is a northeastern species, ranging south to w. NC, ne. GA, e. TN, sc. TN, AL, and AR. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV, Z]

\* *Salix triandra* Linnaeus, Almond-leaf Willow. {habitats}; {investigate} [= FNA] {not yet keyed}



## 202. VIOLACEAE Batsch 1802 (Violet Family) [in MALPIGHIALES]

A family of about 20 genera and 900 species, herbs, shrubs, and vines, cosmopolitan in distribution. References: McKinney & Russell (2002)=X.

- 1 Plants caulescent, 3-10 dm tall, the leaves narrowly cuneate to a petiole 0-20 mm long, also long acuminate; petals green ..... *Hybanthus*
- 1 Plants acaulescent or caulescent, 0-4 dm tall, if caulescent, the leaves not at the same time cuneate, short-petiolate, and acuminate; petals white, yellow, violet, or blue, the lowermost spurred ..... *Viola*

### *Hybanthus* Jacquin (Green-violet)

A genus of about 70-150 species, shrubs and herbs, of tropical and warm temperate regions of the Old and New Worlds. Likely to be split in the near future, *H. concolor* retained in a much smaller genus *Hybanthus*, with only 2-3 species, and *H. parviflorus* to be placed in the moderately large genus *Pombalia* Vandelli (H.E. Ballard, pers. comm.). References: McKinney & Russell (2002)=X; Wofford et al. (2004).

- 1 Leaves 9-17 cm long, entire (or with a few obscure teeth); capsule 15-20 mm long; seeds ca. 4 mm long; [native, of nutrient-rich forests]..... *H. concolor*



- 1 Leaves 0.6-3 cm long, finely crenate; capsule 3-4 mm long; seeds ca. 1.5 mm long; [alien, of weedy areas] ..... *H. parviflorus*

***Hybanthus concolor*** (T.F. Forster) Sprengel, Green-violet. Very nutrient-rich and mesic forests. Cleistogamous flowers: April-early May; late May-June. Chasmogamous flowers: Late May-June; August-October. VT and s. ON west to MI and KS, south to SC, GA, and AR. [= RAB, C, F, G, K, Pa, W, WV, X; = *Cubelium concolor* (T.F. Forster) Rafinesque ex Britton & A. Brown – S]

\* ***Hybanthus parviflorus*** (Mutis ex Linnaeus f.) Baillon. Disturbed area; native of South America. April. First collected in North America in New Jersey in the 19<sup>th</sup> century; and again in 1998 by Tom Govus at Fort Pulaski National Monument (Chatham County, GA); it is unclear whether this is a recent introduction or an old weed introduced via ship's ballast (Wofford et al. 2004). [= *Pombalia*]

***Viola*** Linnaeus 1753 (Violet, Johnny-jump-up, Pansy)  
(contributed by B.A. Sorrie and A.S. Weakley)

A genus of about 525-600 species, herbs (rarely shrubs), of temperate regions of the Old and New Worlds. References: Ballard (1992)=Z; Ballard (1994); Gil-ad (1998)=Y; McKinney & Russell (2002)=X; Haines (2001)=V; McKinney (1992); Ballard & Wujek (1994); Russell (1955); Ballard, Sytsma, & Kowal (1999); GW. Key adapted, in part, from Ballard (1992) and Ballard & Wujek (1994).

**Identification notes:** *Viola* has presented numerous problems in taxonomy, distribution, and identification. Particularly troublesome are the so-called “acaulescent blue violets”, including *V. sororia*, *V. sagittata*, *V. palmata*, *V. septemloba*, etc. They may be difficult to identify due to morphological overlap, or trying to key plants without mature leaves; in some instances hybridization may be suspect. Leaf maturity is an important feature to recognize—the earliest 1-2 leaves produced in most of these taxa are generally ovate-cordate in outline and may not display characteristic lobing, toothing, or pubescence until more mature leaves are produced, 1-2 weeks later. Specimens thus collected early in the flowering period can present the botanist with a perplexing series of plants that do not key cleanly. A second troublesome group contains the small white violets, including *V. blanda*, *V. incognita*, and *V. macloskeyi*. These taxa have been dealt with in various ways, but resist a wholly satisfactory treatment, due to apparent hybridization (Russell, 1954, Amer. J. Bot. 41: 679-85; Russell, 1955, Amer. Midl. Nat. 54: 481-94). However, recent reviews of these 3 species in the Southeast show that *V. blanda* and *V. macloskeyi* are quite distinct, with *V. incognita* less so (but this may be due to paucity of specimens from the area). A third difficult group contains *V. appalachensis*, *V. conspersa/labrodorica*, and *V. walteri*. They have been treated recently by Ballard (1992, 1994) and McKinney & Russell (2002). Despite the problems present in the genus, the great majority of plants encountered in the field may be successfully keyed out, particularly by botanists working within an area of several counties. Violet species are usually quite faithful to one or a few plant community types, so once learned these habitats can be valuable indicators as to which species to expect. Botanists working in larger regions (state, floristic province), however, must be aware of increased morphological variation and potential hybridization. The works of McKinney & Russell and Ballard provide the most satisfactory understanding of taxa and are followed here, with exceptions based on field and herbarium studies throughout the Southeastern United States. All species possess brownish or reddish nectar guide striae in the corolla throat; these are ignored in the key. Hairs of the corolla throat and on leaf surfaces are important key characters; several plants should be inspected with a 10× lens before deciding the character state.

- 1 Plant caulescent (producing aerial stems bearing leaves and flowers).
  - 2 Corolla yellow, or white with a yellow center (sometimes drying lavender); stipules entire or erose ..... **Key A**
  - 2 Corolla wholly cream-colored, or cream with a yellow center, or blue-violet, or multicolored (blue or violet with orange or yellow); stipules fringed or deeply lobed..... **Key B**
- 1 Plant acaulescent (with leaf petioles and flower stalks arising separately from the base of the plant).
  - 3 Plant producing stolons; corolla white (or blue in *V. odorata*) ..... **Key C**
  - 3 Plant not producing stolons; corolla blue-violet (or yellow in *V. rotundifolia*)..... **Key D**

**Key A – Caulescent Violets with yellow or white flowers**

- 1 Corolla white with a yellow center (sometimes drying lavender); stipules long-triangular, attenuate..... *V. canadensis* var. *canadensis*
- 1 Corolla solid yellow; stipules ovate to narrowly ovate.
  - 2 Leaf blades deeply 3-lobed..... *V. tripartita*
  - 2 Leaf blades cordate or hastate.
    - 3 Leaves at least as wide as long.
      - 4 Stems 2-several; basal leaves 4 or more; foliage glabrous to glabrate; [widespread in our region] ..... *V. pensylvanica*
      - 4 Stems 1; basal leaves 0-2; foliage densely pubescent; [montane in our region]..... *V. pubescens*
    - 3 Leaves distinctly longer than wide.
      - 5 Leaf blade hastate; base of leaf strongly cordate ..... *V. hastata*
      - 5 Leaf blade narrowly ovate; base of leaf blade rounded to broadly cuneate..... *V. tripartita*

**Key B – Caulescent Violets with blue, cream, or multicolored flowers**

- 1 Stipules foliaceous, deeply lobed (the lobes narrow, but not ciliate or fringed; leaves cuneate at base; plants annual, without thickish rootstock; [of weedy habitats]).
  - 2 Corolla pale blue with a cream center; petals 2× as long as the sepals ..... *V. bicolor*
  - 2 Corolla either cream with a yellow center or multicolored; petals < 2× as long as the sepals.
    - 3 Corolla cream with a yellow center; petals shorter than the sepals or longer by up to 2 mm ..... *V. arvensis*
    - 3 Corolla multicolored (cream to orange with a yellow center, the upper petals at least partly dark blue); petals longer than the sepals by 2 mm or more ..... *V. tricolor*

- 1 Stipules herbaceous, fringed or ciliate along the margin; leaves truncate or cordate at the base; plants perennial, with thickish rootstock; [mainly of natural habitats]; [section *Viola*].
- 4 Stems immediately becoming prostrate at time of flowering; stems persistent through winter, rooting at the nodes, and generating the following year's plants at their tips (plants thus mat-forming).
  - 5 Leaf blades with scattered hairs near the margin only; petioles, peduncles and stems glabrous; stipules shallowly lacerate, with marginal processes < ¼ as long as the stipule ..... *V. walteri* var. *appalachiensis*
  - 5 Leaf blades moderately to densely puberulent over the entire surface; petioles, peduncles and stems moderately to densely puberulent; stipules deeply lacinate with marginal processes > ½ as long as the stipule ..... *V. walteri* var. *walteri*
- 4 Stems ascending to erect at time of flowering and fruiting; stems deciduous at end of growing season, not rooting at nodes (plants thus solitary).
  - 6 Corolla wholly cream-colored ..... *V. striata*
  - 6 Corolla blue or blue-violet.
    - 7 Spur of basal petal 4-6 mm long; lateral petals bearded within; corolla uniformly blue ..... *V. labradorica*
    - 7 Spur of basal petal 10-15 mm long; lateral petals beardless; corolla lavender, with a purple-black eyespot surrounding the throat ..... *V. rostrata*

#### Key C – Acaulescent Violets with stolons and white (or rarely blue) flowers

- 1 Flowers generally blue (sometimes white or blue-and-white variegated); style terminating in a slender hook ca. 1 mm long; capsules hirtellous; [introduced, cultivated, rarely persistent or spreading] ..... *V. odorata*
- 1 Flowers white; style broad at the tip, in most species resembling a scoop; capsules glabrous; [native].
  - 2 Leaf blades > 1.5× as long as broad.
    - 3 Leaf blades lance-ovate, broadly cuneate to subtruncate at the base ..... *V. primulifolia*
    - 3 Leaf blades linear to lanceolate, narrowly cuneate at the base.
      - 4 Leaf blades lanceolate, < 8× as long as wide; plant glabrous ..... *V. lanceolata* var. *lanceolata*
      - 4 Leaf blades linear or narrowly lanceolate, > 10× as long as wide; plant glabrous to pubescent ..... *V. lanceolata* var. *vitata*
  - 2 Leaf blades < 1.5× as long as broad.
    - 5 Leaf blades completely glabrous (petioles may be villous); [of wet, acidic seepage or swampy woods, often with *Sphagnum*] ..... *V. macloskeyi* var. *pallens*
    - 5 Leaf blades pubescent, at least on the upper surface of the basal lobes; [of wet to more mesic situations].
      - 6 Lateral petals glabrous within; petioles and peduncles usually reddish-tinged; leaf apex acute; basal lobes of the leaf often overlapping; pubescence of the upper leaf surface often restricted to the basal lobes; [of mesic, often nutrient-rich forests] ..... *V. blanda*
      - 6 Lateral petals bearded within; petioles and peduncles green; leaf apex obtuse to rounded; basal lobes of the leaf not overlapping; pubescence of the upper leaf surface usually widespread; [of mesic to wet situations] ..... *V. incognita*

#### Key D – Acaulescent Violets without stolons, with blue-violet or yellow flowers

- 1 Corollas yellow; leaf blades rotund, lie nearly flat on ground ..... *V. rotundifolia*
- 1 Corollas violet to bluish or purple, leaves various (flat on ground only in some *V. villosa* and *V. hirsutula*).
  - 2 Leaf blades deeply divided throughout, or lobed basally, or deeply toothed basally (beware that in *V. pedata* the earliest 1-2 leaves may be uncut and cordate!, to shallowly lobed).
    - 3 Blades **either** divided, lobed, or deeply toothed only on basal portion, **or** blades incised only in distal half.
      - 4 Orange stamens conspicuously exsert and beak-like; blades incised only in distal half or only apically ..... *V. pedata* var. *1*
      - 4 Stamens not visible, not exsert; blades divided, lobed, or deeply toothed only on basal portion.
        - 5 Blade outline oblong-lanceolate to ovate-triangular, much longer than wide.
          - 6 Petioles distinctly shorter than blades; blades densely pubescent, apex blunt, basal teeth undeveloped or with a few coarse teeth on mature leaves ..... *V. sagittata* var. *ovata*
          - 6 Petioles equal or longer than blades; blades glabrous or glabrate, apex acute; basal teeth well developed, very coarse to lobe-like ..... *V. sagittata* var. *sagittata*
        - 5 Blade outline ovate to subrotund, about as wide as long.
          - 7 Plant moderately to densely pubescent, at least on petioles and undersurface of leaves; mature leaves trilobed; [of mesic to dryish woods] ..... *V. palmata*
          - 7 Plant glabrous or glabrate (hairs on leaf margins or atop lobes).
            - 8 Mature leaves trilobed, with 1 (-2) reniform or obovate lobes on each side; spurred petal glabrous; [of small blackwater streamsides and floodplains] ..... *V. esculenta*
            - 8 Mature leaves deeply lobed with 2-3 lanceolate lobes on each side; spurred petal bearded; [of mesic to moist pine savannas and pocosin ecotones] ..... *V. septemloba*
    - 3 Blades deeply divided throughout into linear or lanceolate segments (or with several narrow lateral segments and a broadly lanceolate central segment), blades about as broad as long, or broader.
      - 9 Lateral petals glabrous within; orange stamens conspicuously exsert and beak-like ..... *V. pedata* var. *pedata*
      - 9 Lateral petals bearded; stamens not visible, not exsert.
        - 10 Central lobe of leaf blade mostly 1-2.5× the width of the first lateral lobes.
          - 11 Blades pubescent, divisions mostly 7-11; [midwestern, disjunct to shale barrens of western VA] ..... *V. pedatifida*
          - 11 Blades glabrous or glabrate, divisions 5-11; [**either** of limestone glades **or** of Coastal Plain woodlands].
            - 12 Blade divisions 7-11; [of Coastal Plain, moist to mesic hardwoods along rivers or streams] ..... *V. brittoniana*
            - 12 Blade divisions 5-9; [of inland regions, dry limestone glades or barrens] ..... [*V. egglestonii*]
        - 10 Central lobe of leaf blade mostly 3-4× the width of the first lateral lobes.
          - 13 All leaves homophyllous, the early ones not ovate, rotund, or cordate; blades pubescent; [of Piedmont and Mountains] .....

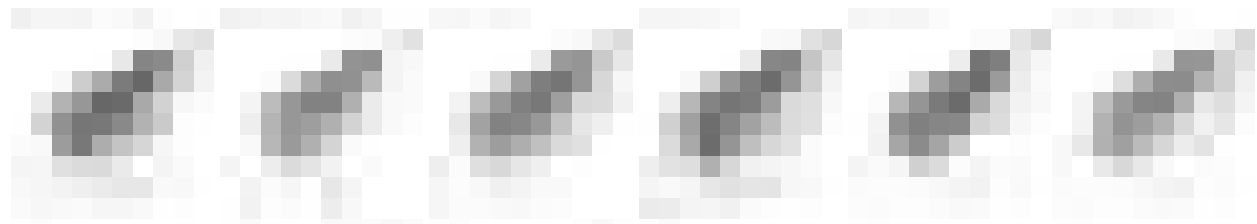
- ..... *V. subsinuata*
- 13 Leaves heterophyllous, the early ones ovate, rotund, or cordate, the mature ones divided; blades pubescent or glabrate; [of various distributions].
- 14 Blades and petioles moderately to densely pubescent; lowermost lobe directed outward parallel to ground; [primarily of mesic hardwoods, widespread]..... *V. palmata*
- 14 Blades glabrous or glabrate; lowermost (outermost) lobe on each half of blade usually directed downward toward ground; [primarily of pine savannas on Coastal Plain]..... *V. septemloba*
- 2 Leaf blades merely serrate or crenate on margin; ovate to subrotund in outline, cordate or truncate basally.
- 15 Most or all blades longer than broad, narrowly ovate to long-triangular, tapering to an acute apex.
- 16 Blades and petioles moderately to densely pubescent; leaves distinctly longer than wide; dry to xeric clearings and banks..... *V. sagittata* var. *ovata*
- 16 Blades and petioles glabrous or glabrate.
- 17 Lateral petals bearded with clavate hairs; spurred petal glabrous within; [of swamps, seepages, bogs, and sphagnum streambanks]..... *V. cucullata*
- 17 Lateral petals with hairs of essentially uniform width; spurred petal bearded within.
- 18 All leaf teeth uniform; leaf bases cordate; [of mesic woods to moist seepages to streambanks]..... *V. sororia* var. *missouriensis*
- 18 Basal teeth longer than others; leaf bases truncate to subcordate (ignore earliest 1-2 leaves).
- 19 Leaf outline broadly triangular, not much longer than wide; basal teeth of the leaf numerous, ± pectinate..... *V. brittoniana*
- 19 Leaf outline narrowly ovate-triangular, much longer than wide; basal teeth of the leaf few, very coarse..... *V. sagittata* var. *sagittata*
- 15 Blades as wide as long or wider, ovate to suborbicular, apex obtuse (to acute).
- 20 Lateral petals bearded with clavate hairs; foliage glabrous or glabrate.
- 21 Petals light blue or light blue-violet, with a dark eye (also with dark veins); sepals 8-12 mm long; no plants in population with lobed blades; [mostly Piedmont and Mountains, rare in Coastal Plain]..... *V. cucullata*
- 21 Petals blue-violet with a white eye (also with dark veins); sepals 6-7(-8) mm long; at least some plants in population with trilobed leaves; [mostly Coastal Plain, inhabiting small blackwater floodplains and streambanks]..... *V. esculenta*
- 20 Lateral petals bearded with hairs of uniform width; foliage distinctly pubescent, glabrate, or glabrous.
- 22 Leaf blades moderately to densely pubescent on one surface or both, and on petioles.
- 23 Leaf blades equally pubescent on both surfaces.
- 24 Leaf blades large, apex acute, carried aloft on long petioles, deciduous; peduncles shorter than to equaling petioles..... *V. sororia* var. *sororia*
- 24 Leaf blades small, apex very blunt or rounded, lie almost flat on ground; evergreen or tardily deciduous; peduncles much longer than petioles..... *V. villosa*
- 23 Leaf blades much more pubescent on one surface than the other.
- 25 Leaf blades densely pubescent above, sparsely so beneath and on petiole; apex blunt to rounded; in life dark veins prominent on pale upper surface of blade..... *V. hirsutula*
- 25 Leaf blades hairy beneath and on petiole, glabrate above; apex acute; veins same shade as blade surface..... *V. septentrionalis*
- 22 Leaf blades glabrous or glabrate, or with hairs confined to just the basal lobes; petioles glabrous or glabrate.
- 26 Leaf blades with obvious area of hairs confined to upper surface of basal lobes; spurred petal bearded; no plants in population with lobed leaves..... *V. sororia* var. *missouriensis*
- 26 Leaf blades glabrous or glabrate.
- 27 At least some plants in population with trilobed leaves; [southern and mainly Coastal Plain, of small blackwater streambanks and floodplains]..... *V. esculenta*
- 27 No plants with lobed leaves; spurred petal glabrous or glabrate, or densely bearded; [collectively widespread].
- 28 Spurred petal densely bearded; leaf blades reniform; [northern, ranging south to PA and WV, of fens and swamps in alkaline soils]..... *V. nephrophylla*
- 28 Spurred petal glabrous or glabrate; leaf blades ovate to widely triangular; [widespread, of mesic slopes to moist floodplains]..... *V. sororia* var. *sororia*

\* *Viola arvensis* Murray, European Field-pansy. Roadsides, fields; native of Europe. March-July. [= RAB, C, F, G, K1, K2, Pa, S, W, WV, X]

*Viola bicolor* Pursh, Wild Pansy. Pastures, roadsides, lawns, other disturbed habitats. March-May. MA and NY west to SD and CO, south to Panhandle FL, TX, and AZ. [= K1, K2, Pa, X; = *V. rafinesquii* Greene – RAB, C, G, S, W, WV; = *V. kitaibeliana* J.A. Schultes var. *rafinesquii* (Greene) Fernald – F; = *V. rafinesquii*, orthographic variant]

*Viola blanda* Willdenow, Sweet White Violet. Moist, rich forests. NH and QC west to MN and ne. ND, south to DE, MD, w. NC, n. GA, e. TN, OH, IN, IL, and e. IA. [= F, G, S, WV; < *V. blanda* – RAB, C, Pa, W, X (also see *V. incognita*); = *V. blanda* var. *blanda* – K1, K2, V]

*Viola brittoniana* Pollard. Low ground, including brackish areas. April-May. MA to SC, along the coast. [= Pa, V, Y; > *V. brittoniana* Pollard var. *brittoniana* – RAB, G, K1, K2; > *V. brittoniana* Pollard var. *pectinata* (Bicknell) Alexander – RAB, G, K1, K2; < *V. palmata* var. *palmata* – C; > *V. brittoniana* – F; > *V. pectinata* Bicknell – F; = *V. pedatifida* G. Don ssp. *brittoniana* (Pollard) McKinney – X; = *V. brittoniana* – V, Y]



*Viola canadensis* Linnaeus var. *canadensis*, Tall White Violet. Rich cove forests, other rich mesic situations, such as floodplains. April-July. NL (Newfoundland) to ON, south to GA, AL, TN, and AR. Other varieties are more western. [= RAB, C, K1, K2, 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* – Pa, W, X]


*Viola cucullata* Aiton, Blue Marsh Violet, Bog Violet. Bogs, seeps, margins of spring branches. April-June. NL (Newfoundland) west to MN, south to SC, GA, AL, MS, and MO. [= RAB, C, G, GW, K1, K2, Pa, S, V, W, X, Y; > *V. cucullata* var. *cucullata* – F; > *V. cucullata* – WV; > *V. obliqua* Hill]

*Viola egglestonii* Brainerd. Calcareous barrens. In c. and se. TN (Chester, Wofford, & Kral 1997), nw. GA (Jones & Coile 1988), IN, KY, and AL (Kartesz 1999). [= K1, K2, Y; < *V. palmata* var. *pedatifida* – C; = *V. egglestonii* – F, G, orthographic variant; = *V. septemloba* LeConte ssp. *egglestonii* (Brainerd) L.E. McKinney – X]

*Viola esculenta* Elliott ex Greene. Small blackwater streamsides and floodplains. Se. VA south to n. peninsular FL, west to e. TX. [= F, G, GW, S; < *V. septemloba* – RAB; < *V. palmata* var. *palmata* – C; = *V. ×esculenta* Elliott ex Greene (pro sp.) (*septemloba* × *triloba*) – K1, K2; = *V. palmata* Linnaeus var. *esculenta* Elliott ex D.B. Ward]

*Viola hastata* Michaux, Spearleaf Violet, Silverleaf Violet, Halberd-leaf Violet. Acidic coves, dry-mesic oak forests, bluff forests. Late March-May. PA and OH south to GA, Panhandle FL, and AL. [= RAB, C, F, G, K1, K2, Pa, S, W, WV, X]

*Viola hirsutula* Brainerd. Bottomlands and moist slopes. CT, NY, PA, OH, and s. IN, south to Panhandle FL, AL, and MS. [= RAB, F, G, K1, K2, Pa, S, W, V, WV, X; < *V. villosa* Walter – C]



*Viola incognita* Brainerd. Moist to wet forests. April-June. NL (Labrador) to MN, south to DE, PA, and WI, and in the Appalachians south to w. NC. [= S, WV; < *V. blanda* – RAB, C, Pa, X; > *V. incognita* var. *incognita* – F, G; > *V. incognita* var. *forbesii* Brainerd – F, G; = *V. blanda* Willdenow var. *palustriformis* A. Gray – K1, K2, V]

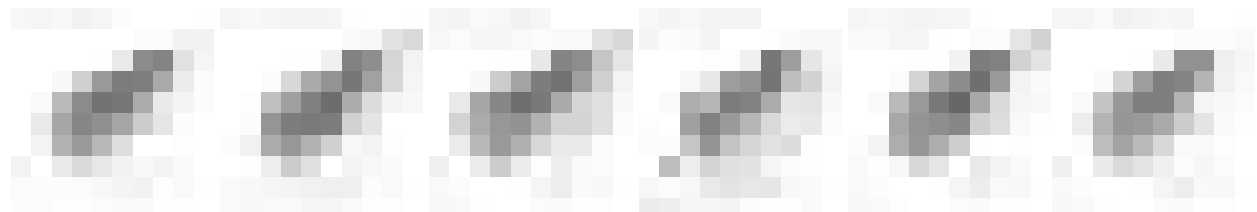
*Viola labradorica* Schrank, American Dog-violet. Moist alluvial woodlands and forests, seepage slopes, marl ravines, hammocks. Late March-May. NL (Labrador) west to AK, south to e. VA, nw. SC, n. GA, c. AL, and OH; disjunct in sw. GA and Panhandle FL. Ballard (1992) concluded that *V. conspersa* was not distinct from *V. labradorica*. [= K1, K2, Pa, V, X, Z; > *V. conspersa* Reichenbach – RAB, C, F, G, GW, S, W, WV]

*Viola lanceolata* Linnaeus var. *lanceolata*, Lanceleaf Violet. Wet habitats. March-May. NB west to MN, south to FL and e. TX. [= C, F, Pa, V; < *V. lanceolata* – RAB, W, X; = *V. lanceolata* ssp. *lanceolata* – GW, K1, K2; = *V. lanceolata* – G, S, WV]

*Viola lanceolata* Linnaeus var. *vittata* (Greene) Weatherby & Griscom, Strap-leaf Violet. Wet pinmelands, depressions ponds, other wetlands. February-May. Se. VA south to FL, west to e. TX. [= C, F, V; < *V. lanceolata* – RAB, W, X; = *V. lanceolata* ssp. *vittata* (Greene) Russell – GW, K1, K2; = *V. vittata* Greene – G, S]

*Viola macloskeyi* F. Lloyd var. *pallens* (Banks ex A.P. de Candolle) C.L. Hitchcock, Wild White Violet. Brookbanks, seepages. NL (Labrador) west to NT, south to GA, AL, MS, MO, SD, CO, UT, NV, and CA. Perhaps better recognized at the specific level, as *V. pallens*, which seems distinct from the narrowly distributed *V. macloskeyi*, of CA, OR and e. NV. Ballard et al. (2001) suggest that Hispaniolan *V. domingensis* Urban is conspecific with *V. macloskeyi sensu lato*. [= RAB, C; = *V. pallens* (Banks ex A.P. de Candolle) Brainerd – F, G, GW, S, WV; > *V. pallens* var. *pallens* – G; > *V. pallens* var. *subreptans* Rousseaux – G; = *V. macloskeyi* ssp. *pallens* (Banks ex A.P. de Candolle) M.S. Baker – K, Pa, V, W; < *V. macloskeyi* F. Lloyd – X]

*Viola nephrophylla* Greene, Northern Bog Violet. Bogs. May. NL (Newfoundland) and YT south to PA, WV, IN, IL, LA, TX, and CA. [= C, F, G, K, V, WV] {add to synonymy}



\* *Viola odorata* Linnaeus, Sweet Violet, English Violet. Gardens, lawns, disturbed places, persistent or weakly spreading from horticultural use; native of Europe. [= C, F, G, K, Pa, S, V, Z]

*Viola palmata* Linnaeus, Wood Violet. Moist forests. ME west to WI, south to FL, AL, MS, and LA. [= Pa, V, X; > *V. palmata* var. *palmata* – RAB, WV; > *V. palmata* var. *triloba* (Schweinitz) Gingins ex A.P. de Candolle – RAB, WV; < *V. palmata* var. *palmata* – C; > *V. triloba* Schweinitz var. *triloba* – F, G, K; > *V. stoneana* – F, G; >> *V. palmata* – F, G, S, W, in the narrow sense; > *V. chalcosperma* Brainerd – F, S; < *V. palmata* Linnaeus (pro sp.) – K; ? *V. triloba* Schweinitz – S, W]

*Viola pedata* Linnaeus var. *pedata*, Bird's-foot Violet. Dry rocky or sandy forests, woodlands, glades, and roadbanks. March-May; May-June. NH, NY, MI, WI, MN, and ND south to s. GA, s. AL, s. MS, s. LA, and e. TX. [= *V. pedata* – C, Pa, W; < *V. pedata* – RAB, K, S, V; > *V. pedata* var. *pedata* – F, G, WV; > *V. pedata* var. *lineariloba* A.P. de Candolle – F, G, WV; = *V. pedata* var. *pedata* – X; > *V. pedata* var. *ranunculifolia* (Jussieu ex Poiret) Ging. ex A.P. de Candolle – X]

*Viola pedata* Linnaeus var. *I*, Sandhills Bird's-foot Violet. Sandhills. {distribution} [= *V. pedata* var. *ranunculifolia* (Jussieu ex Poiret) Ging. ex A.P. de Candolle – X, probably misapplied; < *V. pedata* – RAB, K, S, V]]

*Viola pedatifida* G. Don, Crowfoot Violet. Shale barrens. April-May. ON west to AB, south to OH, IN, AR, OK, NM, and AZ; disjunct in w. VA. [= F, G, K; = *V. palmata* Linnaeus var. *pedatifida* (G. Don) Cronquist – C; = *V. pedatifida* G. Don ssp. *pedatifida* – X]



*Viola pensylvanica* Michaux, Smooth Yellow Forest Violet. Mt (AL, GA, KY, MD, NC, SC, TN, VA, WV), Pd (DE, MD, NC, SC, VA), Cp (DE, NC, SC, VA): mesic forests; common (rare in DE Coastal Plain). March-May. QC west to MB south to DE, MD, w. NC, GA, AL, AR, and OK. [= WV; = *Viola pubescens* Aiton var. *scabriuscula* Schweinitz ex Torrey – K, Pa, V, X; = *V. eriocarpa* (Nuttall) Schweinitz var. *leiocarpa* Fernald & Wiegand – RAB; < *V. pubescens* – C, GW, W; > *V. pensylvanica* Michaux var. *pensylvanica* – F; > *V. pensylvanica* var. *leiocarpa* (Fernald & Wiegand) Fernald – F; = *V. eriocarpa* – G, S; = *V. eriocarpa* (Nuttall) Schweinitz var. *leiocarpon* Fernald & Wiegand; > *V. pubescens* Aiton var. *leiocarpon* (Fernald & Wiegand) Seymour]

*Viola primulifolia* Linnaeus, Primrose-leaf Violet. Bogs, wet savannas, pocosins, moist organic soils along small streams. March-May. NL (Newfoundland) to ON, south to FL, and west to TX and se. OK. [= RAB, C, GW, Pa, S, V, W, WV, X; > *V. primulifolia* var. *primulifolia* – F, G; > *V. primulifolia* var. *acuta* (Bigelow) Torrey & A. Gray – F; > *V. primulifolia* var. *villosa* Eaton – F, G; = *V. primulifolia* Linnaeus (pro sp.) (*lanceolata* × *macloskeyi*) – K]

*Viola pubescens* Aiton, Hairy Yellow Forest Violet. Mt (MD, NC, TN, VA, WV), Pd (DE, MD), Cp (DE): rich deciduous forests; common in WV Mountains, common in DE Piedmont (rare in DE Coastal Plain). March-May. ME and s. QC west to SD, south to DE, NC, TN, MO, and NE. [= G, S, WV; = *V. pubescens* var. *pubescens* – K, Pa, 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. eriocarpa* (Nuttall) Schweinitz var. *eriocarpon*]

*Viola rostrata* Pursh, Long-spurred Violet. Mesic forests, often under *Tsuga canadensis*. April-May. NH and QC west to WI, south to GA and AL. [= RAB, F, G, K, Pa, S, V, W, WV, X, Z]

*Viola rotundifolia* Michaux, Round-leaf Yellow Violet, Early Yellow Violet. Rich coves. March-April. ME to s. ON, south to w. NC, n. GA, and e. TN. [= RAB, C, F, G, K, Pa, S, V, W, WV, X]



*Viola sagittata* Aiton var. *ovata* (Nuttall) Torrey & A. Gray. Dry soils, glades, prairies. April. NS west to MN, south to n. FL, AL, LA, and OK. [= K, Pa, V, X; = *V. fimbriatula* J.E. Smith – RAB, F, G, S, W, WV, Y; < *V. sagittata* Aiton – C]

*Viola sagittata* Aiton var. *sagittata*, Arrowhead Violet. Dry to moist forests and woodlands. April. MA west to MN, south to Ga and e. TX. [= K, Pa, V, X; = *V. sagittata* – RAB, F, S, W, WV, Y; > *V. emarginata* (Nuttall) Le Conte var. *emarginata* – RAB, F, G; > *V. emarginata* var. *acutiloba* Brainerd – RAB, F, G; < *V. sagittata* – C (also see *V. fimbriatula*); ? *V. emarginata* – S]

*Viola septemloba* Le Conte. Sandy pinelands. Late March-early May. E. NC south to s. FL, west to LA, mainly on the Coastal Plain. [= F, G, GW, K, S, W, Y; < *V. septemloba* – RAB (also see *V. esculenta*); < *V. palmata* var. *palmata* – C; ? *V. septemloba* ssp. *septemloba* – X]

*Viola septentrionalis* Greene. Moist woods, moist thickets. NL (Newfoundland) to BC south to PA, w. NC (P. McMillan, pers. comm.), e. TN (Chester, Wofford, & Kral 1997), MI, WI, MT, and WA. [= G, K, W, WV, Y; < *V. sororia* – C, V; ? *V. septentrionalis* var. *septentrionalis* – F; < *V. sororia* var. *sororia* – X; = *V. sororia* Willdenow var. *septentrionalis* (Greene) XXX {comb. nov.}]

*Viola sororia* Willdenow var. *missouriensis* (Greene) L.E. McKinney, Thinleaf Violet, LeConte's Violet. Swamp forests, wet bottomlands. March-May. ME west to se. MN, south to Panhandle FL and e. TX. Var. *sororia* and var. *missouriensis* are

not yet satisfactorily understood. The extremes of these varieties (var. *missouriensis* with blades distinctly longer than wide, and glabrate; var. *sororia* with blades wider than long or equally as wide as long, and pubescent) are readily identified. However, too many specimens still cannot be readily keyed. [= X; = *V. affinis* Le Conte – RAB, F, G, GW, Pa, S, V, W, WV; < *V. sororia* – C; > *V. affinis* Le Conte – K, Y; > *V. missouriensis* Greene – K, Y]

*Viola sororia* Willdenow var. *sororia*, Dooryard Violet, Confederate Violet, Common Blue Violet. Bottomlands, lawns, moist forests. February-May. NL (Newfoundland) west to MB, south to s. FL and TX. [= *V. sororia* – W, Y; > *V. palmata* var. *sororia* (Willdenow) Pollard – RAB; > *V. papilionacea* Pursh – RAB, F, S, WV; < *V. sororia* – C, V (also see *V. affinis*, *V. septentrionalis*); > *V. sororia* – F, G, K, Pa, 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]

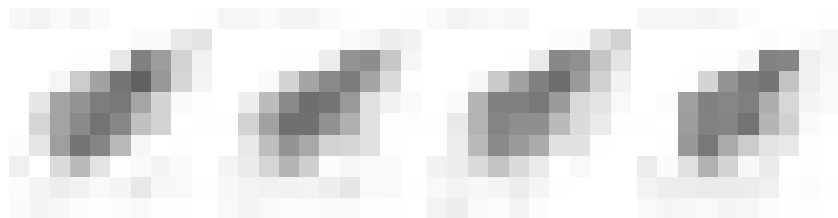


*Viola striata* Aiton, Creamy Violet. Mesic forests and woodlands, disturbed areas. March-June. MA west to WI, south to GA, AR, and e. OK. [= RAB, C, F, G, GW, K, Pa, S, V, W, WV, X, Z]

*Viola subsinuata* Greene. {hábitat}. {distribution} {phenology} [= Pa, V, X; < *V. palmata* var. *palmata* – C; ? *V. triloba* Schweinitz var. *dilatata* (Elliott) Brainerd – F, G, K]

\* *Viola tricolor* Linnaeus, Pansy, Johnny-jump-up. Lawns, garden borders, railroad rights-of-way, commonly cultivated; native of Europe. March-June (and sporadically later). [= RAB, C, F, G, K, Pa, V]

*Viola tripartita* Elliott. Moist slopes and bottomlands, especially over mafic or calcareous rocks. Late March-May. Sw. PA, s. OH south to SC, GA, Panhandle FL, and ne. MS [= C, F, K, WV, X; > *V. tripartita* var. *glaberrima* (A.P. de Candolle) R.M. Harper – RAB, G, Pa, S, W; > *V. tripartita* var. *tripartita* – RAB, G, S, W]



*Viola villosa* Walter, Southern Woolly Violet. Pocosin ecotones, other sites with moist soils. Late February-early April. MD south to n. peninsular FL, west to TX and OK. Reported for VA by Kartesz (1999), on the basis of Massey (1961); report requiring additional documentation. [= RAB, F, G, K, S, X, Y; < *V. villosa* – C (also see *V. hirsutula*)]

*Viola walteri* House var. *appalachensis* (L.K. Henry) L.E. McKinney, Appalachian Violet. Serpentine barrens, rich cove forests (especially old road beds through coves). April-May. PA, MD, and WV south to sw. NC. See Grund & Isaac (2007) and Ballard & Wujek (1994) for discussion of the taxonomy of this species. [= X; = *V. appalachensis* L.K. Henry – K, Pa, WV, Z]

*Viola walteri* House var. *walteri*, Walter's Violet. Nutrient-rich woodlands and forests, especially over mafic or calcareous rocks. March-May. W. VA west to s. OH and AR, south to n. peninsular FL and e. TX. [= X; = *V. walteri* – RAB, F, G, K, S, W, Z]



## 208. LINACEAE A.P. de Candolle ex Gray 1821 (Flax Family) [in MALPIGHIALES]

A family of about 10-14 genera and 250-350 species, trees, vines, shrubs, and herbs, cosmopolitan. References: Robertson (1971)=Y.

### *Linum* Linnaeus 1753 (Flax)

A genus of about 180 species, herbs, of temperate and subtropical areas. References: Rogers (1984)=Z; Rogers (1963)=Y.

- 1 Petals blue, red, or pink; capsule 5-10 mm long; [section *Linum*].
  - 2 Petals red or pink.....*L. grandiflorum*
  - 2 Petals blue.
    - 3 Inner sepals with minutely ciliate margins; stigmas slender, elongate; capsule 6-10 mm long ..... *L. usitatissimum*
    - 3 Inner sepals entire; stigmas capitate; capsule 5-7 mm long.
      - 4 Flowers homostylous (flowers with stigmas at about the level to slightly above the anthers) ..... *L. lewisii* var. *lewisii*
      - 4 Flowers heterostylous (some flowers with stigmas below the anthers, others with stigmas well above the anthers) ..... *L. perenne*
- 1 Petals yellow; capsules 1-4 mm long; [section *Linopsis*].
  - 5 Inner and outer sepals all very conspicuously glandular-toothed; annual; leaves with 2 brownish glands flanking the attachment to the stem; styles united basally for (0.2-) 0.5-1.2 (-1.8) mm; [section *Linopsis*, subsection *Rigida*].
    - 6 Sepals 2.3-3.5 mm long, acute; inflorescence consisting of 1 or more elongate and racemiform branches; dried plants dark, purple-dotted.....*L. harperi*
    - 6 Sepals (3.1-) 3.6-5 (-7.3) mm long, acuminate; inflorescence an open panicle; dried plants pale green ..... *L. sulcatum*
  - 5 Outer sepals entire (very rarely sparsely glandular-toothed), inner sepals entire or sparsely to conspicuously glandular-toothed; perennial; leaves without brownish glands flanking the attachment to the stem; styles free; [section *Linopsis*, subsection *Linopsis*].
    - 7 Fruit as long as broad or longer, its apex acute, apiculate, or obtuse, (2-) 2.2-3.2 (-3.3) mm long; leaves mostly 1.3-4.3 mm wide.
      - 8 Leaves (1.2-) 2.3-4.3 (-5.6) mm wide, mostly 25-50 below the inflorescence; septa of the fruit sparsely but conspicuously ciliate; false septa incomplete; fruit apex acute, the exposed portions purple.....*L. intercursum*
      - 8 Leaves (1.0-) 1.3-2.0 (-3.2) mm wide, mostly 50-120 below the inflorescence; septa of the fruit glabrous; false septa virtually complete; fruit apex rounded to apiculate, the exposed portions purple or yellow.
        - 9 Fruit pyriform, (2.0-) 2.3-2.8 (-3.0) mm long, 1.7-2.6 mm in diameter, the apex rounded, the exposed portions purple; seeds (1.6-) 1.7-2.0 (2.1) mm long; anthers averaging 0.8 mm long..... *L. floridanum* var. *floridanum*
        - 9 Fruit ovate, (2.8-) 3.0-3.2 (-3.3) mm long, 2.5-3.1 mm in diameter, the apex minutely apiculate, the exposed portions yellow; seeds 2.1-2.4 mm long; anthers averaging 1.2 mm long..... *L. floridanum* var. *chrysocarpum*
    - 7 Fruit broader than long, its apex depressed, flattened, or broadly rounded, (1.3-) 1.5-2.1 (-2.3) mm long; leaves mostly 1.9-9.3 mm wide.
      - 10 Margins of the inner sepals with conspicuous stalked glands; mature fruits of dried specimens usually adhering to the plant..... *L. medium* var. *texanum*
      - 10 Margins of the inner sepals glandless, or with a few inconspicuous, sessile glands; mature fruits of dried specimens usually shattering and falling freely.
        - 11 Inflorescence paniculate, the lower inflorescence branches not elongate, their tips not nearly reaching the tips of the upper inflorescence branches; branchlets striate-ridged; leaves mostly opposite (usually to beyond the midpoint from the base of the plant to the first inflorescence branch) ..... *L. striatum*
        - 11 Inflorescence corymbose, some (at least) of the lower branches of the inflorescence elongate, their tips nearly equaling the tips of the upper inflorescence branches; branchlets terete or nearly so; leaves mostly alternate (usually the opposite leaves of the lower stem not extending beyond the midpoint from the base of the plant to the first inflorescence branch).....*L. virginianum*

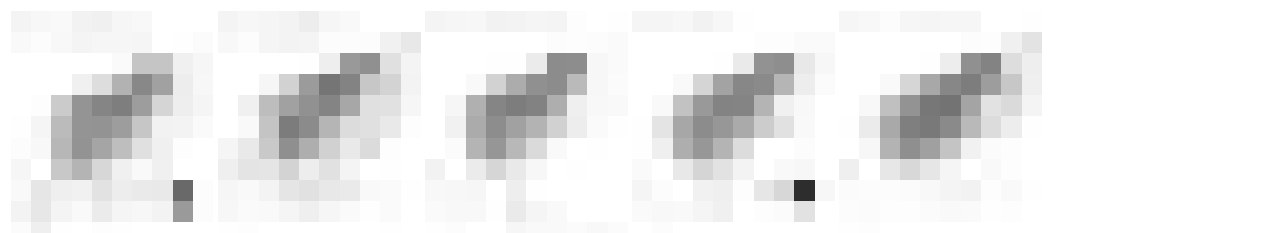
*Linum floridanum* (Planchon) Trelease var. *chrysocarpum* Rogers, Yellow-fruited Yellow Flax. Wet savannas. June-October. Se. NC south to s. FL and west to s. MS. [= K, Y, Z; < *L. virginianum* var. *floridanum* Planchon – RAB; < *L. floridanum* – GW, WH; < *Cathartolinum floridanum* (Planchon) Small – S]

*Linum floridanum* (Planchon) Trelease var. *floridanum*, Florida Yellow Flax. Savannas, sandhill seeps. June-October. E. NC south to s. FL and west to LA, also in the West Indies, essentially limited to the Coastal Plain. [= K, Y, Z; < *L. virginianum* var. *floridanum* Planchon – RAB (also see *L. floridanum* var. *chrysocarpum* and *L. intercursum*); < *L. floridanum* – C, F, G, GW, WH; < *Cathartolinum floridanum* (Planchon) Small – S; > *Cathartolinum macrosepalum* Small – S]

\* *Linum grandiflorum* Desfontaines, Red Flax. Disturbed areas; native of Africa. [= F, K, WH; = *Adenolinum grandiflorum* (Desfontaines) W.A. Weber]

*Linum harperi* Small, Harper's Grooved Flax. Dry pinelands. This is a rare taxon of longleaf pine woodlands or savannas in w. FL, sw. GA, and c. AL. It is probably distinct from *L. sulcatum* at the species level, needing additional study. [= *L. sulcatum* Riddell var. *harperi* (Small) Rogers – K, Y, Z; = *Cathartolinum harperi* (Small) Small – S; < *L. sulcatum* – WH]

*Linum intercursum* Bicknell, Bicknell's Yellow Flax. Dry to moist places. June-October. MA south to c. TN, nw. GA, and c. AL; from MA to MD, nearly restricted to the Coastal Plain, in VA, NC, SC, GA, AL, and se. TN, however it is primarily on the Piedmont and Mountains. It also occurs disjunctively in n. IN near the Great Lakes. [= C, F, G, K, Pa, W, Y, Z; < *L. virginianum* var. *floridanum* (Planchon) – RAB; = *Cathartolinum intercursum* (Bicknell) Small – S]



*Linum lewisii* Pursh var. *lewisii*, Prairie Flax. Calcareous glades and barrens. A western blue-flowered species, ranging from NU west to AK, south to MI, LA, TX, NM, AZ, and CA; disjunct at Smoke Hole Caverns, WV, and several adjacent counties. [= K; < *L. perenne* – C, apparently misapplied to WV material; < *L. lewisii* – F; < *L. perenne* Linnaeus var. *lewisii* (Pursh) Eaton & J. Wright – G; < *Adenolinum lewisii* (Pursh) A. & D. Löve]

*Linum macrocarpum* C.M. Rogers, Spring Hill Flax. Pitcher plant bogs, wet savannas. FL Panhandle west through s. AL and s. MS to se. LA. [= K, WH] {not yet keyed; add synonymy}

*Linum medium* (Planchon) Britton var. *texanum* (Planchon) Fernald, Texas Yellow Flax. Dry to moist places. Var. *texanum* ranges from s. ME, MI, and n. IL south to s. FL and TX, and in the West Indies. Var. *medium* is limited to area around the Great Lakes. [= C, F, GW, K, Pa, W, WH, WV, Y, Z; < *L. virginianum* var. *medium* Planchon – RAB; < *L. medium* – G; < *Cathartolinum medium* (Planchon) Small – S; = *L. medium* ssp. *texanum* (Planchon) A. Haines]

\* *Linum perenne* Linnaeus, Perennial Flax. Disturbed areas; native of Europe. Cultivated and "rarely naturalized along roadsides" in scattered locations in PA (Rhoads & Klein 1993; Rhoads & Block 2007) and reported tentatively for VA (Kartesz 1999). [= K, Pa; < *L. perenne* – C (also see *L. lewisii* var. *lewisii*)]

*Linum striatum* Walter, Ridgestem Yellow Flax. Bogs, seepages, other wet places, often growing in *Sphagnum*. June-October. MA, PA, MI, and IL south to Panhandle FL, LA, and e. TX. [= RAB, C, G, GW, K, Pa, W, WH, Y, Z; > *L. striatum* var. *striatum* – F; = *Cathartolinum striatum* (Walter) Small – S]



*Linum sulcatum* Riddell, Grooved Yellow Flax. Dry calcareous places in the mountains of VA (where also somewhat weedy in adjacent disturbed areas), diabase barrens in the Piedmont of NC. May-August. Primarily a species of the Great Plains of s. MB, ND, and MN south through SD, IA, WI, NE, MO, IL, KS, and MO to OK, *L. sulcatum* occurs farther east as a rare disjunct on glades or barrens over rocks such as limestone or diabase. [= RAB, C, F, G, Pa, W, WV; = *Linum sulcatum* Riddell var. *sulcatum* – K, Y, Z; = *Cathartolinum sulcatum* (Riddell) Small – S; = *Mesynium sulcatum* (Riddell) A. & D. Löve]

\* *Linum usitatissimum* Linnaeus, Common Flax. Disturbed places; native of Europe. This is the flax of commerce, used both for its fiber, the source of flax, and the oil expressed from its seeds (linseed oil). [= RAB, C, F, G, K, Pa, S, WH, WV, Z]

*Linum virginianum* Linnaeus, Virginia Yellow Flax. Dry or moist places. June-October. MA, NY, ON, MI, and IL south to SC, GA, AL, and MO. [= C, F, G, GW, K, Pa, W, WV; = *L. virginianum* var. *virginianum* – RAB; = *Cathartolinum virginianum* (Linnaeus) Reichenbach – S]

*Linum westii* C.M. Rogers, West's Flax. Bogs, margins of flatwoods ponds. Ne. FL; Panhandle FL. [= K, WH] {not yet keyed; add synonymy}

### 213. *PODOSTEMACEAE* Richard ex C. Agardh 1822 (Riverweed Family) [in MALPIGHIALES]

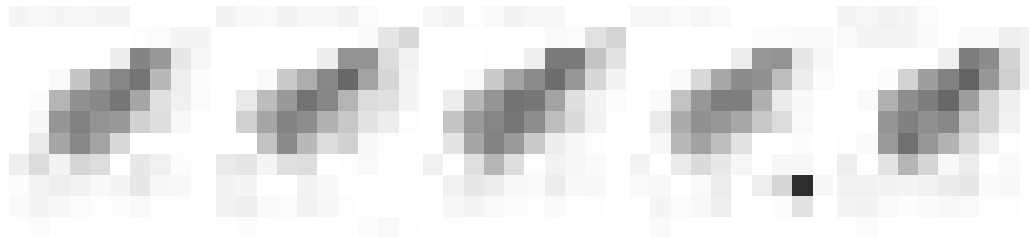
A family of about 47-49 genera and 280 species, aquatic herbs, of tropical, subtropical, and rarely temperate regions of the New World and Old World. References: Graham & Wood (1975); Cook & Rutishauser in Kubitzki, Bayer, & Stevens (2007).

#### *Podostemum* Michaux 1803 (Riverweed)

A genus of about 7-17 species, reduced aquatic herbs, of tropical to temperate America. References: Graham & Wood (1975)=Z; Philbrick & Crow (1983); Cook & Rutishauser in Kubitzki, Bayer, & Stevens (2007).

**Identification notes:** *Podostemum* is a curious plant, seeming more like an alga than a vascular plant in color, texture, mode of attachment to substrate (by a fleshy disk), and irregular thalloid branching.

*Podostemum ceratophyllum* Michaux, Threadfoot, Riverweed. Attached to rocks and dams in rapidly or slowly flowing water. May-July. NS, ME, and QC south to sw. GA, s. AL, s. MS, se. LA (Florida parishes), AR, and w. TN; disjunct in the Ozark-Ouachita Highlands of w. AR and se. OK; Dominican Republic; Honduras. Fehrmann, Philbrick, & Halliburton (2012) demonstrate very low genetic diversity in the populations north of the glacial maximum, in the Ozark-Ouachita Highlands, and in Central America, and high genetic diversity in the portion of the unglaciated southeast east of the Mississippi River. [= RAB, C, F, G, K, Pa, W, WV, Z; = *Podostemum ceratophyllum* – GW, orthographic variant; > *Podostemon ceratophyllum* – S, orthographic variant; > *Podostemon abrotanoides* Nuttall – S]



### 214. *HYPERICACEAE* A.L. de Jussieu 1789 (St. John's-wort Family) [in MALPIGHIALES]



A family of 7-9 genera and 480-560 species, herbs, shrubs, and trees, nearly cosmopolitan. It appears from molecular analysis that recognition of the Hypericaceae may (after all) be warranted. *Hypericum* is in a clade with *Podostemum* and *Bonnetia*, sister to a clade including Clusiaceae s.s. (Savolainen et al. 2000), and unless the morphologically very different Podostemaceae is to be included in a broad Clusiaceae, Hypericaceae and Podostemaceae must be recognized. References: Adams (1973)=Z; Godfrey (1988)=Y; Wood & Adams (1976); Stevens in Kubitzki, Bayer, & Stevens (2007).

***Hypericum* Linnaeus 1753 (St. John's-wort)**

A genus of 370-420 species, trees, shrubs, and herbs, primarily temperate. *Hypericum* in our area is a large, complex, and interesting genus, with a number of unresolved questions remaining. The species treated in Key B have often been treated in the segregate genus *Ascyrum*. Evidence from a variety of disciplines now suggests that they should be included in *Hypericum* (Adams & Robson 1961; Calie, Schilling, & Webb 1983; Robson 1996). References: Sorrie (2012)=U; Adams (1973)=Z; Godfrey (1988)=Y; Robson (1977, 1981, 1990, 1996, 2001, 2002, 2006)=X; Adams (1962)=V; Allison (2011)=Q; Adams (1957); Webb (1980); Robson & Adams (1968); Adams & Robson (1961); Calie, Schilling, & Webb (1983); Culwell (1970); Stevens in Kubitzki, Bayer, & Stevens (2007). Key based in part on Adams (1973), Godfrey (1988), C, and GW.

- 1 Petals pale pink; stamens fascicled, in 3 fascicles of 3 stamens each; staminodia (hypogynous glands) present, alternating with the fascicles of stamens; perianth 5-merous; ["*Triadenum*"]..... **Key H**
- 1 Petals yellow; stamens fascicled or not, if fascicled then not into 3 fascicles of 3 stamens each; staminodia (hypogynous glands) lacking; perianth 4-5-merous.
  - 2 Leaves with an articulation at the very base, this appearing as a narrow line, groove, or abrupt change of color and texture which extends across the petiole; shrub; [section *Myriandra*].
    - 3 Leaves needle-like, 0.5-1.5 (-2) mm wide, the margins essentially parallel (*H. galioides* keyed here and below); [subsection *Centrosperma*]..... **Key A**
    - 3 Leaves, at least the largest on the plant, not needle-like, wider than 2 mm, the margins not parallel, the widest point often beyond the middle.
      - 4 Petals 4; sepals 4 (rarely 2); plant 5-100 cm tall; leaves 2-40 mm long; [subsection *Ascyrum*]..... **Key B**
      - 4 Petals 5; sepals 5; plant 50-250 cm tall; leaves (10-) 20-70 mm long; [subsections *Centrosperma* and *Brathydium*]..... **Key C**
  - 2 Leaves without an articulation at the very base, the petiole merging gradually into the stem with no break, groove, or abrupt change in color or texture; herb, decumbent shrub, or shrub.
    - 6 Leaves ascending or appressed, 1-nerved, < 1 mm wide; inflorescence a compound raceme; annual herbs; [section *Brathys*]..... **Key D**
    - 6 Leaves spreading or ascending, generally multi-nerved, > 1 mm wide; inflorescence a dichasial cyme; herbs or shrubs.
      - 7 Capsule 3 (-4) locular; stamens connate at the base into 3 or 5 fascicles; leaves with black glandular dots as well as translucent glandular dots when backlit (except in *H. perforatum*); sepals and/or petals marked with black glandular dots or lines; perennial herbs; [section *Hypericum*]..... **Key E**
      - 7 Capsule 1-locular; stamens separate or connate at the base, but not grouped into fascicles; leaves with translucent glandular dots, without black glandular dots (when backlit); sepals and petals with translucent glandular lines or dots only, not marked with black glandular dots or lines.
        - 8 Shrubs, decumbent shrubs, or suffruticose herbs; [section *Myriandra*, subsections *Pseudobrathydium* and *Suturosperma*] .... **Key F**
        - 8 Herbs; [section *Trigynobrachys*, and section *Myriandra* subsection *Suturosperma*]..... **Key G**

**Key A – shrubby St. John's-worts with needle-like leaves and flowers with 5 petals and 5 sepals**  
[section *Myriandra*, subsection *Centrosperma*]

**Identification notes:** "Longest leaves" should be sought at branch nodes.

- 1 Longest leaves 5-16 mm.
  - 2 Upper leaf surface convex, merging gradually with revolute margins; leaves oblanceolate to linear-oblanceolate ("oblinear"); [east and west of the Mississippi River in the Coastal Plain]..... *H. galioides*
  - 2 Upper leaf surface plane, abruptly angled to the revolute portion; leaves linear; [east of the Mississippi in the Coastal Plain].
    - 3 Capsules 3-4.5 (-6) mm long; longest leaves 7-16 mm long; corollas 13-17 mm in diameter; seeds reddish-amber or brown, the alveoli not in distinct longitudinal rows, the seed lacking longitudinal ridges except for the two marginal sutures; primary branches with two ridged or winged angles running the length of the internodes, extending from the leaf midribs (but not the margins) at the base of the paired leaves; leaf surface glossy; [of alfisols and ultisols of wet pine savannas, flatwoods, and seepage bogs]..... *H. brachyphyllum*
    - 3 Capsules 6-9 mm long; longest leaves 5-10 (-11); corollas 13-15 mm long; seeds dark red to black, the alveoli in distinct longitudinal rows, with raised ridges often evident between the rows; primary branches with six ridged or winged angles running the length of the internodes, extending from the midribs and margins at the base of the paired leaves; leaf surface dull; [of seasonally dry spodosol pine flatwoods and interdune flats and hollows]..... *H. tenuifolium*
- 1 Longest leaves 13-30 mm.
  - 4 Plant a low shrub, <4 dm tall, more-or-less decumbent, forming dense clumps or patches; flowers 10-12 mm in diameter; inflorescence elongate (flowers at up to 5 nodes); [of dry to mesic soils of the lower Piedmont and inner Coastal Plain from sc. VA to ec. AL; disjunct to rock outcrops of the sc. GA Coastal Plain]..... *H. lloydii*
  - 4 Plant an erect shrub, 5-40 dm tall, with single main stem branched above; flowers 13-26 mm diameter; inflorescence elongate (3-7 nodes) or short (1-3 nodes in *H. fasciculatum* and *H. chapmanii*); [of wet soils of the Coastal Plain].
    - 5 Undersurface of most leaves easily visible (exposed) on both sides of the midrib, the veins usually obvious on the undersurface; leaves narrowly oblanceolate to linear-oblanceolate ("oblinear"), 1.5-5 (-7) mm wide; inflorescence elongate (3-7 nodes)..... *H. galioides*

- 5 Undersurface usually not visible except for the midrib (leaf margins nearly touching the midrib for its entire length), if the undersurface visible then no veins visible; leaves linear, needle-like, 0.5-1.5 mm wide; inflorescence elongate or short.
- 6 Plant <1 m tall; stem <1 cm wide at base; plant unbranched or few-branched, wand-like with a narrow crown; [endemic to FL Panhandle].....*H. exile*
- 6 Plant normally >0.8 m tall; 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 a tree-like or vase-like aspect; [restricted to shores of sinkhole ponds in Bay and Washington Counties, FL Panhandle].....*H. lissophloeus*
- 7 Young branches, leaves, and sepals not glaucous; bark of upper stem and branches not silvery gray and smooth (except some *H. chapmanii*); mature plants 0.8-3 (-4) m tall, variously shaped; [more widespread in our area, Coastal Plain of se. NC south to FL< and west to se. LA].
- 8 Inflorescence elongate (3-7 nodes); stem bark tight, thin, not exfoliating or exfoliating in narrow strips, not revealing buff or pale cinnamon color; leaf undersurface, if exposed at all, distinctly paler than the 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; leaf undersurface, if exposed at all, about the same color as the upper surface; [usually associated with static water (Carolina bays, impoundments, beaver ponds, borrow pits, flatwoods depressions, cypress-gum ponds and stringers)].
- 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 B – shrubby St. John's-worts with 4 petals and 4 (rarely 2) sepals  
[section *Myriandra*, subsection *Ascyrum*]**

- 1 Styles and carpels 3 (rarely 4); leaves (5-) 7-20 mm wide, rounded, subcordate, or cordate-clasping at the base; plant an erect shrub.
- 2 Leaves rounded or subcordate at the base; [widespread in our area] .....*H. crux-andreae*
- 2 Leaves cordate-clasping at the base; [of e. GA southward] .....*H. tetrapetalum*
- 1 Styles and carpels 2 (3 in *H. microsepalum*); leaves 1-7 mm wide, mostly cuneate (or if rounded the leaves < 8 mm long and 3 mm wide); erect or decumbent shrub.
- 3 Sepals nearly equal in size; styles 3; [s. GA south to n. FL].....*H. microsepalum*
- 3 Sepals markedly unequal, one opposite pair large and enclosing the capsule; styles 2; [collectively widespread].
- 4 Pedicels 6-13 mm long, soon reflexed; subtending bractlets located near the last pair of leaves; decumbent shrub, to 2 dm tall .....
- .....*H. suffruticosum*
- 4 Pedicels 1-5 mm long, erect; subtending bractlets located midway between the base of the flower and the last pair of leaves; erect or decumbent shrub, mostly 1-15 dm tall.
- 5 Erect shrub, usually with a single stem, freely branched well above ground level (or from ground level if injured, as by fire, but then the multiple branches still erect rather than decumbent), to 1 m or more tall; leaves usually variable in size and shape, widest near the middle .....
- .....*H. hypericoides*
- 5 Decumbent, matted shrub, with several prostrate stems arising from a primary rootstock near ground level, each with numerous erect branchlets, rarely over 3 dm tall; leaves usually relatively uniform in size and shape, widest above the middle.....*H. stragulum*

**Key C – shrubby St. John's-worts with broader leaves (mostly lanceolate or oblanceolate)  
and flowers with 5 petals and 5 sepals**

- 1 Leaves cordate-clasping at the base, ovate; [of s. SC southward]; [section *Myriandra*, subsection *Brathydium*] .....*H. myrtifolium*
- 1 Leaves cuneate at the base, oblanceolate, oblong, elliptic, or narrowly elliptic; [collectively widespread]; [section *Myriandra*, subsection *Centrosperma*].
- 2 Leaves mostly narrowly oblanceolate, the larger 2-3 cm long, 2-5 (-7) mm wide, mostly 5-10× as long as wide; seeds 0.4-0.8 mm long, dark brown .....
- .....*H. galioides*
- 2 Leaves mostly oblong, elliptic, narrowly elliptic, or broadly oblanceolate, the larger (2-) 3-7 cm long, 5-15 mm wide, mostly 2.5-5× as long as wide; seeds 0.8-1.3 mm long, amber to medium brown.
- 3 Flowers solitary, terminal (or in 3-flowered terminal cymes); petals 10-20 mm long; sepals 7-15 mm long; shrubs to 1 m tall.....
- .....*H. frondosum*
- 3 Flowers (1-) 3-many in terminal cymes; petals 5-10 mm long; sepals 1.5-8 mm long; shrubs to 3 m tall.
- 4 Flowers (1-) 3-7 per inflorescence; capsules (6-) 7-14 mm long; larger leaves (4-) 7-14 mm wide.....*H. prolificum*
- 4 Flowers 7-many per inflorescence; capsules (3-) 4.5-6 mm long; larger leaves 1-7 (-11) mm wide.
- 5 Leaves (1.8-) 2.8-8.3 (-11) mm wide, the widest on a plant always over 4 mm wide; [widespread] .....
- .....*H. densiflorum* var. *densiflorum*
- 5 Leaves 1.0-3.7 (-4.1) mm wide; [of the Ridge and Valley of nw. GA, c. and nw. AL, and e. TN].....*H. densiflorum* var. *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; stamens 10-22 .....

- ..... *H. drummondii*
- 1 Leaves scale-like, 1-5 mm long; capsules ca. 2-3× as long as the sepals; seeds minutely and inconspicuously reticulate; stamens 5-10 .....  
..... *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, cylindrical, sometimes slightly falcate, dull brown when mature .....  
..... *H. apocynifolium*
- 3 Flowers usually in many-flowered cymes terminating branches; sepals 1.5-2.0 mm long, usually triangular-acute; capsules ovoid to subglobose, 4-5 mm long (excluding the styles) and 4-5 mm broad; seeds 1.5-1.8 mm long, usually falcate-cylindric, dark purplish-brown and lustrous when mature .....  
..... *H. nudiflorum*

**Key G – herbaceous St. John's-worts with broad leaves, 1-locular capsules, stamens separate or connate at base, but not grouped into fascicles, leaves with translucent dots, without black dots, sepals and petals with translucent lines or dots only, not marked with black dots or lines**

- 1 Stems and leaves pubescent; [section *Trigynobrathys*] .....  
..... *H. setosum*
- 1 Stems and leaves glabrous.
- 2 Styles united, persistent as a single straight beak on the capsule; [section *Myriandra*, subsection *Suturosperma*].
- 3 Leaves 3-6 cm long, 4-6× as long as wide, the margins revolute; [plants (in our area) of low elevations in the Coastal Plain] .....  
..... *H. adpressum*
- 3 Leaves 1-3 (-4) cm long, 2-3× as long as wide, the margins not revolute; [plants (in our area) of high elevations in the Mountains] .....  
..... *H. ellipticum*
- 2 Styles separate, more or less divergent, not persistent as a beak on the capsule; [section *Trigynobrathys*].
- 4 Styles 2-4 mm long; stamens 50-80.
- 5 Punctate glands absent on the stem (rarely very few on the internodes of the inflorescence); punctate glands of the leaves small, round, distributed on the lower leaf surface, becoming sparse toward the base of the leaf and toward the midrib; midstem leaves mostly broadest at or beyond the middle .....  
..... *H. virgatum*
- 5 Punctate glands frequent on the stem; punctate glands of the leaves and stem large, oval, distributed evenly and densely on the lower leaf surface, also dense on the upper leaf surface in *H. denticulatum* and *H. harperi* (absent on upper leaf surface in *H. species 1*); midstem leaves usually broadest at or below the middle.
- 6 Upper surface of the leaf with no punctate glands; inflorescence branches typically with 3-12 pairs of bracteal leaves about 1/2 as large as the foliage leaves; [of shallow soil mats on granitic domes in the Piedmont of NC] .....  
..... *H. radfordiorum*

- 6 Upper surface of the leaf with abundant punctate glands; inflorescence branches with at most a few pairs of very small bracts; [of Coastal Plain wetlands, very rarely disjunct inland and then in wetlands].
- 7 Leaves 5-20 (-24) mm long, 5-15 mm wide, 1.5-3× as long as wide, ovate to obovate to narrowly elliptic, mostly appressed to the stem, mostly shorter than the internodes; sepals 4.0-8.0 mm long, 2.0-4.0 mm wide, acute; lower stem not spongy-thickened with aerenchymatous tissue; [of moist pinelands of the Coastal Plain, very rarely disjunct inland to bog habitats in the Piedmont and Mountains].....*H. denticulatum*
- 7 Leaves 10-35 (-40) mm long, 3-8 (-12) mm wide, 3-10× as long as wide, lanceolate to linear-lanceolate, mostly ascending to spreading, often equaling the internodes; sepals 3.0-5.0 mm long, 0.8-2.5 mm wide, acute to acuminate; lanceolate to linear-lanceolate; upper portion of stem with numerous axillary branches; lower stem usually spongy-thickened with aerenchymatous tissue; [of upland depression ponds of the Coastal Plain, growing where seasonally inundated].....*H. harperi*
- 4 Styles 0.5-1.5 mm long; stamens 5-22.
  - 8 Leaves lanceolate to linear, 6-30 mm long, 0.5-3 mm wide, the leaf base attenuate to cuneate.....*H. canadense*
  - 8 Leaves ovate to elliptic, 3-35 mm long, 2-15 mm wide, the leaf base rounded to cordate-clasping.
    - 9 Sepals broadest near the base; inflorescence with few or no normally sized leaves, these only low in the inflorescence, giving the inflorescence a naked appearance; [of Coastal Plain pinelands].....*H. gymnanthum*
    - 9 Sepals broadest near the middle; inflorescence with many normally sized leaves and leaflike bracts, giving the inflorescence a leafy appearance; [collectively widespread].
      - 10 Ultimate bracts of the inflorescence elliptic, much like the leaves; leaves not paler beneath; sepals obtuse, much shorter than the capsule; capsule 3-5 mm long.....*H. boreale*
      - 10 Ultimate bracts of the inflorescence linear, differing conspicuously from the leaves; leaves paler beneath; sepals acute, about equaling the capsule; capsule 2-3.5 mm long.
        - 11 Inflorescence branches from the upper 1-6 nodes of the stem, the further branching repeatedly monochasial; stem with apical internode well developed, usually longer than the internode below; sepals broader above the middle, more-or-less imbricate; [of the Coastal Plain].....*H. mutilum* var. *latisepalum*
        - 11 Inflorescence branches from the upper 2-10 nodes of the stem, the further branching mostly dichasial; stem with apical internode shorter than the internode below or even essentially absent; sepals broader below the middle, not imbricate (rarely broader above the middle and imbricate); [widespread].....*H. mutilum* var. *mutilum*

**Key H – “Triadenum”**

- 1 Leaves narrowed to the cuneate or broadly cuneate (rarely truncate) base.
  - 2 Lower leaves sessile; sepals 5-7 mm long, acute (to obtuse); leaves lacking translucent or dark glands or punctae; styles 0.5-1.5 mm long (best seen in fruit).....*H. tubulosum*
  - 2 Lower leaves petiolate; sepals 3-5 mm long, obtuse; leaves with translucent glands and dark punctae; styles 1.5-3 mm long (best seen in fruit).....*H. walteri*
- 1 Leaves clasping, cordate, or subcordate at the base.
  - 3 Sepals 2.5-5 mm long at maturity, obtuse to acute; styles 0.5-1 (-1.5) mm long (best seen in fruit).....*H. fraseri*
  - 3 Sepals 5-8 mm long at maturity, acute to acuminate; styles 1.8-3 mm long (best seen in fruit).....*H. virginicum*

*Hypericum adpressum* Rafinesque ex Barton, Bog St. John's-wort, Creeping St. John's-wort. Boggy depressions. July-August. E. MA south to sw. GA in the Coastal Plain; disjunct inland in e. WV (Greenbrier County), IN, IL, and sc. TN. See discussion on its habitats and rarity in Sorrie (1998b). [= RAB, C, F, G, GW, K, Pa, S, V, WV, X, Z]

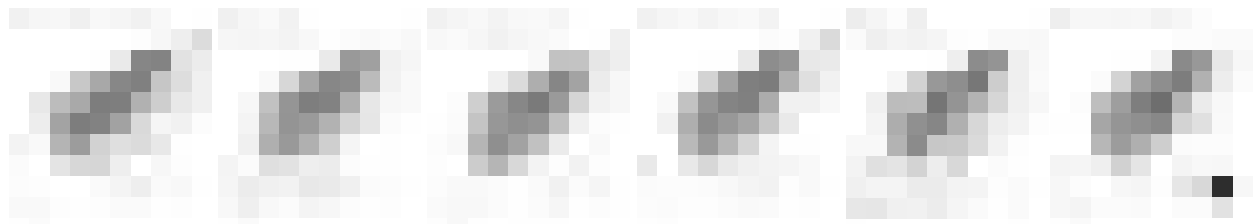
*Hypericum apocynifolium* Small. Mesic bluffs and ravines, ridges and natural levees in floodplains. C. GA, s. GA, and Panhandle FL west to se. AR and e. TX. [= S, V, X, Y; < *H. nudiflorum* – GW, K, WH, Z]

*Hypericum ascyron* Linnaeus ssp. *pyramidatum* (Aiton) N. Robson, American Great St. John's-wort. Swamps, bottomlands. June-August. The species is of e. North America and e. Asia; the North American ssp. *pyramidatum* occurs from QC west to MN, south to s. PA (Rhoads & Klein 1993; Rhoads & Block 2007), MD (Robson 2000), and WV (Harmon, Ford-Werertz, & Grafton 2006). [= X; < *H. ascyron* Linnaeus – K; = *H. pyramidatum* Aiton – C, F, G, Pa] {not yet keyed} {section *Roscyna*}

*Hypericum boreale* (Britton) Bicknell, Dwarf St. John's-wort, Northern St. John's-wort. Sinkhole ponds in the Mountains, interdune ponds in the outer Coastal Plain, boggy places. NL (Newfoundland) and QC west to w. ON, south to VA, nw. NC (?), OH, IN, and n. IL. Hybrids with *H. canadense* have been called *H. ×dissimulatum* Bicknell (pro sp.). [= C, F, G, K, Pa, WV; = *H. mutilum* Linnaeus ssp. *boreale* (Britton) J.M. Gillett – X]

*Hypericum brachyphyllum* (Spach) Steudel. Ponds and wet pinelands. Se. NC south to s. FL, west to s. MS. Material from se. NC was at one point thought to perhaps represent a new taxon. [= GW, K, U, V, WH, X, Y, Z; < *H. aspalathoides* – S]

*Hypericum buckleyi* M.A. Curtis, Granite Dome St. John's-wort. Thin soil in seasonal seepage around rock outcrops, particularly granitic exfoliation domes. June-August. Sw. NC south to nw. SC and ne. GA, a Southern Appalachian endemic. Wilbur (1995) showed that Curtis's spelling of the epithet, "*buckleii*", should be maintained; however, changes in the International Code of Botanical Nomenclature have reversed this (Robson 1996). [= RAB, GW, S, W, V, X, Z; = *H. buckleii* – K, orthographic variant]



\* *Hypericum calycinum* Linnaeus, Aaron's-beard. Disturbed areas, naturalized from plantings; native of se. Europe and Asia Minor. Naturalized in Knox County, TN (D. Estes, pers. comm., 2012). {not yet keyed; add to synonymy}

*Hypericum canadense* Linnaeus, Canada St. John's-wort Cp (DE, FL, GA, NC, SC, VA), Mt (NC, SC, VA, WV), Pd (DE, NC, VA); bogs, pine savannas, ditches; common (rare in NC and VA Piedmont, rare in FL). July-September. NL (Newfoundland) and QC west to MN, south to s. GA, ne. FL, Panhandle FL, and MS; also in Holland and Ireland, where considered by some to be native. Hybrids with *H. mutilum* and/or *H. boreale* have been called *H. ×dissimulatum* Bicknell (pro sp.). [= RAB, C, G, GW, K, Pa, S, W, WH, WV, X, Z; > *H. canadense* var. *canadense* – F; > *H. canadense* var. *galiiforme* Fernald – F]

*Hypericum chapmanii* W.P. Adams, Apalachicola St. John's-wort, Tree St. John's-wort. Margins of pond-cypress ponds, pond-cypress stringers, often growing with *Cyrilla parviflora* and *Nyssa ursina*. Endemic to Panhandle FL (9 counties). [= GW, K, U, V, WH, X, Y, Z; < *H. fasciculatum* – S; = *H. arborescens* Chapman]

*Hypericum cistifolium* Lamarck. Pine savannas, wet pine flatwoods. June-August. E. NC south to s. FL, west to e. TX. [= RAB, GW, K, V, WH, X, Y, Z; > *H. cistifolium* – S, in a narrower sense; > *H. opacum* Torrey & A. Gray – S]

*Hypericum crux-andreae* (Linnaeus) Crantz, St. Andrew's Cross, St. Peter's-wort. Dry forests and woodlands, pine flatwoods. June-October. NY (Long Island) and NJ south to s. FL, west to e. TX, primarily on the Coastal Plain, but scattered inland to w. NC and n. GA, also north in the interior to c. TN, s. KY, c. AR, and se. OK. [= GW, K, Pa, W, WH, X, Y; = *H. stans* (Michaux ex Willdenow) W.P. Adams & Robson – RAB, C, V, Z; = *Ascyrum stans* Michaux ex Willdenow – F, G; > *Ascyrum stans* – S; > *Ascyrum cuneifolium* Chapman – S]

*Hypericum densiflorum* Pursh var. *densiflorum*, Mountain Bushy St. John's-wort. Bogs, streambanks, dry to moist forests, rock outcrops, moist forests, pine savannas. June-September. Sw. PA south to n. GA and c. AL in and near the Mountains; NJ south to SC in the Coastal Plain; s. GA west to TX in the Coastal Plain. The related *H. lobocarpum* Gattinger is more western, extending east to TN; the basis for attribution of *H. lobocarpum* to "Blue Ridge, N.C." by Small (1933) is unknown. [< *H. densiflorum* – RAB, C, GW, K, Pa, W, WV, X, Z; < *H. densiflorum* var. *densiflorum* – F, G (also see *H. interior*); > *H. densiflorum* Small – S; > *H. glomeratum* Small – S]

*Hypericum densiflorum* Pursh var. *interior* (Small) Sorrie & Weakley, Interior Bushy St. John's-wort. Rocky forests, riverbanks. E. and c. TN, nw. GA south to c. AL. Probably best treated as a variety of *H. densiflorum*; see Weakley et al. (2011). Potentially to be re-elevated to species rank, if more carefully studied. [= *H. interior* Small – S; < *H. densiflorum* Pursh – K, V, X, Z; ? *H. revolutum* R. Keller]



*Hypericum denticulatum* Walter, Coppery St. John's-wort. Savannas, wet pine flatwoods, adjacent ditches, borrow scrapes, blackwater stream shores. July-September. S. NJ south to e. GA (McIntosh County) (Sorrie 1998b) on the Coastal Plain; disjunct inland in c. and w. NC, sc. TN, and in s. AL. See discussion under *H. virgatum*. [= K, Pa, Q, S; = *H. denticulatum* var. *denticulatum* – RAB, C, F, G, Z; < *H. denticulatum* – GW (also see *H. virgatum*); = *H. denticulatum* ssp. *denticulatum* – X]

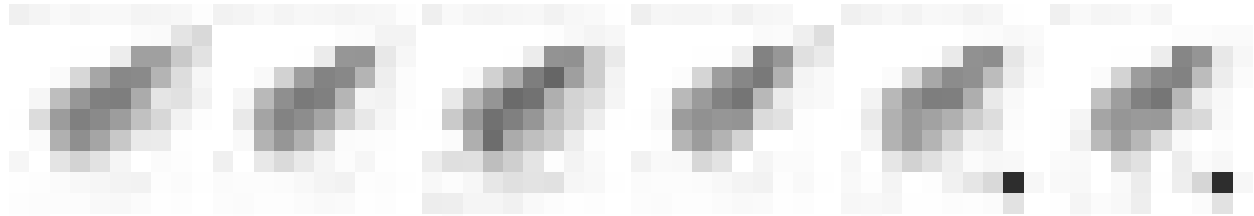
*Hypericum dolabriforme* Ventenat, Glade St. John's-wort. Limestone glades and barrens. In nw. GA (Jones & Coile 1988) and e. TN (Chester, Wofford, & Kral 1997); this species should be sought in sw. VA. [= C, F, G, K, S, V, X, Z] {not yet keyed}

*Hypericum drummondii* (Greville & Hooker) Torrey & A. Gray, Nits-and-lice, Drummond's St. John's-wort. Dry woodlands, woodland borders, fields. July-September. MD west to OH, IL, and se. KS, south to Panhandle FL and c. TX. [= RAB, C, F, G, GW, K, Pa, W, WH, WV, X, Z; = *Sarothra drummondii* Greville & Hooker – S]

***Hypericum ellipticum*** Hooker, Pale St. John's-wort. Swamp forests, wet places along streams. July-August. NL (Newfoundland) and NS west to w. ON, south to NY, DE, MI, and MN, and in the mountains to WV, NC (?), and ne. TN (Johnson County) (Chester, Wofford, & Kral 1997), and NC (?). The documentation for C's attribution of *H. ellipticum* to NC is unknown. [= C, F, G, K, Pa, V, WV, X]

***Hypericum erythrae*** (Spach) Steudel, Georgia St. John's-wort, Sparse-leaved St. John's-wort, Grit St. John's-wort. Seepage bogs, roadside ditches. Apparently nearly endemic to the Altamaha Grit region of the GA Coastal Plain, extending to Beaufort County, SC (Allison, in press). [= Q] {not yet keyed}

***Hypericum exile*** W.P. Adams. Pine flatwoods. Endemic to Panhandle FL (Bay, Franklin, Gulf, Liberty, and Washington counties). There seems nothing in particular to recommend Robson's reduction of *H. exile* to a subspecies of *H. nitidum*. [= GW, K, U, V, WH, Y, Z; = *H. nitidum* Lamarck ssp. *exile* (W.P. Adams) N. Robson – X]



***Hypericum fasciculatum*** Lamarck, Peelpark St. John's-wort. Wet pine savannas, beaver ponds, upland depression ponds. May-September. E. NC south to s. FL, west to s. MS. [= RAB, GW, K, U, V, WH, X, Y, Z; < *H. fasciculatum* – S (also see *H. nitidum* and *H. chapmanii*)]

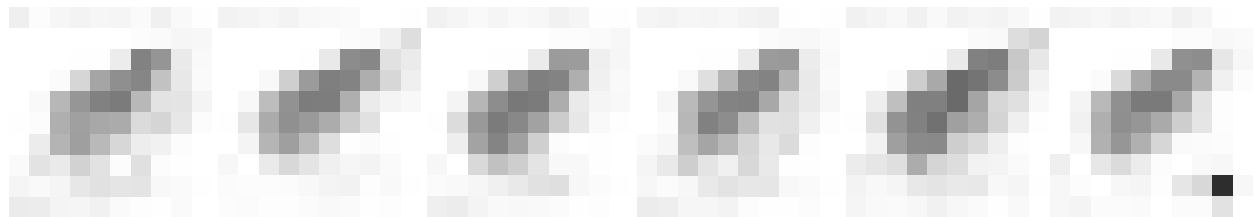
***Hypericum fraseri*** Spach, Fraser's Marsh St. John's-wort. Bogs, peaty wetlands. July-August. NL (Newfoundland) and QC west to MN, south to NY, PA, w. VA, ne. TN, w. NC, OH, n. IN, and NE. Closely related to *T. virginicum* and reduced to a variety of (or included in) that species by some authors. [= *Triadenum fraseri* (Spach) Gleason – C, G, K, Pa; = *Hypericum virginicum* Linnaeus var. *fraseri* (Spach) Fernald – F, WV; < *T. virginicum* – W, Z]

***Hypericum frondosum*** Michaux. Rock outcrops and rocky woodland. Late May-July. This species is native and widespread as far east as e. TN (Chester, Wofford, & Kral 1997), GA, and FL. [= C, F, G, K, V, W, WH, Y, Z; > *H. aureum* Bartram – S; > *H. splendens* Small – S]

***Hypericum galioides*** Lamarck. Wet pine savannas, wet pine flatwoods, pools, edges of bottomlands. June-August. E. NC south to c. peninsular FL, west to se. TX. [= RAB, GW, K, U, V, X, Y, Z; > *H. ambiguum* Elliott – S; > *H. galioides* – S]

***Hypericum gentianoides*** (Linnaeus) Britton, Sterns, & Poggenburg, Pineweed, Orange-grass. Fields, rock outcrops, woodland borders, eroding areas, pond margins, flatwoods. July-October. ME and ON west to MN, south to s. FL and TX. [= RAB, C, F, G, K, Pa, W, WH, WV, X, Z; = *Sarothra gentianoides* Linnaeus – S]

***Hypericum graveolens*** Buckley, Mountain St. John's-wort. Grassy balds, grassy openings, forests, at high elevations (1200 m or more). July-August. Nw. NC and ne. TN south to sw. NC, a Southern Appalachian endemic. This and the related *H. mitchellianum* (another narrow endemic to the Southern Appalachians) hybridize, forming local hybrid populations with intermediate characteristics (Culwell 1970). [= RAB, GW, K, S, W, X, Z]



***Hypericum gymnanthum*** Engelman & A. Gray, Claspingleaf St. John's-wort. Pine savannas, wet pine flatwoods, sinkhole ponds (Augusta and Rockingham counties, VA), other wet to moist habitats. June-September. S. NJ south to ne. FL, Panhandle FL, west to c. TX, and scattered inland in PA, WV, sc. TN, OH, IN, IL, MO, and e. KS; also disjunct in Guatemala (introduced?). [= RAB, C, F, G, GW, K, Pa, S, WH, X, Z]

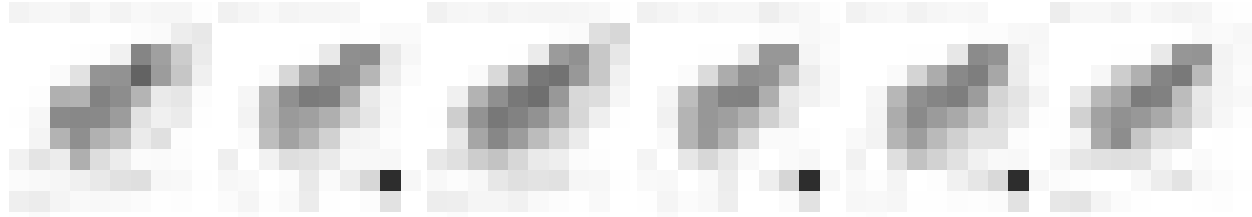
***Hypericum harperi*** R. Keller, Harper's St. John's-wort. Clay-based Carolina bays, other upland depression ponds, with *Taxodium ascendens*. July-September. E. and c. SC south to sw. GA and e. Panhandle FL. *H. harperi* should be sought in sc. and se. NC, where it may well occur. This species has generally been considered a part of *H. denticulatum* or *H. virgatum*, but Webb (1980) makes a convincing argument for its recognition, including the ecological differentiation and absence of intermediates or hybrids when growing in proximity to *H. denticulatum*. See *H. virgatum* for additional discussion. [= Q, WH, X; < *H. denticulatum* var. *acutifolium* – RAB, Z; < *H. denticulatum* – GW; < *H. harperi* – K; < *H. acutifolium* – S]

***Hypericum hypericoides*** (Linnaeus) Crantz, St. Andrew's Cross. Dry forests and woodlands. May-August. NJ, w. VA, c. KY, se. MO, and c. OK, south to s. FL and e. TX; also in the West Indies, Mexico, and Central America. [= RAB, C, GW, V, W, WH, Y, Z; > *Ascyrum hypericoides* Linnaeus var. *hypericoides* – F, G; > *Ascyrum hypericoides* Linnaeus var. *oblongifolium* (Spach) Fernald – F, G; = *H. hypericoides* ssp. *hypericoides* – K, X; > *Ascyrum hypericoides* Linnaeus – S; > *Ascyrum linifolium* Spach – S]

***Hypericum lissophloeus*** W.P. Adams. Margins of sinkhole ponds. Endemic to Panhandle FL (Bay and Washington counties). [= GW, K, U, V, WH, X, Y, Z]

***Hypericum lloydii*** (Svenson) W.P. Adams, Lloyd's St. John's-wort. Dry woodlands, sandhills, edges of granitic flatrocks, edges of Altamaha Grit outcrops, roadbanks. June-September. Sc. VA (Sorrie & LeBlond 2008) south to c. AL. [= RAB, K, U, V, X, Z; = *Hypericum galioides* Lamarck var. *lloydii* Svenson]

***Hypericum lobocarpum*** Gattinger. Streambanks, river bottoms, pinelands. C. KY, c. TN (Chester, Wofford, & Kral 1997) and s. MS west to s. IL, se. OK, and e. TX; credited to SC by Robson (1996), based on specimens debated and dismissed by Adams (1973). Late May-September. [= C, K, S, V, X, Z; = *H. densiflorum* var. *lobocarpum* (Gattinger) Svenson – F, G; < *H. densiflorum* – GW] {not yet keyed}



***Hypericum majus*** (A. Gray) Britton. Wet meadows and shores. July-September. NL (Newfoundland) west to BC, south to s. NJ, n. DE, nw. PA (Rhoads & Block 2007), OH, IN, IL, MO, OK, CO, and OR (Kartesz 1999). [= C, F, G, K, Pa, X] {not yet keyed}

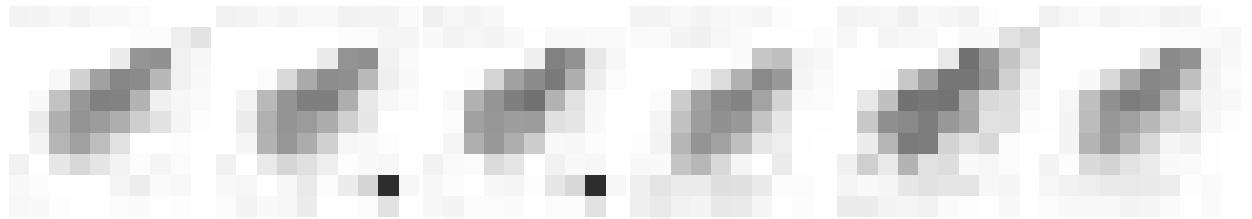
***Hypericum microsepalum*** (Torrey & A. Gray) A. Gray ex S. Watson. Moist to wet pine flatwoods. S. GA south to Panhandle FL. [= GW, K, V, WH, X, Y, Z; = *Crookea microsepala* (Torrey & A. Gray) Small – S]

***Hypericum mitchellianum*** Rydberg, Blue Ridge St. John's-wort. Grassy balds, grassy openings, forests, seepages, at moderate to high elevations (generally at 1000-1900 m or more). July-August. W. VA, e. WV, and e. TN south to sw. NC, a Southern Appalachian endemic. Robson (2006) interprets this as a hybrid of *H. graveolens* and *H. punctatum* but offers no evidence other than its general morphological intermediacy. [= RAB, C, F, G, GW, K, S, W, WV, Z; = *H. ×mitchellianum* Rydberg, pro sp. – X]

***Hypericum mutilum*** Linnaeus var. *latisepalum* Fernald, Southern Dwarf St. John's-wort. Marshes and other wet habitats. June-October. Se. SC south to peninsular FL, west to TX (and, according to F, north to s. NJ). Hybrids with *H. canadense* have been called *H. ×dissimulatum* Bicknell (pro sp.). [= F; < *H. mutilum* – RAB, G, GW, K, S, W, WH, Z; = *H. mutilum* ssp. *latisepalum* (Fernald) N. Robson – X]

***Hypericum mutilum*** Linnaeus var. *mutilum*. Common Dwarf St. John's-wort. Bogs, marshes, other wet habitats. June-October. NL (Newfoundland) and QC west to MB, south to s. FL and c. TX; scattered (probably as an adventive) farther west in North America, in Central and South America, and Europe. Hybrids with *H. canadense* have been called *H. ×dissimulatum* Bicknell (pro sp.). [= F; < *H. mutilum* – RAB, C, G, GW, K, Pa, S, W, WH, WV, Z; = *H. mutilum* ssp. *mutilum* – X]

***Hypericum myrtifolium*** Lamarck, Myrtle-leaf St. John's-wort. Ponds. Small (1933) reports this species from SC; this distribution is now documented by a specimen from Jasper Co., SC (P. McMillan, pers. comm.). Se. SC south to s. FL, west to se. MS, a Southeastern Coastal Plain endemic. [= GW, K, S, V, WH, X, Y, Z]



***Hypericum nitidum*** Lamarck. Usually in flowing water of blackwater streams. June-August. C. SC south to Panhandle FL, west to sw. AL. [= RAB, GW, K, U, V, WH, Y, Z; = *H. nitidum* ssp. *nitidum* – X]

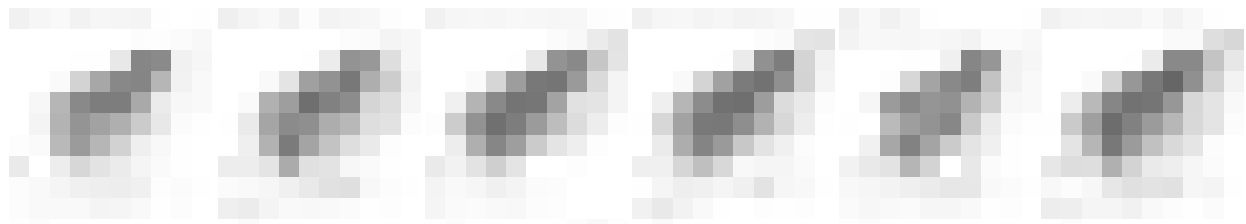
***Hypericum nudiflorum*** Michaux ex Willdenow. Streambanks, moist forests. June-July. Se. VA south to Panhandle FL, west to e. TX, s. AR, and se. OK; disjunct in Cumberland Plateau of TN. [= RAB, C, F, G, S, W, WH, V, X, Y; < *H. nudiflorum* – GW, K, Z (also see *H. apocynifolium*)]

\* ***Hypericum perforatum*** Linnaeus, European St. John's-wort. Fields, pastures, roadsides, woodland borders; native of Europe. June-September. See Duncan (1985) for documentation for GA. [= RAB, C, F, G, K, Pa, S, W, WV, Z; = *H. perforatum* ssp. *perforatum* – X]

***Hypericum prolificum*** Linnaeus, Shrubby St. John's-wort. Bogs, seepages, rocky forests, rock outcrops. June-October. NY west to s. MI and MN, south to GA and LA. [= RAB, C, G, K, W, Pa, S, V, WV, X, Z; = *H. spathulatum* (Spach) Steudel – F]

***Hypericum pseudomaculatum*** Bush. Wet, moist, or dry forests. June-September. SC south to Panhandle FL, west to TX, north in the interior to e. TN, c. IL, s. MO, and c. OK. {records east of the Ozarks need to be studied more carefully} [= RAB, C, G, K, S, X, Z; = *H. punctatum* Lamarck var. *pseudomaculatum* (Bush) Fernald – F; < *H. punctatum* Lamarck – WH]

***Hypericum punctatum*** Lamarck, Spotted St. John's-wort. Fields, woodland borders. June-September. QC west to MN, south to c. peninsular FL and TX. [= RAB, C, G, K, Pa, W, WV, X, Z; = *H. punctatum* var. *punctatum* – F; > *H. punctatum* – S; > *H. subpetiolatum* Bicknell ex Small – S; < *H. punctatum* – WH]



***Hypericum radfordiorum*** Weakley ex J.R. Allison, Radfords' St. John's-wort, Brushy Mountain St. John's-wort. Shallow circumneutral soil mats of granitic domes in the Brushy Mountains. Apparently endemic to the Brushy Mountains of Alexander and Wilkes counties, NC. This taxon, included in *H. denticulatum* var. *acutifolium* by Webb (1980), differs from typical *H. virgatum* in being profusely branched from the medial and upper nodes (rather than being little if at all branched, and then only from the uppermost nodes), in having leaves with acuminate (rather than acute to obtuse) apices, and electrophoretically (Webb 1980). Additionally, these plants have numerous bracteal leaves along the inflorescence branches (vs. few or none), the punctate glands of the foliage are large and oval, resembling those of *H. denticulatum* (vs. small and round), and the punctate glands are distributed on the lower leaf surface and stem (vs. lower leaf surface only). It is notable that these same outcrops are phytogeographically interesting, with other disjunct and weakly differentiated races (see *Allium cuthbertii*) and disjunct populations. See Allison (2011) for more detailed information. [= Q; < *H. denticulatum* (included in concept of *H. denticulatum* (= *H. denticulatum* var. *acutifolium*, *H. denticulatum* ssp. *acutifolium*) by most earlier authors]

***Hypericum setosum*** Linnaeus, Hairy St. John's-wort. Pine savannas, wet pine flatwoods, boggy areas, adjacent ditches, fireflow lines, and scrapes. May-September. Se. VA south to c. peninsular FL, west to se. TX. [= RAB, C, F, G, GW, K, S, WH, X, Z]

***Hypericum sphaerocarpum*** Michaux, Barrens St. John's-wort. Limestone barrens. C. OH, s. MI, s. WI, IA, and se. NE south through KY, e. and c. TN (Chester, Wofford, & Kral 1997), to nw. GA (GAHP 2003), c. AL, c. MS, LA, and ne. TX; also reported for sw. PA, where considered adventive (Rhoads & Klein 1993). [= C, F, G, K, Pa, V, X, Z; > *H. turgidum* Small – S; > *H. sphaerocarpum* var. *turgidum* (Small) Svenson] {not yet keyed}

***Hypericum stragulum*** W.P. Adams & Robson, Low St. John's-wort, Stragglings St. John's-wort. Dry rocky or sandy woodlands. May-August. MA (Nantucket Island), NY (Long Island), west to s. PA, s. OH, s. IN, s. IL, c. MO, se. KS, and c. OK, south to ne. NC, c. SC, c. GA, n. AL, n. MS, n. LA, and c. TX. [= C, Pa, V, W, Z; = *H. stragulum* – RAB, misspelling; = *Ascyrum hypericoides* Linnaeus var. *multicaule* (Michaux ex Willdenow) Fernald – F, G, WV; = *H. hypericoides* (Linnaeus) Crantz ssp. *multicaule* (Michaux ex Willdenow) Robson – K, X]

***Hypericum suffruticosum*** W.P. Adams & Robson, Pineland St. John's-wort. Pine savannas and flatwoods. April-June. Se. NC south to c. peninsular FL, west to se. LA. [= RAB, K, V, WH, X, Y, Z; = *Ascyrum pumilum* Michaux – S]

***Hypericum tenuifolium*** Pursh, Sandhill St. John's-wort. Pine flatwoods, pine savannas, sandhills. June-September. Se. NC south to s. peninsular FL; Panhandle FL and se. AL. Robson (1996) indicates that the older name *H. tenuifolium* Pursh has now been adequately shown to apply to this taxon. [= U, X; = *H. reductum* (Svenson) W.P. Adams – RAB, GW, K, V, WH, Y, Z; < *H. aspalathoides* Willdenow – S (also including *H. brachyphyllum*)]



***Hypericum tetrapetalum*** Lamarck. Wet pinelands and in depressional wetlands (open or dominated by *Taxodium ascendens*). E. GA (within a few counties of se. SC), south to s. FL, west to Panhandle FL. [= GW, K, V, WH, X, Y; = *Ascyrum tetrapetalum* (Lamarck) Vail – S]

***Hypericum tubulosum*** Walter, Southern Marsh St. John's-wort. Bogs, peaty wetlands, drawdown sloughs along rivers, drawdown shorelines along man-made reservoirs. August-September. Se. VA south to Panhandle FL, west to LA, and north in the interior to se. and c. TN, s. IL and s. OH. [= RAB; = *Triadenum tubulosum* (Walter) Gleason – C, G, GW, K, WH, Z; = *Hypericum tubulosum* Walter – RAB; = *Hypericum tubulosum* Walter var. *tubulosum* – F; = *T. longifolium* Small – S]

***Hypericum virgatum*** Lamarck, Strict St. John's-wort. Woodlands, rock outcrops, woodland borders. Late June-September. MD west to s. OH, s. IN, and s. IL, south to c. NC, c. SC, sw. GA, Panhandle FL, s. MS, and se. LA. Though treated by most recent authors as a variety of *H. denticulatum*, *H. virgatum* is better considered as a distinct species. Webb (1980) recognized *H. harperi* as a separate species (it had previously been considered a part of *H. virgatum*), and continued to recognize this taxon as a variety of *H. denticulatum*. However, based on the nature of the punctate glands, size of seeds, inland distribution, etc., it appears that *H. virgatum* is more distantly related to *H. denticulatum* and *H. harperi* than they are to one another; recognition at the species level is warranted for *H. virgatum*. As pointed out by Webb, *H. denticulatum* is primarily tetraploid ( $n = 24$ ), while *H. virgatum* and *H. harperi* are (as far as is known) strictly diploid. Additionally, the aberrant populations from granitic outcrops in the Brushy Mountains of Alexander and Wilkes counties, NC referred by Webb (1980) to this taxon are distinct, and more closely allied to *H. denticulatum* and *H. harperi*; see *Hypericum radfordiorum* for additional discussion. [= K, Q; < *H. denticulatum* Walter var. *acutifolium* (Elliott) Blake – RAB, C, F, G, W, Z (also see *H. harperi*); > *H. denticulatum* var. *recognitum* Fernald & Schubert –



RAB, F, WV; < *H. denticulatum* – GW, WH; < *H. acutifolium* Elliott – S (also see *H. harperi*); = *H. denticulatum* ssp. *acutifolium* (Elliott) N. Robson – X]

***Hypericum virginicum*** Linnaeus, Common Marsh St. John's-wort. Bogs, peaty wetlands. July-September. NS west to OH and s. ON, south to s. FL and MS, mostly on the Coastal Plain but scattered inland. [= RAB; = *Triadenum virginicum* (Linnaeus) Rafinesque – C, G, GW, K, Pa, S, WH; = *Hypericum virginicum* var. *virginicum* – F, WV; < *T. virginicum* – W, Z (also see *T. fraseri*)]

***Hypericum walteri*** J.G. Gmelin, Walter's Marsh St. John's-wort. Swamp forests and marshes. July-September. MD south to n. peninsular FL, west to e. TX, and north in the interior to s. MO, s. IL, and OH. [= RAB; = *Triadenum walteri* (J.G. Gmelin) Gleason – C, G, GW, K, Pa, W, WH, Z; = *Hypericum tubulosum* Walter var. *walteri* (J.G. Gmelin) Lott – F, WV; = *T. petiolatum* (Walter) Britton – S]



**215. GERANIACEAE** A.L. de Jussieu 1789 (Geranium Family) [in GERANIALES]

A family of about 5-11 genera and 700-835 species, herbs and shrubs, mostly temperate. References: Albers & Van der Walt in Kubitzki, Bayer, & Stevens (2007).

- 1 Leaves pinnately cleft or compound; fertile stamens 5, staminodia 5.....***Erodium***
- 1 Leaves palmately cleft or compound; fertile stamens 10 (except in *G. pusillum*, and note that anthers are readily deciduous in all species).....***Geranium***

***Erodium*** L'Héritier in Aiton 1789 (Stork's-bill, Filaree)

A genus of about 60-80 species, herbs, mainly Old World. References: Albers & Van der Walt in Kubitzki, Bayer, & Stevens (2007).

- 1 Leaves simple, deeply lobed but not divided.....***E. texanum***
- 1 Leaves compound, with 3 or more leaflets.
  - 2 Primary leaflets sessile or nearly so, sometimes connected by blade tissue; blades of the primary leaflets divided nearly or quite to the base; apical pits of mericarp lacking sessile glands.....***E. cicutarium***
  - 2 Primary leaflets petiolulate; blades of the primary leaflets divided <0.75× to the base; apical pits of mericarp with sessile glands.....***E. moschatum* var. *moschatum***

\* ***Erodium cicutarium*** (Linnaeus) L'Héritier, Heron's-bill, Common Stork's-bill, Redstem Filaree, Alfileria, Pin-clover.

Disturbed areas, fields, lawns; native of Europe. March-June; April-July. [= RAB, C, F, G, K2, Pa, S, W, WH; > *E. cicutarium* ssp. *cutitarium* – K1]

\* ***Erodium moschatum*** (Linnaeus) L'Héritier var. ***moschatum***, Whitestem Filaree. Disturbed areas, waste area near wool-combing mill; native of Mediterranean Europe. April-September. Naturalized south to DE and PA; also in SC Coastal Plain. [= F, K1, K2; < *E. moschatum* – C, G, Pa, S]

\* ***Erodium texanum*** A. Gray, Texas Stork's-bill. Waste areas near wool-combing mill, perhaps merely a waif; native of sc. and sw. United States. [= K1, K2]

***Geranium*** Linnaeus 1753 (Geranium, Crane's-bill)

A genus of about 350-430 species, mainly perennial herbs, also annuals and dwarf shrubs, mainly temperate. House plants called 'geranium' are members of the genus *Pelargonium*. References: Aedo (2012)=Z; Aedo, Aldasoro, & Navarro (1998); Yeo (1984); Albers & Van der Walt in Kubitzki, Bayer, & Stevens (2007).

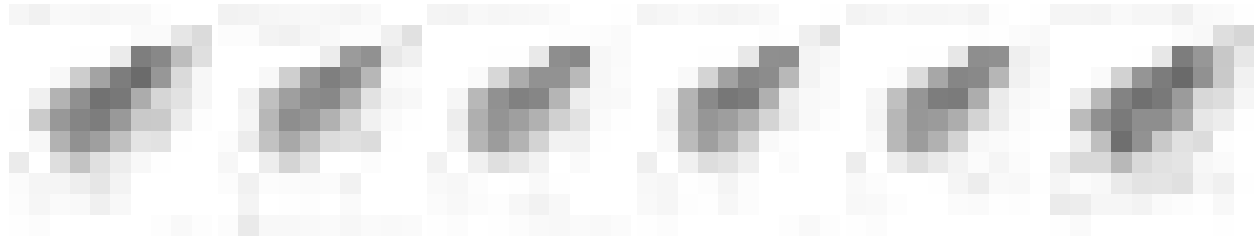
- 1 Perennial, from a stout rhizome; [subgenus *Geranium*].
  - 2 Cymules 1-flowered (rarely a few cymules 2-flowered); pedicels with eglandular hairs only.
    - 3 Petals 15-22 mm long; fruit 28-42 mm long.....***G. sanguineum***
    - 3 Petals 4-6 mm long; fruit 14-20 mm long.....***G. sibiricum***
  - 2 Cymules 2-flowered; pedicels with a mixture of glandular and eglandular hairs (except with eglandular hairs only in *G. maculatum*).
    - 4 Pedicels with eglandular hairs only; petals 11-16 mm long; [native, common in much of our area (and also sometimes cultivated)].....***G. maculatum***
    - 4 Pedicels with a mixture of glandular and eglandular hairs; petals **either 6-9 or 12-29 mm long**; [alien, rare and in disturbed situations].
      - 5 Fruit 30-37 mm long; petals 12-24 mm long.....***G. pratense***
      - 5 Fruit 14-27 mm long; petals **either 6-9 mm long or 15-29 mm long**.
      - 6 Petals 15-29 mm long; mericarp callus absent; fruits 15-27 mm long.....***G. ibericum***

- 6 Petals 6-9 mm long; mericarp callus present; fruits 14-20 mm long ..... *G. thunbergii*
- 1 Annual, from a taproot.
- 7 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 9-14 mm long; [rare in our area, mainly northward]; [subgenus *Robertium*, section *Robertium*] ..... *G. robertianum*
- 7 Leaves dissected, but not compound, all segments interconnected by leaf tissue; petals 2-10 mm long; [collectively common and widespread in our area].
- 8 Sepals blunt or acute, or terminating in a minute callus tip (mucro) < 0.3 mm long; [subgenus *Robertium*, section *Batrachioidea*].
- 9 Mericarps appressed pubescent across the surface, 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*
- 9 Mericarps glabrous across the surface (slightly to densely ciliate at the base), **either** reticulately ridged **or** not; 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).
- 10 Mericarps not reticulately ridged ..... *G. aequale*
- 10 Mericarps reticulately ridged ..... *G. molle*
- 8 Sepals awned or subulate, the subulate awn 0.7-3 mm long.
- 11 Mature pedicels < 1.5× as long as the calyx.
- 12 Mericarps with spreading hairs about 0.5 mm long, these often gland-tipped; [subgenus *Geranium*, section *Dissecta*] ..... *G. dissectum*
- 12 Mericarps with long appressed hairs about 1 mm long, these not gland-tipped; [subgenus *Geranium*, section *Geranium*] ..... *G. carolinianum*
- 11 Mature pedicels > 2× as long as the calyx; [subgenus *Geranium*, section *Geranium*].
- 13 Pedicels glandular-villous ..... *G. bicknellii*
- 13 Pedicels retrorsely strigose ..... *G. columbinum*

\* *Geranium aequale* (Babington) Aedo. Disturbed areas; native of w. Europe. April-June. Reported by Aedo (2012) for nc. KY, Coastal Plain of NJ, and other areas north of our area. [= K2, Z; = *G. molle* Linnaeus var. *aequale* Babington]

*Geranium bicknellii* Britton, Northern Cranebill, Bicknell's Crane's-bill. Open woods and clearings. June-September. NL (Newfoundland) and AK south to PA, WV, IN, IL, MO, CO, UT, and CA; previous reports for TN (Davidson and Johnson counties) are based on misidentifications (Wofford, pers. comm. 2011). [= C, G, K1, K2, Pa, W, Z; > *G. bicknellii* var. *bicknellii* - F]

*Geranium carolinianum* Linnaeus, Carolina Crane's-bill. Fields, roadsides, lawns, pastures, gardens, disturbed areas. March-June (and sometimes later). MA, MI, WY, and BC south to FL, CA, and n. Mexico (and introduced in various places in the Old and New World). Varieties are sometimes recognized, with two in our area: var. *carolinianum*, with the inflorescence diffusely corymbiform (because of long upper internodes), mostly 4-12-flowered, and pubescence of the stem mostly < 0.5 mm long, and var. *confertiflorum*, with the inflorescence a compact corymb (because of notably short upper internodes), mostly 5-25-flowered, and pubescence of the stem mostly > 0.75 mm long. [= Pa, RAB, S, W, WH, WV, Z; > *G. carolinianum* var. *carolinianum* - C, F, G; > *G. carolinianum* var. *confertiflorum* Fernald - C, F, G; > *G. carolinianum* var. *carolinianum* - K1, K2]



\* *Geranium columbinum* Linnaeus, Long-stalk Crane's-bill. Roadsides, pastures, disturbed areas; native of Europe. May-July. [= RAB, C, F, G, K1, K2, Pa, S, W, WV, Z]

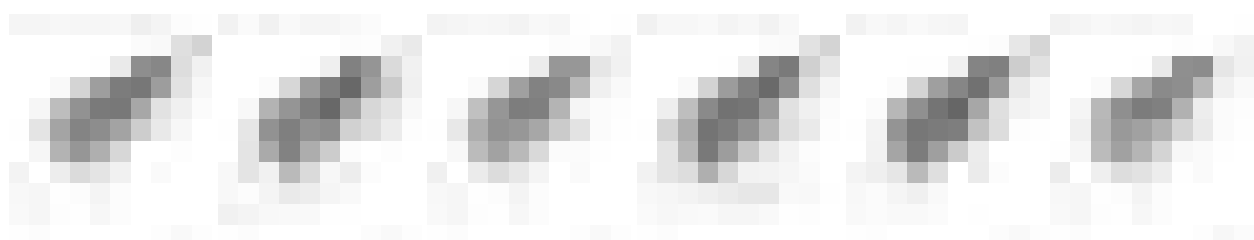
\* *Geranium dissectum* Linnaeus, Cutleaf Crane's-bill. Roadsides, pastures, disturbed areas; native of Europe, c. Asia, n. Africa. April-July. [= RAB, C, F, G, K1, K2, Pa, S, W, WV, Z]

\* *Geranium ibericum* Cavanilles, Iberian Crane's-bill. Spread from horticultural use; native of Europe. Recently found in Great Smoky Mountains National Park, in both NC and TN (K. Langdon, pers. comm.). [= F, K, Z; ? *G. nepalense* - C] {not yet keyed}

*Geranium maculatum* Linnaeus, Wild Geranium. Cove forests, bottomland forests, other mesic, base-rich forests. April-June (and rarely later). ME west to MB, south to SC, GA, FL Panhandle (Gadsden County) (Kunzer et al. 2009) and ne. OK. Sometimes cultivated. [= RAB, C, F, G, K1, K2, Pa, S, W, WV, Z]

\* *Geranium molle* Linnaeus, Dove's-foot Crane's-bill. Roadsides, pastures, disturbed areas; native of Europe and w. Asia. April-July. Reported for MS (Majure et al. 2011). [= RAB, C, F, G, K1, K2, Pa, S, W, WV, Z]

\* *Geranium pratense* Linnaeus, Meadow Crane's-bill. Disturbed areas; native of Eurasia. June-July. Reported for MD (Prince Georges County) (Kartesz 2010). [= C, F, G, K2, Z]



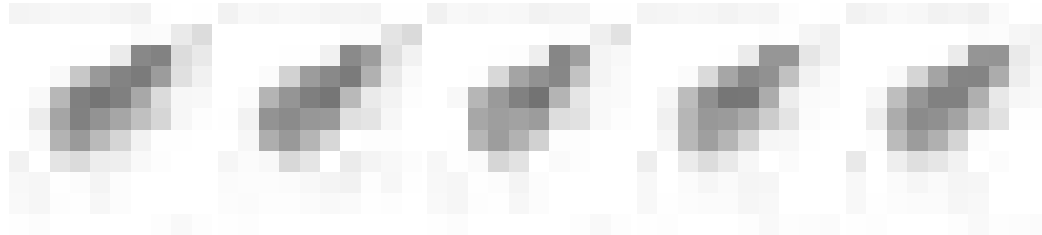
\* ***Geranium pusillum*** Linnaeus, Small-flowered Crane's-bill. Roadsides, pastures, disturbed areas; native of Europe, c. Asia, and n. Africa. May-June. [= RAB, C, G, K1, K2, Pa, S, W, WV, Z]

\* ***Geranium robertianum*** Linnaeus, Herb Robert. Rocky woodlands, especially over calcareous rocks. June-October. NF west to MB, south to e. MD, w. VA, e. WV, IL, and MN; also in Europe, c. Asia, and n. Africa. Considered by some authors (such as C and G) to be introduced in North America, but apparently native based on its occurrence in remote and high quality natural communities. [= C, F, G, K1, Pa, W, WV, Z; = *G. robertianum* ssp. *robertianum* – K2]

\* ***Geranium sanguineum*** Linnaeus, Blood-red Crane's-bill. Roadbanks, roadsides, persistent or spread from cultivation; native of Europe. [= C, F, G, K1, K2, Z] {not yet keyed; add to synonymy}

\* ***Geranium sibiricum*** Linnaeus. Disturbed areas, roadsides; native of Eurasia. July-September. Naturalized south to s. PA (Rhoads & Klein 1993; Rhoads & Block 2007). [= C, F, K1, K2, Z]

\* ***Geranium thunbergii*** Siebold & Zuccarini ex Lindley & Paxton. Field edges, disturbed areas, lawn along Blue Ridge Parkway; native of e. Asia. Reported for NC by Nesom (2000) on the basis of a 1936 specimen. [= K, Pa, Z; ? *G. ibericum* Cavanilles – C, apparently misapplied; = *G. nepalense* Sweet var. *thunbergii* (Siebold & Zuccarini ex Lindley & Paxton) Kudo – F, G]



**219. LYTHRACEAE** J. St.-Hilaire 1805 (Loosestrife Family) [in MYRTALES]

A family of about 27-35 genera and about 600 species, herbs, shrubs, and trees, primarily tropical (a few warm temperate).

References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007). Keys adapted, in large part, from Z. [including *PUNICACEAE* and *TRAPACEAE*]

- 1 Plant woody or suffrutescent, a shrub or a small tree 1-10 m tall; petals present, showy, 8-20 mm long.
  - 2 Aquatic shrubs with arching suffrutescent or woody stems; leaves opposite or whorled; [native] .....*Decodon*
  - 2 Terrestrial shrubs or small trees with erect woody stems; leaves alternate to subopposite; [aliens cultivated and sometimes persistent].
  - 3 Flowers in many-flowered terminal or axillary panicles; fruit a loculicidal capsule .....*Lagerstroemia*
  - 3 Flowers solitary or several in terminal or axillary clusters; fruit a leathery berry (pomegranate).....*Punica*
- 1 Plant not woody, an herb 0.1-1.2 m tall; petals absent or present, inconspicuous or showy, 1-10 mm long.
  - 4 Fruit with 2-4 prominent spines; leaves coarsely toothed..... *Trapa*
  - 4 Fruit not spinose; leaves entire.
    - 5 Stems pubescent.
      - 6 Floral tube (hypanthium) swollen obliquely at its base; capsule dehiscing longitudinally along the upper surface.....*Cuphea*
      - 6 Floral tube (hypanthium) symmetrical; capsule dehiscing septically at the apex.....*Lythrum*
    - 5 Stems glabrous.
      - 7 Floral tube cylindrical to turbinate, about 2× as long as wide.....*Lythrum*
      - 7 Floral tube campanulate to globose, about 1× long as wide.
      - 8 Flowers or fruits (1-) 3-10 in the leaf axils (at least some axils with 2 or more flowers or fruits on a given plant).....*Ammannia*
      - 8 Flowers or fruits solitary in the leaf axils (never > 1 per axil).
        - 9 Capsule indehiscent; petals 0; sepals 4, broadly triangular, lacking intersepaly appendages; seeds spatulate or oblanceolate, about 1 mm long, minutely granular on one face and smooth on the other.....*Didiplis*
        - 9 Capsule dehiscing septically; petals 4; sepals 4 (-6), triangular, with intersepaly appendages of size about equal to the calyx lobes; seeds hemispheric, about 0.3 mm long, the surface very finely reticulate .....*Rotala*

***Ammannia*** Linnaeus 1753 (Toothcup)

A genus of about 80 species, herbs, cosmopolitan. The circumscription of the genus here includes *Nesaea* and *Hionanthera*, following Graham, Diazgranados, & Barber (2011) and Graham (2007). References: Graham (1985)=Y; Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007). Key based in part on Y.

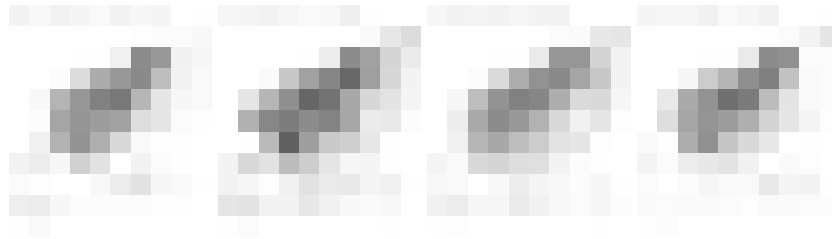
- 1 Style included (when in fruit), thick, 0.5-1.0 mm long (much shorter than the ovary); calyx lobes obtuse, often with the apices minutely mucronate; petals 0, 1, or 4, pale pink to white, to 1 mm long and 1 mm wide ..... *A. latifolia*
- 1 Style exerted (when in fruit), filiform, 1.5-3.0 mm long (equal to or longer than the ovary); calyx lobes triangular, with acute apices; petals 4 (-5), deep rose-purple or pale lavender, ca. 2 mm long and 2 mm wide.
  - 2 Inflorescence usually a short- or long-pedunculate cyme (sometimes reduced); flowers usually > 3 per axil; petals deep rose-purple; fruits 3.5-5 mm in diameter ..... *A. coccinea*
  - 2 Inflorescence sessile; flowers usually 1-3 per axil; petals pale lavender; anthers yellow; fruits 4-6 mm in diameter ..... *A. robusta*

*Ammannia auriculata* Willdenow, Eared Redstem. Swamps, ditches, other wetlands. May-July. MS, LA, SD, NM, and AZ, south to TX and Mexico. [= GW, K2, Y, Z] {not yet keyed}

*Ammannia coccinea* Rottbøll. Marshes, ditches, exposed muddy river shores and banks, wet pine flatwoods, other wet places. July-October. NJ, OH, IN, IL, IA, and SD south to s. FL and TX; disjunct in CA; south through Mexico and Central America to n. South America. [= RAB, C, K1, K2, Pa, W, WH, Y; > *A. coccinea* ssp. *purpurea* (Lamarck) Koehne - G; < *A. coccinea* - F, GW, S, Z]

*Ammannia latifolia* Linnaeus, Pink Redstem. Tidal marshes, wet places, ditches. July-September. NJ south to s. FL and west to TX (mostly on the Coastal Plain), and also in the West Indies, Yucatan, Central America, and South America. All plants in North America north of Florida have flowers with petals; most plants from FL south through the West Indies into Central and South America have flowers without petals. Graham (1985) considered these forms; additional study is warranted. The name *A. koehnei* Britton is available for the petaliferous North American plant should its recognition prove warranted. [= C, GW, K1, K2, W, WH, Y, Z; > *A. teres* Rafinesque - RAB, G; > *A. teres* var. *teres* - F; > *A. teres* var. *exauriculata* (Fernald) Fernald - F; > *A. latifolia* - S; > *A. koehnei* Britton - S]

*Ammannia robusta* Heer & Regel, Grand Redstem. Marshes, ditches, swamps. OH and BC south to w. KY, w. TN, LA, TX, CA, Mexico, and Belize; West Indies; introduced in NJ and n. South America. [= C, K1, K2, Y; < *A. coccinea* - F, GW, S, Z]



*Cuphea* P. Browne 1756 (Waxweed)

A genus of about 260 species, herbs, of America, primarily tropical and subtropical. References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007).

- 1 Leaves whorled (at least in part); pedicels > 10 mm long; [flatwoods of FL Panhandle]..... *C. aspera*
- 1 Leaves opposite (none whorled); pedicels < 3 mm long; [collectively widespread].
  - 2 Floral tube green, 4.5-6 mm long, glabrous inside; stamens much shorter than the floral tube; petioles to 8 mm long, often very short ..... *C. carthagenensis*
  - 2 Floral tube purple-green, 6-10 mm long, villous inside; stamens equal to or exceeding the floral tube; petioles to 20 mm long ..... *C. viscosissima*

*Cuphea aspera* Chapman, Apalachicola Waxweed. Flatwoods. Endemic to the FL Panhandle (Franklin, Gulf, and Calhoun counties). [= K, WH, Z; = *Parsonia lythroides* Small - S]

\* *Cuphea carthagenensis* (Jacquin) J.F. Macbride, Colombian Waxweed. Marshes, ditches, floodplain forests, wet hammocks, other wet places; native of South America. June-September. [= GW, K, WH, Z; = *C. carthagenensis* - RAB (a misspelling); = *Parsonia balsamona* (Chamisso & Schlechtendal) Standley - S]

\* *Cuphea procumbens* Gómez Ortega is reported for NC by Small (1933). Graham (1975) considers this Mexican species to be represented in se. United States only by "garden escapes that do not persist." [= K, Z; = *Parsonia procumbens* (Gómez Ortega) Heller - S] {not keyed; not mapped}

*Cuphea viscosissima* Jacquin. Dry or wet places, especially over mafic or calcareous rocks. July-October. NH west to IA and KS, south to c. GA, LA, and e. OK. [= RAB, C, GW, K, Pa, W, WV, Z; = *C. petiolata* (Linnaeus) Koehne - F, G; = *Parsonia petiolata* (Linnaeus) Rusby - S]

*Decodon* J.F. Gmelin 1791 (Water-oleander, Water-willow)

A monotypic genus, a weak shrub, endemic to e. North America (more widespread in the fossil record). References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007).

*Decodon verticillatus* (Linnaeus) Elliott, Water-oleander, Water-willow, Swamp Loosestrife, Peatweed. Natural lakes, limesink ponds, peatlands, peaty swamps, not known in the Piedmont or Mountains of NC or SC, but scattered in the Ridge and

Valley of VA. July-September. NS, ON, and MN south to c. peninsular FL and e. TX. The lower stems are spongy in texture. [= RAB, GW, K, Pa, S, W, WH, WV, Z; > *D. verticillatus* var. *verticillatus* – C, F, G; > *D. verticillatus* var. *laevigatus* Torrey & Gray – C, F, G]

***Didiplis* Rafinesque 1833 (Water-purslane)**

A monotypic genus, an herb, endemic to e. North America. References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007).

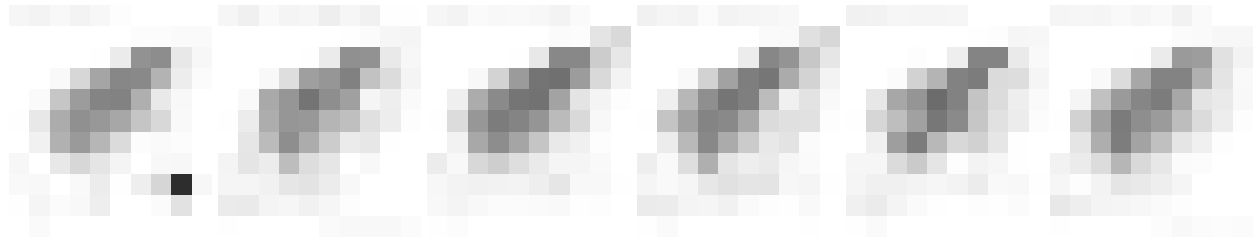
**Identification notes:** See Horn (2011) for discussion of the submersed and emersed leaf forms of *Didiplis*, and how to distinguish them from superficially similar species.

***Didiplis diandra*** (Nuttall ex A.P. de Candolle) Wood, Water-purslane. Stagnant water of pools, streams, and old beaverponds. April-August. Se. VA, IN, and WI south to NC, SC, MS, and LA; disjunct in s. peninsular FL (Wunderlin & Hansen 2008). [= C, G, GW, K, S, WH, Z; = *Peplis diandra* Nuttall ex A.P. de Candolle – RAB, F]

***Lagerstroemia* Linnaeus 1759 (Crape-myrtle)**

A genus of 53-56 species, trees, of tropical se. Asia and Australia. References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007).

\* ***Lagerstroemia indica*** Linnaeus, Crape-myrtle. Commonly cultivated, persistent around old plantings, weakly spreading; native of Asia. June-September. Reported as escaping in DC (Steury 2011). [= C, K, S, WH, Z]



***Lythrum* Linnaeus 1753 (Loosestrife)**

A genus of about 36 species, herbs, cosmopolitan. References: Graham (1975)=Z; Haines (2010)=Y; Graham in Kubitzki, Bayer, & Stevens (2007).

- 1 Flowers numerous in terminal spike-like thyrses; stamens usually 12; leaves opposite or whorled.....***L. salicaria***
- 1 Flowers solitary or paired in axils; stamens usually (4-) 6; leaves opposite or alternate.
- 2 Annual; flowers present in nodes more-or-less throughout the plant; flowers homostylous, all alike, the stamens always included.....***L. hyssopifolia***
- 2 Perennial by basal stoloniferous outshoots; flowers present only only at upper nodes; flowers heterostylous (either with an exerted style and included stamens, or vice versa)
- 3 Leaves opposite throughout, mostly shorter than to as long as the internodes, 1-4 mm wide.....***L. lineare***
- 3 Leaves opposite below, alternate above, mostly longer than the internodes, 2-14 mm wide.
- 4 Floral tube 3-4 mm long; petals 2-3 mm long; calyx appendages about the same length as the calyx lobes; branch leaves abruptly and definitely reduced in size relative to the stem leaves, and widely spaced; [of sw. GA southward].....***L. curtissii***
- 4 Floral tube 5-6 mm long; petals 5-6 mm long; calyx appendages about 2× as long as the calyx lobes; branch leaves gradually reduced relative to the stem leaves, dense and overlapping; [collectively widespread in our area].
- 5 Leaves ovate to lanceolate, widest at a point 1/6 to 1/2 of the way from the base to the apex, the base rounded to subcordate; stems mostly slender, to 8 dm tall; bracteoles mostly at the base of the pedicel.....***L. alatum***
- 5 Leaves lanceolate to linear-lanceolate, widest at a point 1/3 to 2/3 of the way from the base to the apex, the base cuneate, often narrowly so; stems stout, to 13 dm tall; bracteoles mostly on the upper pedicel, immediately below the floral tube .....***L. lanceolatum***

***Lythrum alatum*** Pursh, Northern Winged Loosestrife. Calcareous meadows, marl fens, and disturbed wet calcareous places. June-September. ME, NY, MI, and ND south to sc. VA, e. TN, nw. GA, n. AL, n. AR, ne. OK, and CO. [= F, Pa, S, W, WV; = *L. alatum* var. *alatum* – C, G, GW, K, Z; = *L. alatum* ssp. *alatum* – Y]

***Lythrum curtissii*** Fernald, Curtiss's Loosestrife. Calcareous swamps, seepage areas. June-early September. Sw. GA south to Panhandle FL, and disjunct in ne. FL; the report from Emanuel County, GA (Jones & Coile 1988) is in error. [= GW, K, S, WH, Z]

\*? ***Lythrum hyssopifolia*** Linnaeus, Annual Loosestrife. Salt marshes, other wet soils; probably only adventive from Eurasia, but sometimes interpreted as native from ME to NJ. June-September. [= C, F, G, K, Pa]

***Lythrum lanceolatum*** Elliott, Southern Winged Loosestrife. Moist to wet places. May-September. Se. VA, se. NC, SC, GA, AL, MS, n. AR, and OK south to s. FL, s. TX, and in the West Indies. Although Graham (1975) argues that *L. lanceolatum*

should be reduced to a variety of *L. alatum*, her evidence can also be interpreted as warranting specific status. [= RAB, F, S; = *L. alatum* Pursh var. *lanceolatum* (Elliott) Torrey & A. Gray ex Rothrock – C, G, GW, K, WH, Z; = *L. alatum* ssp. *lanceolatum* (Elliott) A. Haines – Y]

***Lythrum lineare*** Linnaeus, Narrowleaf Loosestrife, Wand Loosestrife. Nearly fresh, brackish, and saline marshes. July-October. NJ south to s. FL and west to TX. [= RAB, C, F, G, GW, K, S, WH, Z]

\* ***Lythrum salicaria*** Linnaeus, Purple Loosestrife. Swamps, marshes, other wet places; native of Eurasia. June-September. An extremely noxious weed in the ne. United States, aggressively colonizing and coming to dominate a wide variety of freshwater wetlands, sometimes to the near exclusion of native vegetation. [= RAB, C, G, K, Pa, W, WV, Z; > *L. salicaria* var. *salicaria* – F; > *L. salicaria* var. *gracilior* Turczaninow – F; > *L. salicaria* var. *tomentosum* (P. Miller) A.P. de Candolle – F]



***Punica*** Linnaeus 1753 (Pomegranate)

A genus of 2 species, trees, of Mediterranean Europe and w. Asia. Sometimes treated in the monogeneric family Punicaceae; here included in Lythraceae, following Angiosperm Phylogeny Group (2003, 2009); *Punica* is deeply embedded phylogenetically in Lythraceae (Graham, Diazgranados, & Barber 2011). References: Zohary & Hopf (1994); Graham in Kubitzki, Bayer, & Stevens (2007).

\* ***Punica granatum*** Linnaeus, Pomegranate. Suburban areas, cultivated and at least persistent; native of Mediterranean Europe. Reported as cultivated on Hatteras Island (Dare County, NC) (Brown 1959). This species has been cultivated in the Old World for at least five millenia. [= K, S]

***Rotala*** Linnaeus 1771 (Toothcup)

A genus of about 44 species, wetland herbs, of temperate to tropical areas, closely related to *Didiplis*. References: Graham (1975)=Z; Graham in Kubitzki, Bayer, & Stevens (2007).

- 1 Leaves linear to oblanceolate, > 3× as long as wide ..... ***R. ramosior***
- 1 Leaves broadly elliptical to orbicular, < 1.5× as long as wide ..... ***R. rotundifolia***

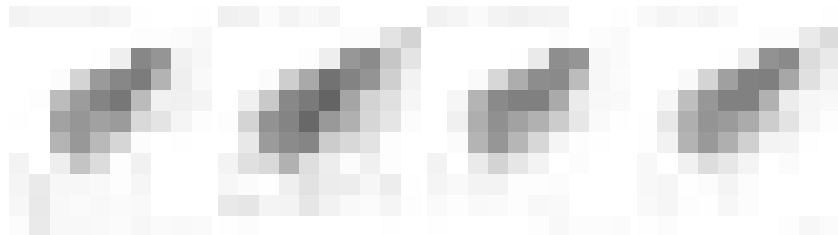
***Rotala ramosior*** (Linnaeus) Koehne, Toothcup. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA): marshes, ditches, exposed drawdown muds and silts; common (uncommon in VA Mountains). June-October. VT, NY, ON, MI, WI, MN, SD, MT, and BC, south to s. FL, TX, AZ, CA, and south through Mexico to Central America and , South America; West Indies. [= RAB, C, GW, K, Pa, S, W, WH, Z; > *R. ramosior* var. *ramosior* – F, G; > *R. ramosior* var. *interior* Fernald & Griscom – F, G]

\* ***Rotala rotundifolia*** (Buchanan-Hamilton) Koehne, Dwarf *Rotala*, Roundleaf Toothcup. Disturbed wet areas, perhaps just a waif; native of Asia. March-August. [= K2, WH]

***Trapa*** Linnaeus 1753 (European Water-chestnut)

A genus of 1 highly polymorphic or up to 45 more narrowly defined species, annual aquatic herbs, native of the Old World. Often placed in a monogeneric family, Trapaceae, but *Trapa* is deeply embedded phylogenetically in Lythraceae (Graham, Diazgranados, & Barber 2011). References: Angiosperm Phylogeny Group (2003, 2009); Graham in Kubitzki, Bayer, & Stevens (2007).

\* ***Trapa natans*** Linnaeus, European Water-chestnut, Water-caltrop. Cp (DE, VA), Pd (VA): farm ponds and other stagnant or slow-moving water; rare, native of Eurasia and Africa. June-September. [= C, F, G, K, Pa]



220. *ONAGRACEAE* A.L. de Jussieu 1789 (Evening-primrose Family) [in MYRTALES]

A family of about 18 genera and 655 species, herbs, shrubs, and rarely trees, cosmopolitan (especially of temperate and subtropical America). References: Wagner, Hock, & Raven (2007); Munz (1965)=X; Crisci et al. (1990).

- 1 Flowers 2-merous, the petals white; fruits with uncinat trichomes; leaves opposite, decussate, borne spreading at right angles to the stem, mostly ovate, on petioles mostly 0.5-8 cm long; [subfamily *Onagroideae*; tribe *Circeae*] .....2. *Circaea*
- 1 Flowers (3-) 4 (-7)-merous, the petals yellow, pink, or white (or absent); fruits lacking uncinat trichomes; leaves alternate (rarely opposite), not decussate, usually ascending or appressed (rarely spreading at right angles to the stem), mostly lanceolate, mostly sessile or subsessile.
  - 2 Fruit indehiscent; seeds 1-6 per capsule, 1.5-3.5 mm long; [subfamily *Onagroideae*; tribe *Onagreae*] .....5. *Oenothera*
  - 2 Fruit dehiscent; seeds (10-) 50-many per capsule, 0.3-2 mm long.
    - 3 Seeds with an elongate coma at one end (wind-dispersed); petals pink or white; [subfamily *Onagroideae*; tribe *Epilobieae*].
      - 4 Leaves all alternate; flowers numerous in a terminal raceme (with small bracts); flower buds reflexed, the flowers held horizontally or ascending; petals 10-20 mm long; stigma 4-lobed; plants 10-30 dm tall .....3. *Chamerion*
      - 4 Leaves all or at least the lowermost opposite; flowers few, axillary, or in poorly developed, leafy racemes; flower buds not reflexed, the flowers ascending; petals 2-8 mm long (except 10-15 mm long in *E. hirsutum*); stigma capitate (except 4-lobed in *E. hirsutum*); plants 1-20 dm tall .....4. *Epilobium*
    - 3 Seeds not comose (gravity-dispersed); petals yellow or absent (rarely white or pink).
      - 5 Calyx tube not extended beyond the summit of the ovary; sepals persistent on the capsule (rarely deciduous); stamens 4, 8, or 10-14; petals yellow or absent; [primarily of wetlands]; [subfamily *Ludwigioideae*] .....1. *Ludwigia*
      - 5 Calyx tube extended beyond the summit of the ovary; sepals deciduous; stamens 8; petals yellow (rarely pink or white); [primarily of uplands]; [subfamily *Onagroideae*; tribe *Onagreae*] .....5. *Oenothera*

1. *Ludwigia* Linnaeus 1753 (Seedbox, Water-primrose, Water-purslane)

A genus of about 82 species, herbs and shrubs, cosmopolitan. References: Wagner, Hoch, & Raven (2007)=U; Peng (1989)=Z; Munz (1965)=X; Nesom & Kartesz (2000)=Q; Zardini, Gu, & Raven (1991)=V; Peng (1984, 1986, 1988); Peng & Tobe (1987); Raven (1963); Munz (1938, 1944); Eyde (1977, 1978, 1981); Raven & Tai (1979); Duke (1955). Key based in part on GW, Z, and Q.

**Identification notes:** Many natural hybrids are known, not necessarily in our area. Hybrids are generally recognizable from their intermediate morphology and usual association with their two parents. However some hybrids resemble one parent much more than the other, and some hybrids are found in populations independent (and even disjunct) from one or both parents. Allopolyploidy may have had a major role in the evolution of this genus, especially section *Microcarpum*, which has a majority of polyploid species.

- 1 Leaves opposite; plants creeping (rooting at the nodes); [section *Dantia*] .....Key A
- 1 Leaves alternate; plants erect or ascending (not rooting at the nodes), or creeping (rooting at the nodes).
  - 2 Stamens 8-14; sepals 4-7; petals 4-7; [of various habits, including annual and perennial herbs and shrubs, variously erect, ascending, creeping, or forming floating mats] .....Key B
  - 2 Stamens 4; sepals 4; petals 0-4; [perennial herbs, with erect ascending flowering stems] .....Key C

Key A – *Ludwigia* with opposite leaves

- 1 Pedicels of flowers and fruits 5-35 mm long.
  - 2 Petals 7-11 mm long; pedicels of capsules 15-35 mm long, longer than the leaves ..... *L. arcuata*
  - 2 Petals 4-5 mm long; pedicels of capsules 5-16 mm long, shorter than to equaling the leaves ..... *L. brevipes*
- 1 Pedicels of flowers and fruits 0-3 mm long.
  - 3 Stems, leaves, capsules, and calyx densely hirsute; seeds dark reddish-brown, 0.3-0.4 mm long ..... *L. spatulata*
  - 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, 4-7 sepals, and 4-7 petals

- 1 Sepals 4; stamens 8; seeds in 2-several vertical series in each locule, free of endocarp tissue.
  - 2 Internodes of the stem conspicuously winged on the angles by 2 decurrent wings running down from each leaf base; petals 0.6-1.2 cm long; capsule 1.0-2.0 cm long, 4-angled or 4-winged; [section *Pterocaulon*] ..... *L. decurrens*
  - 2 Internodes of the stem not winged on the angles (or very faintly so); petals 1.0-5.0 cm long; capsule (1.5-) 2-5 cm long, obtusely 4-angled; [section *Macrocarpon*].
    - 3 Petals (1.5-) 3-5 cm long; sepals ca. 10 mm wide at base ..... *L. bonariensis*
    - 3 Petals 1-2 cm long; sepals 3-5 mm wide at base ..... *L. octovalvis*
- 1 Sepals 5 (-7); stamens 10 (-14); seeds in 1 vertical series in each locule, loosely embraced or embedded in endocarp tissue.
  - 4 Stems erect; floral tube much longer than the pedicel; seeds loosely embraced by a corky, horseshoe-shaped segment of endocarp; [section *Seminuda*] ..... *L. leptocarpa*

- 4 Stems (at least the lower portions) decumbent, creeping, or floating in mats (the flowering stems more-or-less erect in *L. grandiflora* and *L. hexapetala*); floral tube much shorter than the pedicel; seeds embedded in the woody endocarp; [section *Oligospermum*].
- 5 Flowering stems decumbent, floating, or creeping; stem and leaves glabrous or glabrescent; petals mostly 1-1.5 cm long; anthers 1-1.7 mm long.....*L. peploides* var. *glabrescens*
- 5 Flowering stems more-or-less erect; stem and leaves sparsely to densely pubescent with long soft hairs; petals (1.2-) 1.6-3 cm long; anthers 2.5-3.5 mm long.
- 6 Sepals (6-) 8-11 (-14) mm long; primary leaves 5-8.5 cm long, 7-11 mm wide, usually linear-lanceolate, usually widest below the middle; petals (1.2-) 1.6-2.0 (-2.6) cm long; style 4.7-6.7 (-8.2) mm long; stems densely villous.....*L. grandiflora* ssp. *grandiflora*
- 6 Sepals (8-) 12-19 mm long; primary leaves 5.5-13 cm long, 9-18 mm wide, usually narrowly elliptic to oblanceolate, usually widest above the middle; petals (1.5-) 2.0-2.9 (-3) cm long; style (5.8-) 6-10 mm long; stems sparsely to densely villous (rarely glabrous) ....  
.....*L. grandiflora* ssp. *hexapetala*

**Key C – *Ludwigia* with alternate leaves, 4 stamens, 4 sepals, and 0-4 petals**

- 1 Pedicels 2-15 mm long; capsules subglobose to spheric or cubic, about as long as wide, box-like, 4-angled, dehiscence by an apical pore (later sometimes also irregularly loculicidal); petals present, 4-15 mm long, persistent or caducous; roots fascicled, fusiform, tuberous; plants lacking basal, stoloniform shoots; [section *Ludwigia*].
- 2 Leaves cuneate at base; pedicels 2-5 mm long; nectary discs at base of style flattish, inconspicuous; [widespread in our area, in a wide variety of habitats].....*L. alternifolia*
- 2 Leaves rounded or truncate at base; pedicels 4-15 mm long; nectary discs at base of style domed, prominent; [nearly restricted to the Coastal Plain, primarily of pinelands].
- 3 Styles 6-10 mm long; plants glabrous, glabrescent, or pubescent with very short hairs; sepals strongly reflexed in fruit .....*L. virgata*
- 3 Styles 1.5-3 mm long; plants glabrescent or pubescent with short to long, spreading to shaggy hairs; sepals strongly reflexed, spreading, or ascending in fruit.
- 4 Sepals narrowly deltoid, broadest at or near the base, 3-4× as long as wide, ascending or spreading in fruit; plants glabrescent to hirtellous with long spreading hairs.....*L. hirtella*
- 4 Sepals ovate, broadest near the middle, ca. 2× as long as wide, strongly reflexed in fruit; plants pubescent with relatively short, appressed to spreading hairs .....*L. maritima*
- 1 Pedicels 0-1 (-5) mm long; capsules subglobose, obconic, or obpyramidal, about as long as wide or longer than wide, circular to quadrangular in cross-section, dehiscence irregularly loculicidal; petals absent or present, if present (*L. linearis*, *L. linifolia*) then 0-6 mm long and caducous; roots fibrous or rhizomatous; plants frequently with basal, stoloniform shoots; [section *Microcarpum*].
- 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 cylindrical, 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 parquet 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 parquet floor); [of the Coastal Plain of GA, NC, SC, and VA in our area]..... *L. sphaerocarpa*

*Ludwigia alata* Elliott, Winged Seedbox. Interdune ponds, freshwater to slightly brackish (oligohaline) marshes; rare. June-September. Se. VA south to s. FL, west to se. LA; disjunct in Jamaica. This species is a hexaploid ( $n = 24$ ). One third of the genome of *L. alata* is apparently derived from *L. microcarpa* or its ancestor (Peng 1988). [= RAB, C, F, G, K, U, Z; > *L. alata* - GW (also see *L. lanceolata*); > *L. alata* - S; > *L. simulata* Small - S]

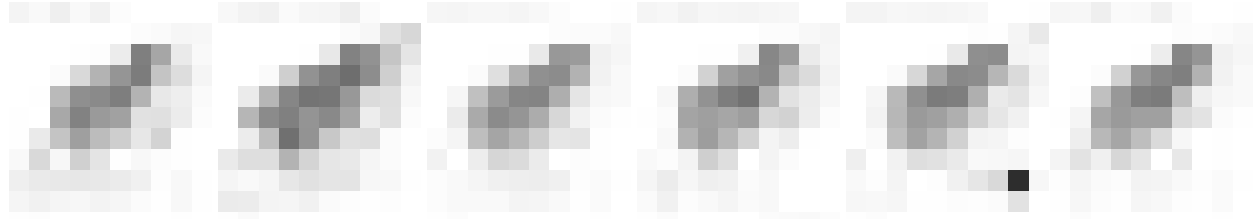
*Ludwigia alternifolia* Linnaeus, Alternate-leaf Seedbox. Ditches, marshes, open wet places, disturbed wet places. May-October. MA west to s. ON, s. MI, IA, and KS, south to n. FL and e. TX. [= RAB, G, GW, K, Pa, S, U, W; > *L. alternifolia* var. *alternifolia* - C, F, WV; > *L. alternifolia* var. *pubescens* E.J. Palmer & Steyermark - C, F; > *L. alternifolia* var. *linearifolia* Britton - WV]

*Ludwigia arcuata* Walter. Marshes or submerged in water of natural Coastal Plain ponds. June-September. SC south to s. FL, west to Panhandle FL and s. AL. [= RAB, GW, K, U; = *Ludwigiantha arcuata* (Walter) Small - S]

\* *Ludwigia bonariensis* (M. Micheli) Hara. Freshwater tidal marshes and adjacent disturbed areas; apparently native of tropical America. June-September. Locally abundant in disturbed edges of freshwater tidal marshes near Wilmington, NC, perhaps introduced on ship's ballast. Material from Wilmington apparently has larger flowers than material of *L. bonariensis* elsewhere; its source and appropriate taxonomic treatment uncertain and needing further study. First reported for SC by Leonard (1971b). [= RAB, GW, K, U; = *Jussiaea neglecta* Small - S]

*Ludwigia brevipes* (B.H. Long ex Britton, A. Braun, & Small) Eames, Long Beach Seedbox, Coastal Plain Water-purslane. Pondshores, blackwater rivers, interdunal swales, borrow ponds, ditches, impoundments, marshes. July-October. NJ south to e. GA (Jones & Coile 1988), in the Coastal Plain. [= RAB, C, F, G, GW, K, U]

*Ludwigia curtisii* Chapman, Curtiss's Seedbox. Pine savannas, flatwoods. [= GW, K1, K2; > *L. curtisii* - S; > *L. simpsonii* Chapman - S; > *L. spathulifolia* Small - S] {add to key}



*Ludwigia decurrens* Walter, Wingstem Water-primrose. Swamp forests, ditches. 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, Pa, U, W; = *Jussiaea decurrens* (Walter) A.P. de Candolle - F, G, S, WV]

*Ludwigia glandulosa* Walter, Small-flowered Seedbox. Low forests, marshes, ditches. June-September. E. MD south to n. FL, west to e. TX, north in the interior to c. TN, w. KY, s. IN, s. IL, se. MO, c. AR, and se. OK, primarily on the Southeastern Coastal Plain. A related species, treated by Peng as *L. glandulosa* ssp. *brachycarpa* (Torrey & A. Gray) Peng, ranges from sw. LA north and west to s. OK and c. TX. This species is tetraploid ( $n = 16$ ). [< *L. glandulosa* - RAB, C, F, G, GW, S; = *L. glandulosa* ssp. *glandulosa* - K, U, Z]

\* *Ludwigia grandiflora* (Michaux) Greuter & Burdet ssp. *grandiflora*, Showy Water-primrose. Ponds, lakes, sluggish waters of ditches or streams. May-September. Se. SC south to FL, west to TX; disjunct in MO, Guatemala, and in s. South America. This taxon is hexaploid ( $n = 24$ ). See Zardini, Gu, and Raven (1991) and Nesom & Kartesz (2000) for additional information. [= Q; < *L. uruguayensis* (Cambessedes) Hara - RAB, C, GW, K; = *L. grandiflora* (Michaux) Zardini, Gu, & Raven - U, V]

*Ludwigia grandiflora* (Michaux) Greuter & Burdet ssp. *hexapetala* (Hooker & Arnott) Nesom & Kartesz, Common Water-primrose. Ponds, lakes, sluggish waters of ditches or streams. 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, Pa, W; < *Jussiaea uruguayensis* Cambessedes - F, G, WV; ? *Jussiaea michauxiana* Fernald - F; = *L. hexapetala* (Hooker & Arnott) Zardini, Gu, & Raven - U, V]

*Ludwigia hirtella* Rafinesque, Rafinesque's Seedbox. Savannas, rarely in mountain bogs. June-September. S. NJ south to Panhandle FL, west to e. TX, north in the interior to KY, c. TN, AR, and se. OK. [= RAB, C, F, G, GW, K, S, U, W]



***Ludwigia lanceolata*** Elliott, Lanceleaf Seedbox. Interdune ponds, open wet areas. August-September. Se. NC south to c. peninsular FL, west to Panhandle FL. This species is tetraploid ( $n = 16$ ). [= RAB, K, S, U, Z; < *L. alata* – GW]

***Ludwigia leptocarpa*** (Nuttall) Hara, Water-willow. Riverbanks, marshes, and ditches. June-September. VA south to c. peninsular FL, west to e. TX, north in the interior along the Mississippi and Ohio rivers to se. MO, s. IL, and w. WV; and in tropical America. [= RAB, C, GW, K, U, W; = *Jussiaea leptocarpa* Nuttall – F, G, S, WV]

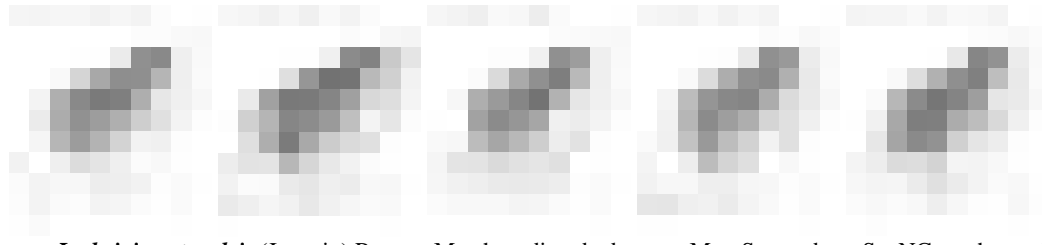
***Ludwigia linearis*** Walter var. *linearis*, Eastern Narrowleaf Seedbox. Savannas. June-September. Var. *linearis* ranges from s. NJ south to c. peninsular FL, west to se. LA, extending inland to the Cumberland Plateau of nc. AL and c. TN. Var. *linearis* is here interpreted to be equivalent to Peng's subglabrous morph. Peng (1989) declines to recognize infraspecific taxa in *L. linearis*, but his discussion makes clear that 2 distinctive entities are present, as characterized by orientation of seed surface cells and characters of leaves, bracteoles, pedicels, sepals, stigmas, and styles (see key). The orientation of seed surface cells, recognized as a distinctive character in other difficult species pairs (such as *L. alata* and *L. lanceolata*) is the most reliable character separating the 2 varieties. This species is diploid ( $n = 8$ ). [< *L. linearis* – RAB, C, F, G, GW, K, S, U, W, Z] {not yet mapped}

***Ludwigia linearis*** Walter var. *puberula* Engelmann & A. Gray, Western Narrowleaf Seedbox. Savannas, interdunal swales. June-September. Var. *puberula* ranges primarily from c. AL west to c. AR, south to e. TX, with intergradational material extending as far north and east as n. FL and e. NC. Var. *puberula* is here interpreted to include Peng's intermediate morph, densely strigillose morph, and completely glabrous morph (Peng 1989). As pointed out by Peng (1989), the glabrous morph is exactly like the densely strigillose morph except for the absence of pubescence. They often grow together, have essentially the same distribution, and may differ only at a single allele. Peng's intermediate morph is heterogeneous; some likely being truly intermediate between (and possibly hybrid derivatives of) the two varieties here recognized, while others clearly belong to var. *puberula* (based on surface cell orientation and floral characteristics) and merely have an amount of pubescence intermediate between the densely strigillose and completely glabrous morphs. [< *L. linearis* – RAB, C, F, G, GW, K, S, U, W, Z] {not yet mapped}

***Ludwigia linifolia*** Poirét, Flaxleaf Seedbox. Limesink ponds (dolines) and *Taxodium ascendens* savannas. June-September. Nc. NC south to s. FL, west to s. MS; disjunct in Tabasco, Mexico. This species is diploid ( $n = 8$ ). [= RAB, GW, K, S, U, Z]

***Ludwigia maritima*** R.M. Harper, Harper's Seedbox. Savannas. June-September. E. NC south to s. peninsular FL, west to e. LA. [= RAB, GW, K, S, U]

***Ludwigia microcarpa*** Michaux, Small-fruited Seedbox. 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. July-October. Ne. NC south to s. FL, west to se. TX (Brown & Marcus 1998); disjunct inland on calcareous or mafic rocks in nc. NC, n. GA, n. AL, c. TN, and sc. MO; also in the Bahamas, Cuba, and Jamaica. This species is diploid ( $n = 8$ ). [= RAB, F, GW, K, S, U, W, Z]



***Ludwigia octovalvis*** (Jacquin) Raven. Marshes, disturbed areas. May-September. Se. NC south to s. FL, west to TX; and widespread in tropical America. [= GW, U; > *L. octovalvis* spp. *octovalvis* – K; > *L. octovalvis* spp. *sessiliflora* (M. Micheli) Raven – K; > *Jussiaea angustifolia* Lamarck – S; > *Jussiaea scabra* Willdenow – S]

***Ludwigia palustris*** (Linnaeus) Elliott, Common Water-purslane. Moist to wet disturbed areas. May-November. Widespread in North America, Eurasia, and Africa. [= RAB, C, GW, K, Pa, U, W; > *L. palustris* var. *americana* (A.P. de Candolle) Fernald & Griscom – F, G, WV; > *L. palustris* var. *nana* Fernald & Griscom – F; = *Isnardia palustris* Linnaeus – S]

\*? ***Ludwigia peploides*** (Kunth) Raven var. *glabrescens* (Kuntze) Shinners. Pools, ditches, disturbed places. 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, Pa, U; < *L. peploides* – W]

\*? ***Ludwigia peruviana*** (Linnaeus) Hara, Primrose-willow. In s. GA (Jones & Coile 1988). Reported for NC (Kartesz 1999). All or part of the Southeastern distribution is as an alien species. {investigate} [= GW, K, U; = *Jussiaea peruviana* Linnaeus – S]

*Ludwigia pilosa* Walter, Hairy Seedbox. Ditches, wet places. June-October. Se. VA south to n. FL, west to se. TX, restricted to the Coastal Plain except for disjunct occurrences inland in NC, VA, and n. AL. This species is tetraploid (n= 16). [= K, U, W, Z; < *L. pilosa* – RAB, C, F, G, GW, S (also see *L. ravenii*)]

*Ludwigia polycarpa* Short & Peter. Wet meadows, swales. June-September; July-October. MA, CT, and w. VT west to s. ON, MI, WI, MN, and c. NE, south to c. VA, KY, s. IL, s. MO, and e. KS. This species is tetraploid (n = 16). [= C, F, G, GW, K, Pa, S, U, Z]



*Ludwigia ravenii* Peng, Raven's Seedbox. Savannas, swamps, marshes, wet open places. June-October. Se. VA south to ne. FL (no known records for GA), restricted to the Coastal Plain. For further information, see Peng (1984, 1988, 1989). This species is tetraploid (n = 16). [= K, U, Z; < *L. pilosa* – RAB, C, F, G, GW, S (included within concept of *L. pilosa* by most earlier authors)]

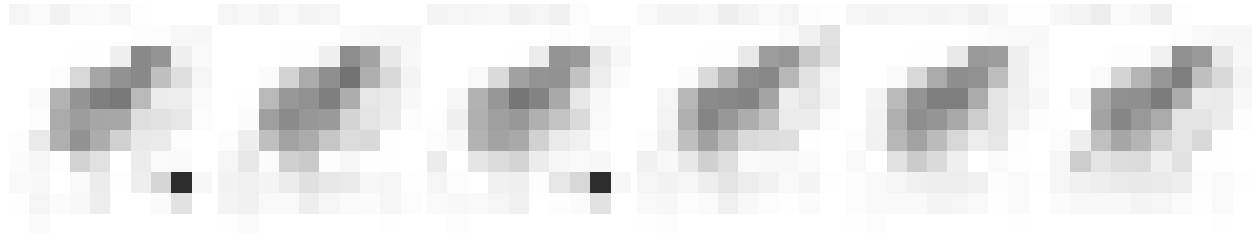
*Ludwigia repens* Forster, Creeping Seedbox. Ditches, pools, and streams. June-September. Se. VA south to s. FL, west to TX and n. Mexico, north in the interior to TN, MO, and OK; also in CA, Bermuda, and the West Indies. Reveal et al. (2003) propose the name *L. repens* for nomenclatural conservation with a conserved type; if this proposal is not accepted, *L. natans* Elliott will become the name of this species. [= RAB, GW, K, U; = *Ludwigia natans* Elliott – F, G; = *Isnardia repens* – S]

*Ludwigia spathulata* Torrey & A. Gray, Southern Water-purslane. Sinkhole ponds, cypress-gum ponds, depression meadows, boggy shores. June-October. SC south to Panhandle FL and s. AL. [= RAB, GW, K, U; = *Isnardia spathulata* (Torrey & A. Gray) Small – S]

*Ludwigia sphaerocarpa* Elliott, Globe-fruited Seedbox. Boggy areas, pools, ditches, river marshes, interdune swales, river and pondshores. 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, Pa, S, U, Z; > *L. sphaerocarpa* var. *sphaerocarpa* – F, G; > *L. sphaerocarpa* var. *jungens* Fernald & Griscom – F, G]

*Ludwigia suffruticosa* Walter, Shrubby Seedbox. Periodically to seasonally flooded portions of limesink ponds (dolines) and clay-based Carolina bays. June-October. Se. NC south to s. peninsular FL, west to Panhandle FL and se AL. This species is tetraploid (n = 16). Peng (1989) reports that "with its whitish creamy sepals, which are very showy in the dense flower aggregates, the cross-pollinating *L. suffruticosa* successfully attracts many insects, mostly bumblebees, honeybees, and wasps." [= RAB, GW, K, S, U, Z; = *L. capitata* Michaux]

*Ludwigia virgata* Michaux, Savanna Seedbox. Wet savannas. June-September. Se. VA south to s. peninsular FL, west to Panhandle FL and se. AL. [= RAB, C, F, GW, K, S, U]



## 2. *Circaea* Linnaeus 1753 (Enchanter's-nightshade)

A genus of 8 species (14 taxa), herbs, of temperate and boreal regions of the Northern Hemisphere. References: Boufford (1983)=Z; Boufford (2005)=Y; Munz (1965)=X; Wagner, Hoch, & Raven (2007)=U; Averett & Boufford (1985); Skvortsov (1979). Key based on Z.

**Identification notes:** Sometimes confused in vegetative condition with *Phryma*; the leaf teeth are quite different.

- 1 Flowers opening before elongation of the raceme axis, therefore clustered and corymbiform at the apex of the raceme, borne on erect or ascending pedicels; plant 5-25 (-30) cm tall; fruits clavate, 2.0-2.5 mm long, 0.7-1.2 mm thick, 1-locular ..... *C. alpina* ssp. *alpina*
- 1 Flowers opening after elongation of the raceme axis, more or less loosely spaced, borne on spreading pedicels; plants (12-) 20-100 cm tall; fruits obovoid to pyriform, 2.8-3.9 (-4.5) mm long, 1.5-3.6 mm thick, 2-locular, or the fruits sterile and aborting shortly after anthesis, 1-2-locular when present.
- 2 All, or nearly all, ovaries developing to maturity; fruit with corky-thickened ribs separated by deep grooves ..... *C. canadensis* ssp. *canadensis*
- 2 All ovaries aborting shortly after anthesis (very rarely a few persistent after anthesis); fruit (when somewhat persistent) with low ribs and shallow grooves ..... *C. xsterilis*

*Circaea alpina* Linnaeus ssp. *alpina*, Alpine Enchanter's-nightshade. Moist organic soil at high elevations (especially in spruce-fir and northern hardwood forests), rocky seepages, in spray behind waterfalls, at dripping cliff bases. June-September. *C. alpina* is treated by Z as a circumboreal complex of six subspecies. Ssp. *alpina* is itself circumboreal, in North America ranging from NL (Newfoundland) and NL (Labrador), west to AK, south to MD, w. NC, e. TN, n. GA (?), KY, n. IL, MN, MT, and WA, disjunct in montane sites southward in the w. United States, such as the Black Hills of SD, and isolated montane sites in CO, AZ, and NM. Another subspecies occurs in w. North America, and four subspecies occur in humid and montane parts of Asia. [= K, Pa, U, X, Z; < *C. alpina* – RAB, F, G, GW, S, W, WV; = *C. alpina* var. *alpina* – C]

*Circaea canadensis* (Linnaeus) Hill ssp. *canadensis*, Canada Enchanter's-nightshade. Mesic, nutrient-rich forests. June-August. NS and NB west to se. MB and ND, south to e. NC, c. SC, s. GA, LA, OK, and NE. The systematics of this taxon is controversial, and the best treatment is still unclear. Most recently, Boufford (2005) has treated the complex as 2 species, *C. canadensis* and *C. lutetiana*, the former with 2 subspecies, ssp. *canadensis* of eastern North America and ssp. *quadrisulcata* of Asia. Previously, Boufford (1983) treated the complex as a circumboreal complex of 3 subspecies of *C. lutetiana*, including the North American ssp. *canadensis* (Linnaeus) Ascherson & Magnus, the primarily Asian ssp. *quadrisulcata* (Maximowicz) Ascherson & Magnus, and the European ssp. *lutetiana*. Other authors have preferred varietal status for the 3 entities, full species status, no formal status at all (*C. lutetiana* as a polymorphic complex), or associating the more similar pair (North American and Asian) as 2 subspecies separate from the European at specific rank. Boufford (1983) and Averett & Boufford (1985) show convincingly that separate taxonomic status for the three entities is warranted, and that ssp. *canadensis* is more closely related to ssp. *quadrisulcata*. The question of the appropriate taxonomic level remains. Boufford (1983) states that "although subsp. *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. [= Pa, U, Y; = *C. lutetiana* Linnaeus ssp. *canadensis* (Linnaeus) Ascherson & Magnus – RAB, K, W, X, Z; = *C. lutetiana* var. *canadensis* Linnaeus – C; = *C. quadrisulcata* (Maximowicz) Franchet & Savatier var. *canadensis* (Linnaeus) Hara – G, WV; > *C. canadensis* var. *canadensis* – F; > *C. canadensis* var. *virginiana* Fernald – F; = *C. latifolia* Hill – S; = *C. quadrisulcata* ssp. *canadensis* (Linnaeus) Löve & Löve]

*Circaea xsterilis* Boufford, Hybrid Enchanter's-nightshade. Mesic, nutrient-rich forests. June-August. *C. xsterilis* is reported to occur frequently in the absence of one or both of its parents (Z, Skvortsov 1979), and is therefore treated separately and keyed here. It ranges from NL (Newfoundland) west to ON and MN, south to w. NC, OH, and WI. It appears to be rare in our area, but should be sought more carefully. Recognition of *C. canadensis* (Linnaeus) Hill as distinct from *C. lutetiana* renders the hybrid binomial name *C. xintermedia* inappropriate for North American plants, since it is the hybrid of *C. alpina* ssp. *alpina* and the European *C. lutetiana*. [= U, Y; = *C. xintermedia* Ehrhart (pro sp.) – RAB, C, K, Pa, W, X, Z (but misapplied as to our material if *C. canadensis* is accepted as a species); > *C. canadensis* var. *canadensis* – F, misapplied; > *C. canadensis* var. *virginiana* Fernald – F; = *C. canadensis* (Linnaeus) Hill – G, WV, misapplied]



### 3. *Chamerion* Rafinesque ex Holub 1972 (Fireweed)

A genus of 8 species (9 taxa), herbs, of arctic, boreal, and temperate Northern Hemisphere. There is increasingly strong evidence for the recognition of this group of plants as a genus separate from *Epilobium*. References: Wagner, Hoch, & Raven (2007)=U; Mosquin (1966)=Z; Holub (1972)=Y; Munz (1965)=X.

*Chamerion platyphyllum* (Daniels) Löve & Löve, Great Willow-herb, Fireweed. Mt (NC, VA, WV), Pd (DE), Cp (DE): grassy balds, roadsides, disturbed areas; uncommon (rare in DE and NC). July-September. *Chamerion platyphyllum* has a circumboreal distribution; it is a member of a circumboreal complex, consisting of several related taxa that differ in chromosome number, a variety of morphological characters, and distribution. The tetraploid *C. platyphyllum* is generally more southern, extending south in North America to NJ, montane w. NC and ne. TN, n. IN, MN, SD, AZ, NM, and CA; it may be more appropriately treated as a variety or subspecies of *C. angustifolium*. The diploid *Chamerion angustifolium* (Linnaeus) Holub is arctic and boreal, extending south in North America to NB, QC, ON, alpine WY, and BC. The hexaploid is *Chamerion danielsii* D. Löve. [< *Epilobium angustifolium* – RAB, G, GW, Pa, W, WV; = *E. angustifolium* var. *canescens* A. Wood – C; >> *E. angustifolium* var. *angustifolium* – F, X; > *E. angustifolium* var. *platyphyllum* (Daniels) Fernald – F; = *Chamerion angustifolium* (Linnaeus) Holub ssp. *circumvagum* (Mosquin) Kartesz – K1, K2, U; < *Chamaenerion angustifolium* (Linnaeus) Scopoli – S; < *Chamerion angustifolium* (Linnaeus) Holub – Y; = *E. angustifolium* Linnaeus ssp. *circumvagum* Mosquin – Z; = *Chamaenerion angustifolium* (Linnaeus) Scopoli ssp. *circumvagum* (Mosquin) Moldenke]

4. *Epilobium* Linnaeus 1753 (Willow-herb) [also see *Chamerion*]

A genus of ca. 165 species (ca. 185 species), herbs, distributed primarily in boreal and alpine latitudes and elevations. All five of the species in our area reach or approach their southern limits in eastern North America in our area. All members of the genus in our area are placed in section *Epilobium*. References: Wagner, Hoch, & Raven (2007)=U; Munz (1965)=Z.

- 1 Stigma 4-cleft; petals 10-15 mm long.....*E. hirsutum*
- 1 Stigma capitate; petals 2-8 mm long.
  - 2 Leaves linear to narrowly lanceolate, broadest near the middle, revolute, the larger generally < 10 mm wide, not toothed; stem pubescence general.
    - 3 Pubescence appressed, the upper leaf surface finely and rather densely pubescent.....*E. leptophyllum*
    - 3 Pubescence spreading .....*E. strictum*
  - 2 Leaves lanceolate, distinctly broader below the middle, flat, the larger generally at least 10 mm wide, toothed; stem pubescence in lines decurrent from the leaf bases.
    - 4 Principal leaves 3-7 cm long, with obscure marginal teeth, the apices merely acute, not gray-green in color, not rugose-veiny in texture; 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, the leaf color often grayish and the leaves rugose-veiny in texture; 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*

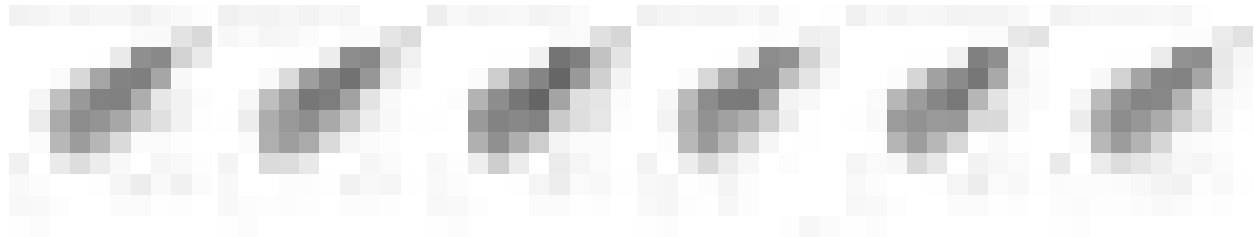
*Epilobium ciliatum* Rafinesque ssp. *ciliatum*, American Willow-herb. Bogs, seeps, disturbed wet places (such as moist edges of logging roads). June-September. NL (Newfoundland) and NL (Labrador) west to AK, south to VA, w. NC, ne. TN, IN, IA, CA, TX, Mexico, Central America; disjunct in Chile and Argentina. [= K, U; < *E. ciliatum* – Pa, RAB, W; = *E. ciliatum* var. *ciliatum* – C; > *E. ciliatum* – F, X, in a narrower sense; > *E. glandulosum* Lehm. var. *adenocaulon* (Haussknecht) Fernald – F, WV; > *E. adenocaulon* Haussknecht var. *adenocaulon* – G, Z]

*Epilobium coloratum* Biehler, Bronze Willow-herb, Eastern Willow-herb. Seepages, moist open places. 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, Pa, S, U, W, WV, Z]

\* *Epilobium hirsutum* Linnaeus, Hairy Willow-herb. Disturbed areas; native of Eurasia. July-September. Naturalized south to s. PA (Rhoads & Klein 1993; Rhoads & Block 2007), MD, and WV (Kartesz 1999, 2010). [= C, F, G, K, Pa, U, Z]

*Epilobium leptophyllum* Rafinesque, Narrowleaf Willow-herb, American Marsh Willow-herb. Bogs, seepages, and boggy meadows. April-October. NL (Newfoundland) and NT west to BC, south to w. NC, ne. TN, KS, ne. TX (Mink, Singhurst, & Holmes 2011b), and CA. [= RAB, C, F, G, GW, K, Pa, U, W, WV, Z]

*Epilobium strictum* Muhlenberg ex Sprengel, Northeastern Willow-herb, Downy Willow-herb, Soft Willow-herb. Marshes, bogs. QC west to MN, south to n. VA (?), OH, and n. IL. Reported for Arlington County, VA; the single record is regarded as questionable. [= C, F, G, K, Pa, U, Z]

5. *Oenothera* Linnaeus 1753 (Evening-primrose)

A genus of about 124 species, herbs, of America (especially temperate regions). This treatment provisional, with further revision likely, especially in the *O. fruticosa*-*O. tetragona*-*O. pilosella* complex. References: Wagner, Hoch, & Raven (2007)=U; Dietrich, Wagner, & Raven (1997)=Z; Dietrich & Wagner (1988)=Y; Munz (1965)=X; Straley (1977)=V. Keys adapted in part from those references.

- 1 Fruit indehiscent; seeds 1-6 per capsule, 1.5-3.5 mm long; [].
  - 2 Pedicels 2-4 mm long; fruit with a stipe at maturity; clumped or matted perennials from woody rhizomes or rootstocks; [of sandy habitats of SC and GA southward].
    - 3 Clumped perennial; petals 4-10 mm long; body of the fruit 5-10 mm long; stipe of the fruit 0.5-4.5 mm long .....*O. filipes*
    - 3 Mat-forming perennial; petals 7-15 mm long; body of the fruit 8-15 mm long; stipe of the fruit 2-8 mm long .....*O. sinuosa*
  - 2 Pedicels 0-1 mm long; fruit without a stipe; annual, winter annual, or biennial; [collectively of various habitats and more widespread in our area].
    - 4 Sepals 2-3.5 mm long; petals 1.5-3 mm long .....*O. curtiflora*
    - 4 Sepals 2.5-12 mm long; petals 2.5-9 mm long.
      - 5 Sepals 2.5-8 mm long; leaves 0.1-1.3 cm wide, the widest rarely over 1 cm wide; flowers 3-4-merous (often mixed on a plant); fruits 3-4-angled (often mixed on a plant); [of the outer Coastal Plain of GA, NC, and SC] .....*O. simulans*

- 5 Sepals 8-13 mm long; leaves 0.3-2.5 cm wide, the larger nearly always > 1 cm wide; flowers 4-merous; fruits 4-angled; [primarily of the Mountains and Piedmont of NC, SC, and VA, extending to the Coastal Plain of GA and SC] ..... *O. gaura*
- 1 Fruit dehiscent; seeds (10-) 50-many per capsule, 0.3-2 mm long.
- 6 Ovary essentially terete; fruit terete or with 4 rounded ridges; stamens equal in length (except in *O. speciosa*).
- 7 Flowers white or pink; flower buds nodding; [section *Hartmannia*] ..... *O. speciosa*
- 7 Flowers yellow; flower buds erect; [section *Oenothera*]
- 8 Fruit linear, nearly isodiametric through its length; seeds borne ascending in the locules, rounded or fusiform, more or less regularly pitted; [section *Oenothera*, subsection *Raimannia*].
- 9 Petals acute to rounded at the apex.
- 10 Inflorescence dense, with > 2 flowers per spike opening each day; leaves gray-green ..... [*O. clelandii*]
- 10 Inflorescence lax, 1-2 flowers per spike opening on each day; leaves green ..... *O. curtissii*
- 9 Petals truncate to emarginate at the apex.
- 11 Nonflowering portion of stems stiff, densely strigillose or sometimes also villous; leaves gray-green, densely strigillose, usually subentire to shallowly dentate (rarely lyrate); [in maritime situations].
- 12 Sepals 2.0-3.3 cm long; petals 2.5-4.5 cm long; stigma elevated above the anthers at anthesis; capsule 2.5-5.5 cm long; rosette leaves 5-14 cm long, 1-2 cm wide ..... *O. drummondii* ssp. *drummondii*
- 12 Sepals 0.3-1.1 cm long; petals 0.45-1.6 cm long; stigma surrounded by the anthers at anthesis; capsule 1.5-4.5 cm long; rosette leaves 4-8 cm long, 0.7-1.0 cm wide ..... *O. humifusa*
- 11 Nonflowering portion of stem not stiff, moderately to sparsely strigillose to sometimes densely villous, and also ± glandular puberulent; leaves green, sparsely to moderately strigillose and usually villous, deeply lobed to dentate (rarely some of them subentire); [in inland disturbed situations].
- 13 Petals 2.5-4 cm long; style 4-7.5 cm long; stigma lobes well elevated above the anthers at anthesis ..... *O. grandis*
- 13 Petals 0.5-2.2 cm long; style 2-5 cm long; stigma lobes surrounded by the anthers at anthesis ..... *O. laciniata*
- 8 Fruit thickest near the base, tapering to the apex; seeds borne horizontally in the locules, angled-prismatic, not regularly pitted; [section *Oenothera*, subsection *Oenothera*].
- 14 Stigma elevated above the anthers at anthesis; petals 2.5-5 cm long.
- 15 Cauline leaves 0.4-1.0 cm wide; apex of the inflorescence curved; free sepal tips subterminal, usually spreading; capsules spreading at nearly right angles to the stem, long-attenuate toward apex, usually conspicuously arcuate ..... *O. argillicola*
- 15 Cauline leaves 1.5-6 cm wide; apex of the inflorescence erect; free sepal tips terminal, erect; capsules erect or slightly spreading, gradually attenuate toward the apex.
- 16 Upper stem, ovary, floral tube, and sepals always conspicuously pubescent, usually with at least some red-pustulate hairs; bracts green, persistent; sepals often flushed with red, or red-striped ..... *O. glazioviana*
- 16 Upper stem, ovary, floral tube, and sepals often apparently glabrous without magnification; pustulate hairs absent, or if present not red (in fresh material); bracts often pale-green and deciduous; sepals yellowish green, or flushed with some red ..  
..... *O. grandiflora*
- 14 Stigma surrounded by or below the anthers at anthesis; petals 0.7-2.5 (-3) cm long.
- 17 Plant appearing exclusively appressed-pubescent (as seen without magnification).
- 18 Apex of the inflorescence curved; free sepal tips subterminal in bud, erect to spreading; dry capsules usually rusty brown .....  
..... *O. oakesiana*
- 18 Apex of the inflorescence erect; free sepal tips erect in bud; dry capsules gray-green or dull green.
- 19 Leaves green to pale green; stems, ovary, floral tube, and sepals sparsely appressed-pubescent ..... *O. biennis*
- 19 Leaves dull green to gray-green; stems, ovary, floral tube, and sepals densely appressed-pubescent .. *O. villosa* ssp. *villosa*
- 17 Plant appearing **either** glabrous **or** with a mixture of long pustular hairs and appressed pubescence (as seen without magnification).
- 20 Apex of inflorescence curved; free sepal tips subterminal in bud.
- 21 Plant (at least the lower portions) predominantly strigillose; leaves dull green to gray-green; dry capsules rusty brown .....  
..... *O. oakesiana*
- 21 Plant predominantly erect-pubescent or appearing glabrous (as seen without magnification); leaves usually bright green; dry capsules usually dark green or black ..... *O. parviflora*
- 20 Apex of inflorescence erect; free sepal tips terminal or subterminal in bud.
- 22 Inflorescence conspicuously pubescent ..... *O. biennis*
- 22 Inflorescence glabrous (or appearing so without magnification).
- 23 Free sepal tips terminal in bud; petals 1.4-2.5 (-3) cm long; bracts caducous, pale green; capsules dull green when dry; petals fading yellowish-white to translucent ..... *O. nutans*
- 23 Free sepal tips subterminal in bud; petals 0.8-1.5 (-2) cm long; bracts persistent, green; capsules usually black or dark green when dry; petals fading pale yellow, usually opaque ..... *O. parviflora*
- 6 Ovary 4-angled or 4-winged (at least near its tip); fruit sharply 4-angled or 4-winged; stamens of two lengths (except *O. triloba* and *O. macrocarpa* ssp. *macrocarpa*).
- 24 Leaves all basal, pinnatifid; [section *Lavauxia*, subsection *Lavauxia*] ..... *O. triloba*
- 24 Leaves in part cauline, entire or toothed.
- 25 Petals 50-70 mm long; flowers opening in the evening; wings of the fruit 10-25 mm wide; [section *Megapterium*] .....  
..... [*O. macrocarpa* ssp. *macrocarpa*]
- 25 Petals 3-30 mm long; flowers opening in the day; wings of the fruit <3 mm wide; [section *Kneiffia*]
- 26 Cauline leaves linear, < 1 mm wide; petals 3-5 (-7) mm long; floral bracts shorter than the subtended ovaries; mature fruits ellipsoid-rhomboid, 4-6 mm long; annual; [section *Kneiffia*, subsection *Peniophyllum*] ..... *O. linifolia*
- 26 Cauline leaves lanceolate to ovate, > 1 mm wide; petals 5-30 mm long; floral bracts longer than the subtended ovaries; mature fruits clavate to oblong-elliptic, 8-20 mm long; perennial; [section *Kneiffia*, subsection *Kneiffia*].
- 27 Petals 5-10 mm long; inflorescence usually nodding ..... *O. perennis*
- 27 Petals 15-30 mm long; inflorescence usually erect.
- 28 Plant conspicuously pilose-hirsute with hairs 1-3 mm long; free sepal tips 1-4 mm long, divergent ..... *O. pilosella*

- 28 Plant either with shorter or appressed pubescence, of glandular or nonglandular hairs; free sepal tips 0-2 (-6) mm long, divergent or not.
- 29 Capsules oblong, widest near the middle, usually abruptly tapered to a stipe 0.1-3 (-7) mm long; hairs of the ovary and capsule predominantly glandular (or the ovary glabrous); leaves subglabrous or sparsely pubescent, more or less dentate.
- 30 Petals (20-) 25-35 mm long; cauline leaves lanceolate to ovate, 2-7 cm long, 1-3 cm wide, often glaucous beneath..... *O. tetragona* var. *fraseri*
- 30 Petals 12-20 (-25) mm long; cauline leaves linear to lanceolate, 2-7 cm long, 0.5-1.0 (-1.5) cm wide..... *O. tetragona* var. *tetragona*
- 29 Capsules clavate, widest above the middle, gradually tapered to a stipe 3-10 mm long; hairs of the ovary and capsule nonglandular (or with a mixture of glandular and nonglandular hairs); leaves generally pubescent, subtentire.
- 31 Petals 15-30 mm long; stems 7-12 dm tall, freely branched, slightly pubescent; cauline leaves lanceolate, 5-12 cm long, 0.5-1.5 cm wide; [of tidal marshes, usually with spongy lower stems and adventitious roots where regularly submerged]..... *O. riparia*
- 31 Petals (8-) 15-22 mm long; stems 1-8 dm tall, less branched (unless mowed, grazed, or otherwise damaged), more pubescent; cauline leaves 2-6 (-8) cm long, 0.2-1.0 (-1.2) cm wide.
- 32 Capsule vestiture a mixture of glandular and nonglandular hairs.
- 33 Cauline leaves not velutinous, 5-10× as long as wide..... *O. tetragona* var. *brevistipata*
- 33 Cauline leaves velutinous, 2-4× as long as wide.
- 34 Petals 7-12 mm long; leaves lance-oblong, obtuse; [of barrens of TN, KY, and AL]..... [ *O. tetragona* var. *sharpii* ]
- 34 Petals 15-20 mm long; leaves lanceolate, acute; [of the Atlantic Coastal Plain] ..... *O. tetragona* var. *velutina*
- 32 Capsule vestiture strictly nonglandular.
- 35 Free sepal tips 1-3 mm long, cartilaginous and often arching after the sepals have reflexed; calyx strigose ..... *O. fruticosa* var. *unguiculata*
- 35 Free sepal tips < 1 mm long; calyx various.
- 36 Capsule body 6-11 mm long, the pubescence rather coarse ..... *O. fruticosa* var. *fruticosa*
- 36 Capsule body 3-5 mm long, the pubescence very fine.
- 37 Capsule body 3.5-4 mm long, strigose-pilose; [of Coastal Plain bogs] ..... *O. fruticosa* var. *microcarpa*
- 37 Capsule body 4-5 mm long; very finely strigillose; [of Piedmont rock outcrops] ..... *O. fruticosa* var. *subglobosa*

*Oenothera argillicola* Mackenzie, Shale-barren Evening-primrose. Mt (VA, WV): shale barrens and woodlands; uncommon. July-September. Sc. PA south through MD to e. WV and w. VA (south to Montgomery County). [= C, F, G, H, K, Pa, W, WV, Z; > *O. argillicola* var. *argillicola* - X; > *O. argillicola* var. *pubescens* Core & Davis - X]

*Oenothera biennis* Linnaeus, Common Evening-primrose. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): fields, pastures, roadsides, disturbed areas; common. June-October. Ranging widely in e. North America and Europe, and scattered in w. North America. [= H, K, Pa, W, Z; < *O. biennis* - RAB, G, S, WV (also see *O. nutans*); = *O. biennis* var. *biennis* - C; > *O. biennis* var. *biennis* - F; > *O. biennis* var. *pyncocarpa* (Atkinson & Bartlett) Wiegand - F; > *O. biennis* ssp. *caeciarum* Munz - X; > *O. biennis* ssp. *centralis* Munz - X]

\* *Oenothera curtiflora* W.L. Wagner & Hoch, Small-flowered Gaura. Cp (GA, SC, VA), Pd (GA): sandy fields, disturbed areas, and clearings; rare, native of c. and w. North America. May-July. IN and IL west to WA, south to MS, and Mexico; apparently introduced eastward to MA, TN, GA, and SC. Kartesz's (1999) adoption of *G. mollis* as the name for this taxon has been rejected (Wagner & Hoch 2000, Brummitt 2001). [= U; = *Gaura parviflora* Douglas ex Lehmann - RAB, F, G, Q, S; = *Gaura mollis* James - K; > *Gaura parviflora* var. *parviflora* - X; > *Gaura parviflora* var. *lachnocarpa* Weatherby - X]

*Oenothera curtissii* Small. Cp (GA, SC): sandhills, sandy fields; rare. May-September. Se. SC south to n. peninsular FL, west to s. AL. Closely related to *O. rhombipetala*, which is restricted to the Great Plains, with scattered occurrences east to AR, IL, and MI. [= K, Y; < *O. rhombipetala* Nuttall ex Torrey & A. Gray - RAB, F, X, misapplied; = *Raimannia curtissii* Rose - S]

\*? *Oenothera drummondii* Hooker ssp. *drummondii*, Drummond's Evening-primrose. Cp (NC, SC): sandy ocean beaches; rare, perhaps only introduced or adventive from the Gulf Coast. April-October. Ssp. *drummondii* ranges from se. NC south to s. FL, west to se. TX, and south to Tamaulipas and Vera Cruz. Ssp. *thalassiphila* (Brandege) W. Dietrich & W.L. Wagner is restricted to the southern tip of Baja California. [= Y; < *O. drummondii* - RAB, K; < *Raimannia drummondii* (Hooker) Rose ex Sprague & Riley - S; = *O. drummondii* var. *drummondii* - X]

*Oenothera filipes* (Spach) W. L. Wagner & Hoch, Threadstalk Gaura. Cp (GA, SC), Pd (GA), Mt (GA): sandy fields, disturbed areas, and clearings; common. April-July. SC west to n. TN and s. IN, south to ne. FL and e. LA. [= U; = *Gaura filipes* Spach RAB, C, G, K, Q, W; > *Gaura filipes* var. *filipes* - F, X; > *Gaura filipes* var. *major* Torrey & A. Gray - F, X; = *Gaura michauxii* Spach - S]

*Oenothera fruticosa* Linnaeus var. *fruticosa*, Southern Sundrops. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, VA, WV): dry forests and woodlands, glades, and rock outcrops; common (rare in DE). April-August. MA west to IN, south to FL and LA. [= F, G, X; < *O. fruticosa* - RAB, C; < *O. fruticosa* ssp. *fruticosa* - H, K, Pa, V, W; > *O. fruticosa* var. *linearis* (Michaux) S. Watson - F, WV; > *O. fruticosa* var. *humifusa* Allen - F, G, X; > *Kneiffia fruticosa* (Linnaeus) Raimann - S; > *Kneiffia arenicola* Small - S; > *Kneiffia semiglandulosa* Pennell - S]

*Oenothera fruticosa* Linnaeus var. *microcarpa* Fernald, Small-fruited Sundrops. Cp (NC, SC, VA): boggy depressions. April-August. E. MD south to e. SC. [= F, X; < *O. fruticosa* - RAB, C; < *O. fruticosa* ssp. *fruticosa* - H, K, V]

*Oenothera fruticosa* Linnaeus var. *subglobosa* (Small) Munz, Flatrock Sundrops. Pd (GA): granite flatrocks and domes; rare. GA to AL. [= X; < *O. fruticosa* - RAB, C; < *O. fruticosa* ssp. *fruticosa* - H, K, V; = *Kneiffia subglobosa* Small - S]

*Oenothera fruticosa* Linnaeus var. *unguiculata* Fernald, Southern Sundrops. Cp (NC, SC, VA): sandhills, moist to wet loamy savannas; uncommon. April-August. Se. VA south to e. SC. [= F, X; < *O. fruticosa* - RAB, C; < *O. fruticosa* ssp. *fruticosa* - H, K, V]

*Oenothera gaura* W.L. Wagner & Hoch, Biennial Gaura, Northeastern Gaura. Mt (NC, SC, VA, WV), Pd (GA, NC, VA), Cp (DE, GA, SC, VA): roadsides, woodlands, streambanks, fields, disturbed areas; common (uncommon in VA Coastal Plain, rare in DE Coastal Plain). June–October. MA and NY west to WI, se. MN, and IA, south to sw. NC, c. GA (Jones & Coile 1988), sc. TN, and c. IL. [= U; = *Gaura biennis* Linnaeus – RAB, K, Pa, Q, S, W, WV; > *Gaura biennis* var. *biennis* – C, F, G, X]

\* *Oenothera glazioviana* Micheli in Martius, Garden Evening-primrose. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA): disturbed areas; uncommon. August–October. This species apparently arose as a garden hybrid, and has been widely cultivated and naturalized nearly worldwide. [= K, Pa, Z; = *O. erythrosepala* Borbás – X]

*Oenothera grandiflora* L'Héritier ex Aiton. Cp (GA, NC, SC), Pd (GA, NC, SC), Mt (GA, NC, SC): disturbed areas; uncommon. June–October. VT west to KY, south to c. peninsular FL and s. MS. [= F, K, Pa, X, S, Z]

\* *Oenothera grandis* (Britton) Smyth. Cp (NC): roadsides; rare, introduced from farther west. March–July. The native range of this species is centered in KS, OK, and TX. [= K, X, Y; = *O. laciniata* Hill var. *grandiflora* (S. Watson) B.L. Robinson – RAB, F, G]

*Oenothera humifusa* Nuttall, Seabeach Evening-primrose, Spreading Evening-primrose. Cp (DE, GA, NC, SC, VA): coastal sand dunes; common. Early May–October. S. NJ south to s. FL, west to s. LA, along the coast. [= RAB, C, F, G, H, K, X, Y; = *Raimannia humifusa* (Nuttall) Rose – S]

*Oenothera laciniata* Hill, Cutleaf Evening-primrose. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas; common. February–November. ME west to ND, south to s. FL and TX; also in CA. [= K, Pa, W, WV; = *O. laciniata* var. *laciniata* – RAB, C, F, G; = *Raimannia laciniata* (Hill) Rose – S; = *O. laciniata* ssp. *laciniata* – X]

*Oenothera linifolia* Nuttall, Threadleaf Sundrops, Flaxleaf Sundrops. Pd (GA, NC, SC, VA\*), Cp (GA, SC), Mt (GA): dry openings and fields; rare (SC Rare, VA Watch List). C. VA west to s. IL and se. KS, south to Panhandle FL and se. TX. Occurrences east of the Mississippi River may be mainly or entirely adventive. Belden et al. (2004) discuss the Virginia occurrence. [= RAB, C, F, G, K, W, V, X; = *Peniophyllum linifolium* (Nuttall) Pennell – S]

*Oenothera nutans* Atkinson & Bartlett. Mt (GA?, NC, SC?, VA, WV), Pd (GA?, NC, SC?): roadsides, openings, forest edges, pastures; common (rare in VA). June–October. ME west to MI, south to n. FL, s. AL, and s. MO. [= K, Pa, Z; < *O. biennis* – RAB, G, S, WV; = *O. biennis* Linnaeus var. *austromontana* (Munz) Cronquist – C; = *O. biennis* var. *nutans* (Atkinson & Bartlett) Wiegand – F; = *O. austromontana* (Munz) Raven, Dietrich, & Stubbe – H, W; = *O. biennis* ssp. *austromontana* Munz – X]

*Oenothera oakesiana* (A. Gray) Robbins ex S. Watson & Coulter. Cp (DE, NC, VA), Pd (VA), Mt (VA): disturbed areas, roadsides; uncommon (rare in VA). NS west to MB, south to e. NC, sc. VA, PA, n. IN, n. IL, and s. MN. [= G, K, Pa, Z; = *O. parviflora* Linnaeus var. *oakesiana* (A. Gray) Fernald – C, F; = *O. parviflora* ssp. *parviflora* var. *oakesiana* (A. Gray) Fernald – X]

*Oenothera parviflora* Linnaeus, Small-flowered Evening-primrose. Mt (NC, VA, WV), Pd (NC, VA), Cp (NC, SC, VA), {GA}: fields, disturbed areas; uncommon (rare in VA Coastal Plain). May–October. NS west to MB, south to NC, TN, KY, and MO. Reported for GA (GANHP). [= RAB, G, K, Pa, W, Z; > *O. parviflora* var. *parviflora* – C, F, WV; > *O. parviflora* var. *angustissima* (R.R. Gates) Wiegand – F, WV; > *O. parviflora* ssp. *parviflora* var. *parviflora* – X; > *O. parviflora* ssp. *angustissima* (R.R. Gates) Munz – X]

*Oenothera perennis* Linnaeus, Little Sundrops. Mt (NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, VA): bogs, sphagnum seeps, moist fields; uncommon (rare in DE, NC, and SC, rare in VA Coastal Plain). May–August. NS west to MB, south to w. NC, nw. SC, KY, and MO. [= RAB, C, G, K, Pa, W, X, WV; > *O. perennis* var. *perennis* – F; = *Kneiffia perennis* (Linnaeus) Pennell – S]

*Oenothera pilosella* Rafinesque, Midwestern Evening-primrose. Mt (VA, WV), Pd (VA), Cp (VA): moist fields, disturbed areas; rare. May–July. NH west to ON, south to s. VA, KY, n. AL, c. MS, and c. LA. *O. sessilis* (Pennell) Munz, treated by Straley (1977) as *O. pilosella* ssp. *sessilis* (Pennell) Straley, is best recognized as a species; it is restricted to West Gulf Coastal Plain. [= F, G, Pa, WV, X; = *O. pilosella* ssp. *pilosella* – C, K, V; > *Kneiffia pratensis* Small – S; = *O. fruticosa* Linnaeus var. *hirsuta* Nuttall ex Torrey & A. Gray]

*Oenothera riparia* Nuttall, Riverbank Evening-primrose. Cp (NC, SC, VA?): tidal marshes; rare (NC Rare). June–July. Se. VA (?) south to se. NC and e. SC. Distinct from *O. fruticosa*. Present in the freshwater tidal portions of the Waccamaw, Northeast Cape Fear, Black, Greater Pee Dee, and Cape Fear (?) rivers. [< *O. fruticosa* – RAB; < *O. fruticosa* ssp. *fruticosa* – K, V; = *Kneiffia riparia* (Nuttall) Small – S; = *O. tetragona* Roth ssp. *glauca* (Michaux) Munz var. *riparia* (Nuttall) Munz – X]

*Oenothera simulans* (Small) W.L. Wagner & Hoch, Southeastern Gaura. Cp (GA, NC, SC): open woodlands, sandy fields, roadsides, primarily in the outer Coastal Plain; common. May–September. E. NC (Dare County) south to s. FL, west to e. TX, endemic to the Coastal Plain. [= U; = *Gaura angustifolia* Michaux – RAB, K, Q, S; > *Gaura angustifolia* var. *angustifolia* – X]

\* *Oenothera sinuosa* W.L. Wagner & Hoch, Texas Gaura. Sandy fields, disturbed areas, and clearings; native of farther west. April–June. AR and OK south to s. TX, introduced eastward to SC and FL. [= U; = *Gaura sinuata* Nuttall ex Seringe – RAB, K, Q, X]

\* *Oenothera speciosa* Nuttall, White Evening-primrose, Pink-ladies. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): roadsides and fields, also cultivated as an ornamental; common (rare in Mountains), introduced from farther west. May–August. [= RAB, C, F, G, K, Pa, W, X; = *Hartmannia speciosa* (Nuttall) Small – S]

*Oenothera tetragona* Roth var. *brevistipata* (Pennell) Munz. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (VA): dry forests and woodlands, roadsides; common. May–August. SC and KY, south to GA and MS. Should perhaps be considered more closely related to *O. fruticosa* (where placed in synonymy by Straley), if it is determined to be valid. [= G; < *O. tetragona* – RAB, C; < *O. fruticosa* Linnaeus ssp. *fruticosa* – H, K, V, W; = *Kneiffia brevistipata* Pennell – S; = *O. tetragona* ssp. *tetragona* var. *brevistipata* – X]

*Oenothera tetragona* Roth var. *fraseri* (Pursh) Munz, Appalachian Sundrops. Mt (GA, NC, SC, VA, WV), Pd (NC, SC, VA), Cp (VA): dry to moist forests and woodlands, roadsides; common. May–August. NY and PA, south to nw. SC and n. GA. This is the more montane and high elevation variant of *O. tetragona*. [= F, G, X; < *O. tetragona* – RAB, C; > *O. tetragona* var. *hybrida* (Michaux) Fernald – F, WV; > *O. tetragona* var. *latifolia* (Rydberg) Fernald – F, WV; < *O. fruticosa* Linnaeus ssp. *glauca* (Michaux) Straley – H, K, Pa, V, W; > *Kneiffia glauca* (Michaux) Spach – S; > *Kneiffia hybrida* (Michaux) Small – S; > *Kneiffia latifolia* Rydberg – S; = *O. tetragona* ssp. *glauca* var. *glauca* – X]



***Oenothera tetragona*** Roth var. ***tetragona***, Northern Sundrops. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, VA): dry forests and woodlands, roadsides; common (rare in DE). May-August. NL (Newfoundland) west to MI, south to e. VA and MO. [= F; < *O. tetragona* – RAB, C; > *O. tetragona* var. *longistipitata* (Pennell) Munz – F, WV; < *O. tetragona* var. *tetragona* – G; < *O. fruticosa* Linnaeus ssp. *glauca* (Michaux) Straley – H, K, Pa, V, W, WV; = *Kneiffia tetragona* (Roth) Pennell – S; = *O. tetragona* ssp. *tetragona* var. *tetragona* – X]

***Oenothera tetragona*** Roth var. ***velutina*** (Pennell) Munz. Cp (VA): dry sandy soils. Se. NY (Long Island) south to se. VA. Should perhaps be considered more closely related to *O. fruticosa* (where placed in synonymy by Straley), if it is determined to be valid. [= F, G; < *O. tetragona* – RAB, C; < *O. fruticosa* Linnaeus ssp. *fruticosa* – H, K, V, W; = *Kneiffia velutina* Pennell – S; = *O. tetragona* ssp. *tetragona* var. *velutina* – X]

***Oenothera triloba*** Nuttall, Stemless Evening-primrose. Mt (GA, VA\*): limestone glades (in GA), blackbelt prairies, disturbed areas (in VA); rare, perhaps only introduced in VA, though native into eastern KY and TN (GA Watch List). May-June. [= C, F, G, H, K, Pa, X; = *Lavauxia triloba* (Nuttall) Spach – S]

\* ***Oenothera villosa*** Thunberg ssp. ***villosa***. Mt (VA, WV), Pd (VA): disturbed areas; uncommon (rare in WV), apparently naturalized in our area from an original distribution in the Great Plains. July. [= K, Z; ? *O. strigosa* (Rydberg) Mackenzie & Bush – G; ? *O. biennis* var. *canescens* Torrey & A. Gray – C, F; < *O. villosa* – Pa; ? *O. strigosa* (Rydberg) Mackenzie & Bush ssp. *canoviensis* (Steele) Munz – X]

\* ***Oenothera clelandii*** W. Dietrich, Raven, & W.L. Wagner. Reported for SC (Kartesz 1999). {investigate} Centered in IL and WI, ranging east, probably mostly as introductions, to NJ, WV, KY. [= C, K, Y; < *O. rhombipetala*, misapplied]

***Oenothera filiformis*** (Small) W.L. Wagner & Hoch. East to MD, PA, KY, TN, and AL (Kartesz 1999). [= U; = *Gaura longiflora* Spach – K, preoccupied name; = *Gaura biennis* Linnaeus var. *pitcheri* Torrey & A. Gray – C, F, G, X; > *Gaura filiformis* Small – S; > *Gaura longiflora* – S] {not yet keyed}

***Oenothera macrocarpa*** Nuttall ssp. ***macrocarpa***, Wingfruit Evening-primrose, occurs as a disjunct in c. TN. [= K; < *O. missouriensis* Sims – F; < *O. macrocarpa* Nuttall – C, G; = *O. missouriensis* Sims var. *missouriensis* – X; ? *Megapterium missouriense* (Sims) Spach]

***Oenothera serrulata*** Nuttall, Yellow Sundrops. River banks. June-July. ON west to AB, south to w. KY (Jones 2005), w. AR, TX, NM, and Mexico. Sometimes treated as *Calylophus serrulatus* (see synonymy), but better included a broadly-circumscribed *Oenothera*, based on Wagner, Hoch, & Raven (2007). [= U; = *Calylophus serrulatus* (Nuttall) Raven – K] {not yet keyed; synonymy incomplete}

***Oenothera tetragona*** Roth var. ***sharpii*** Munz. Known from the Eastern Highland Rim of TN, AL, and KY. [= < *O. tetragona* – RAB, C; < *O. tetragona* var. *tetragona* – G; < *O. fruticosa* Linnaeus ssp. *fruticosa* – H, K, V, W; = *O. tetragona* ssp. *tetragona* var. *sharpii* – X]

***Oenothera xenogaura*** W.L. Wagner & Hoch. Disjunct eastward in GA (Kartesz 1999). [= U; = *Gaura drummondii* (Spach) Torrey & A. Gray K] {not yet keyed}



222. **MYRTACEAE** A.L. de Jussieu 1789 (Myrtle Family) [in MYRTALES]

A family of about 100-142 genera and 3500-5500 species, trees and shrubs, nearly worldwide in tropical and subtropical areas. References: Wilson in Kubitzki (2011).

- 1 Leaves opposite, orbicular, clasping; [subfamily *Myrtoideae*; tribe *Eucalypteae*] ..... ***Eucalyptus***
- 1 Leaves alternate, lanceolate; [subfamily *Myrtoideae*; tribe *Melaleuceae*] ..... ***Melaleuca***

***Eucalyptus*** L'Héritier 1789 (Gum, Eucalyptus, Stringybark)

A genus of about 800 species, trees and shrubs, nearly all of Australia. References: Wilson in Kubitzki (2011).

**Identification notes:** Other species of *Eucalyptus* are more rarely planted and may eventually naturalize.

\* ***Eucalyptus cinerea*** F. Mueller ex Bentham, Silver-dollar Eucalyptus, Silver-dollar Tree, Argyle-apple, Mealy Stringybark. Planted (becoming very popular across the warmer parts of the se. United States as an ornamental), sometimes persistent and appearing naturalized; native of se. Australia. [= K2]

***Melaleuca*** Linnaeus 1767 (Cajeput, Bottlebrush, Punktree)

A genus of ca. 300 species (if circumscribed, as here, to include *Callistemon*), trees and shrubs, of tropical and subtropical Australia and nearby Asia and Pacific Islands. References: Wilson in Kubitzki (2011).

- 1 Filaments red or crimson; flowers attached to the inflorescence axis singly ..... ***M. citrina***

- 1 Filaments white, greenish, or yellowish; flowers attached to the inflorescence in triads ..... *M. quinquenervia*
- \* *Melaleuca citrina* (Curtis) Dumont de Courset, Crimson Bottlebrush. Disturbed areas; native of Australia. [= *Callistemon citrinus* (Curtis) Skeels – K2, WH]
- \* *Melaleuca quinquenervia* (Cavanilles) Blake, Punktree, Paperbark Tree, Meleleuca. Wetlands, disturbed areas; native of Australia. [= GW, K2, WH; = *M. leucadendra* Linnaeus – S, misapplied]



### 223. MELASTOMATACEAE A.L. de Jussieu 1789 (Melastome Family) [in MYRTALES]

A family of about 200 genera and 4500-5000 species, trees, shrubs, vines, and herbs, of tropical, subtropical, and warm temperate areas.

#### *Rhexia* Linnaeus 1753 (Meadow-beauty) (by Richard J. LeBlond)

A genus of about 13 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; Nesom (2012a)=Y; Bounds (1987); Wurdack & Kral (1982); Snyder (1996).

**Identification notes:** Measurements of the hypanthium are to the base of the calyx lobes.

- 1 Anthers 1-3.5 (-4) mm long, straight to slightly curved.
- 2 Petals white (rarely pale lavender); anthers (2-) 3-3.5 (-4) mm long, usually longer than the filaments; [pond margins in sw. GA and Panhandle FL]; [section *Rhexia*] ..... *R. parviflora*
- 2 Petals yellow or lavender-rose to pink; anthers 1-2.5 mm, usually shorter than the filaments; [collectively more widespread].
- 3 Stem internodes with at least some hairs; leaves oblong, linear, or spatulate; petals yellow; [section *Luteorhexia*] ..... *R. lutea*
- 3 Stem internodes glabrous; leaves ovate, suborbicular, or widely elliptic; petals lavender-rose to pink; [section *Brevianthera*].
- 4 Calyx segments blunt to acute; floral tube glandular-pubescent; surface of seeds irregularly ridged; [of s. GA and Panhandle FL] ..... *R. nuttallii*
- 4 Calyx segments acuminate-aristate; floral tube nearly glabrous except along the calyx lobes; surface of seeds pebbled; [widespread in the Coastal Plain from se. VA southward and westward, and rarely inland]..... *R. petiolata*
- 1 Anthers 5-11 mm long, distinctly curved.
- 5 Stem nodes and internodes glabrous; stem and foliage blue-green; [section *Cymborhexia*] ..... *R. alifanus*
- 5 Stem nodes and usually also the internodes hirsute; stem and foliage green; [section *Rhexia*].
- 6 Sepal lobes aristate, the awn-tip 0.5-1.5 mm long, and also with flaring, yellowish, stiff hairs 3-5 mm long ..... *R. aristosa*
- 6 Sepal lobes obtuse to acuminate, not aristate, the hairs shorter and not yellowish or stiff.
- 7 Leaves 1-5 (-8) mm wide, linear, linear-elliptic, narrowly oblong, or narrowly spatulate.
- 8 Leaves twisted at base, borne in a vertical plane; four stem faces subequal, the angles narrowly winged; mature hypanthium neck shorter than body; calyx lobes 1.5-2 mm long; anthers 4-5 mm long ..... *R. salicifolia*
- 8 Leaves not twisted at base, borne more or less horizontally; four stem faces markedly unequal, the angle wings inconspicuous or absent; mature hypanthium neck as long as or longer than body; calyx lobes 2-4 mm long; anthers 5-10 mm long.
- 9 Petals lavender-rose, (1-) 1.5-2 (-2.5) cm long; mature hypanthium 10-14 mm long, with glandular hairs; marginal nerves of leaf abaxial surface either absent or obscure and discontinuous; anthers 7-10 mm long ..... *R. cubensis*
- 9 Petals white to pink (-rose-purple), (7-) 0.9-1.4 cm long; mature hypanthium 6-10 mm long, glabrous or sparsely glandular-hairy; marginal nerves of leaf abaxial surface prominent; anthers 5-8 mm long ..... *R. mariana* var. *exalbida*
- 7 Leaves (5-) 7-20 (-35) mm wide, lanceolate, elliptic, or ovate.
- 10 Four stem faces at mid-stem markedly unequal, one pair of opposite faces broader, convex, darker green, the narrower pair concave or flat, pale, the arrangement of broader and narrower faces alternating at each subsequent internode.
- 11 Mature hypanthium 6-10 (-11) mm long, glandular-setose; petals 12-15 (-18) mm long, glabrous on the lower surface; anthers 5-8 mm long ..... *R. mariana* var. *mariana*
- 11 Mature hypanthium (9-)10-15 (-20) mm long, glabrous or glabrate; petals (18-) 20-25 mm long, glandular-hairy on the lower surface (best seen in bud); anthers 8-11 mm long ..... *R. nashii*
- 10 Four stem faces at mid-stem about equal, almost flat, the angles sharp or winged.
- 12 Roots tuberous; stem angles at mid-stem conspicuously winged; hypanthium 7-10 mm long, the neck shorter than the body ..... *R. virginica*
- 12 Roots not tuberous; stem angles sharp to narrowly winged; hypanthium 10-13 mm long, the neck as long as or longer than the body.
- 13 Hypanthium 7-9 (-10) mm long; petals 8-12 mm long; seeds irregularly ridged, especially along the crest [west of the Appalachians] ..... *R. interior*

- 13 Hypanthium (9-) 10-12 mm long; petals 10-25 mm long; seeds papillate, the papillae in concentric lines [from NJ to SC east of the Appalachians] ..... *R. ventricosa*

**Alternate Key based largely on vegetative characters**

- 1 Stem internodes glabrous.
  - 2 Stem nodes as well as internodes glabrous, leaf margins entire or remotely low-toothed apically, glabrous..... *R. alifanus*
  - 2 Stem nodes hirsute, leaf margins toothed, the teeth often tipped with hairs.
    - 3 Longest leaves 1.5 (-2) cm long, ovate or suborbicular
      - 4 Leaf apex obtuse to acute, margins subentire to blunt-toothed or serrulate, teeth hairs if present shorter than 1 mm..... *R. nuttallii*
      - 4 Leaf apex acute to acuminate, serrulate, the teeth tipped with a hair 1 mm long or slightly longer, the margin appearing ciliate ..... *R. petiolata*
    - 3 Longest leaves > 2 cm long, lanceolate, elliptic, or ovate.
      - 5 Rhizomes present, roots not tuberiferous or spongy-thickened..... *R. ventricosa*
      - 5 Rhizomes absent, roots tuberiferous or spongy-thickened.
        - 6 Stem leaves gradually reduced upward ..... *R. virginica*
        - 6 Stem leaves gradually lengthening from the base to mid-stem..... *R. aristosa*
  - 1 Stem internodes (and nodes) hirsute or glandular-hairy.
    - 7 Leaves lanceolate, elliptic, or ovate, broadest at or below the middle.
      - 8 Four stem faces at mid-stem about equal, almost flat, the angles sharp or winged.
        - 9 Some roots rhizome-like, with adventitious buds; roots not tuberiferous or spongy-thickened ..... *R. ventricosa*
        - 9 Roots not rhizome-like; roots tuberiferous or spongy-thickened ..... *R. virginica*
      - 8 Four stem faces at mid-stem markedly unequal, one pair of opposite faces broader, convex, darker green, the narrower pair concave or flat, pale.
        - 10 Mature hypanthium 6-10 mm long, glandular-hairy; petals 1.2-1.5 cm long, glabrous on the lower surface..... *R. mariana* var. *mariana*
        - 10 Mature hypanthium 10-15 mm long, glabrous or glabrate; petals 2.0-2.5 cm long, glandular-hairy on lower surface (best seen in bud) ..... *R. nashii*
    - 6 Leaves linear, narrowly elliptic, or broadest above the middle.
      - 11 Plant bushy-branched..... *R. lutea*
      - 11 Plant simple below the cymose inflorescence.
        - 12 Leaves twisted at base, borne in a vertical plane; four stem faces subequal, the angles narrowly winged..... *R. salicifolia*
        - 12 Leaves not twisted at base, borne more or less horizontally; four stem faces markedly unequal, the angle wings inconspicuous or absent.
          - 13 Mature hypanthium 10-14 mm long, with glandular hairs; petals lavender-rose, 1.5-2.0 cm long ..... *R. cubensis*
          - 13 Mature hypanthium 6-10 mm long, glabrous or sparsely glandular-hairy; petals white, 1.2-1.5 cm long ..... *R. mariana* var. *exalbida*

{add *R. parviflora*}

***Rhexia alifanus*** Walter, Smooth Meadow-beauty. Pine flatwoods and savannas, pocosins borders, more able to tolerate merely moist soils than other *Rhexia* species. May-September. A Southeastern Coastal Plain species: e. NC south to n. peninsular FL and west to se. Texas (Singhurst, Mink, & Holmes 2010). Our tallest and showiest *Rhexia*: the unbranched (unless injured), wandlike stems, with strongly ascending, bluish-green, generally entire leaves make this species unmistakable. [= GW, K, RAB, S, WH, Y, Z]

***Rhexia aristosa*** Britton, Awned Meadow-beauty, Bristly Meadow-beauty. Clay-based Carolina bays, depression meadows, and limesink ponds (dolines). June-September. This species has a very local and disjunct range extending (strictly on the Coastal Plain) from NJ south to AL. The long yellowish bristles at the summit of the calyx/hypanthium are diagnostic. *R. aristosa* × *virginica* is known from the Coastal Plain of NJ (Snyder 1996). [= C, F, G, GW, K, RAB, S, Y, Z]

***Rhexia cubensis*** Grisebach, West Indies Meadow-beauty. Limesink ponds (dolines). June-September. Se. NC south to s. FL and west to sw. MS; also in the West Indies. [= GW, K, RAB, S, WH, Y, Z]

***Rhexia interior*** Pennell. Moist to wet areas, ditches, prairies. S. IN, s. IL, s. MO, and se. KS south to c. AL, c. MS, n. LA, and se. OK. [= F, G, Y; = *R. mariana* Linnaeus var. *interior* (Pennell) Kral & Bostick – GW, K, Z; < *R. interior* – C]



***Rhexia lutea*** Walter, Yellow Meadow-beauty, Golden Meadow-beauty. Wet pine flatwoods and savannas, seepage slopes, and bogs. April-July (and later in response to growing-season fire). A Southeastern Coastal Plain species: e. NC south to ne. FL and Panhandle FL, and west to se. TX. The only yellow-flowered *Rhexia* and also our bushiest species. [= GW, K, RAB, S, WH, Y, Z]

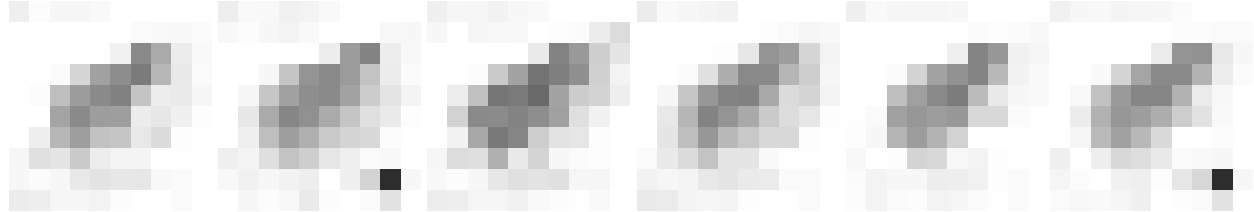
***Rhexia mariana*** Linnaeus var. ***exalbida*** Michaux, White Meadow-beauty. Wet pine flatwoods and savannas, wet meadows, ditches, and wet roadsides. June-September. NC south to FL and west to MS. Merging into *R. mariana* var. *mariana* from FL westward, var. *exalbida* appears quite distinct in NC. The white flowers and linear leaves are diagnostic. [= RAB; ? *R. lanceolata* – S; < *R. mariana* var. *mariana* – GW, K, Z; < *R. mariana* – WH]

***Rhexia mariana*** Linnaeus var. ***mariana***, Maryland Meadow-beauty, Dull Meadow-beauty, Pale Meadow-beauty. Pine flatwoods, wet meadows, bog margins, ditches, wet roadsides, often weedy. May-October. E. MA south to s. FL, west to TX, and north to s. IN and IL. [= G, W, RAB; < *R. mariana* var. *mariana* – F, GW, K, Z (also see *R. mariana* var. *exalbida*); > *R. mariana* var. *leiosperma* Fernald & Griscom – F; ? *R. delicatula* Small – S; < *R. mariana* – Pa, WH, WV]

***Rhexia nashii*** Small, Hairy Meadow-beauty, Maid Marian. Wet pine flatwoods and savannas; pondshores, bogs, marshes, ditches, wet roadsides. May-October. Primarily a Southeastern Coastal Plain species: e. VA south to s. FL and west to se. LA. [= GW, K, S, WH, Y, Z; = *R. mariana* var. *purpurea* Michaux – F, G, RAB]

***Rhexia nuttallii*** C.W. James, Nuttall's Meadow-beauty. Pine flatwoods, bogs. Coastal Plain of se. GA west to FL Panhandle, south to s. peninsular FL. [= GW, K, WH, Y, Z; = *R. serrulata* Nuttall – S]

***Rhexia parviflora*** Chapman, Small-flowered White Meadow-beauty, Apalachicola Meadow-beauty. Limesink pond margins. Sw. GA (Mitchell County) and se. AL south into Panhandle FL. [= GW, K, S, WH, Y, Z]



***Rhexia petiolata*** Walter, Ciliate Meadow-beauty, Short-stemmed Meadow-beauty. Wet pine flatwoods and savannas, pocosin borders, and ditches. June-September. May-October. A Southeastern Coastal Plain endemic: se. VA south to s. FL and west to se. TX. The flowers are sessile, the petals ascending. [= C, G, GW, K, RAB, WH, Y, Z; = *R. ciliosa* Michaux – F, S]

***Rhexia salicifolia*** Kral & Bostick, Willowleaf Meadow-beauty, Panhandle Meadow-beauty. Drawdown zones of Coastal Plain depression ponds and interdune swales. Sw. GA and FL Panhandle west to s. AL (Jensen 2007). [= GW, K, WH, Y, Z]

***Rhexia ventricosa*** Fernald & Griscom, Swollen Meadow-beauty. Pine flatwoods and savannas, clearings in cypress-hardwood swamps, ditches, wet roadsides. June-September. S. NJ south to e. SC. This taxon is closely related to *R. interior* Pennell, which is distributed west of the Appalachians. [= F, RAB, Y; = *R. mariana* Linnaeus var. *ventricosa* (Fernald & Griscom) Kral & Bostick – GW, K, W, Z; < *R. interior* Pennell – C]

***Rhexia virginica*** Linnaeus, Virginia Meadow-beauty, Deergrass, Handsome Harry, Wing-stem Meadow-beauty. Wet pine flatwoods and savannas, pond shores, bogs, and ditches. May-October. E. Canada and WI south to ne. FL, Panhandle FL, and TX. [= C, G, GW, K, Pa, W, WH, WV, Y, Z; > *R. virginica* var. *purshii* (Sprengel) C.W. James – RAB; > *R. virginica* var. *virginica* – F, RAB; > *R. virginica* var. *septemnervia* (Walter) Pursh – F; = *R. stricta* Pursh – S]

### 230. STAPHYLEACEAE Martynov 1820 (Bladdernut Family) [in CROSSOSOMATALES]

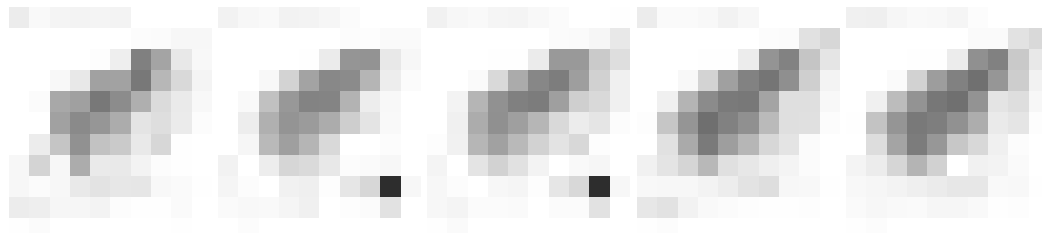
A family of 2 genera and about 45-50 species, trees and shrubs, of mainly temperate Northern Hemisphere, especially e. Asia. References: Spongberg (1971)=Z; Simmons in Kubitzki, Bayer, & Stevens (2007).

#### *Staphylea* Linnaeus 1753 (Bladdernut)

A genus of 23 species, trees and shrubs, mainly of temperate Eurasia and e. North America, but extending into Central and South America. References: Simmons in Kubitzki, Bayer, & Stevens (2007).

**Identification notes:** The opposite, trifoliolate leaves with serrulate margins are diagnostic.

***Staphylea trifolia*** Linnaeus, Bladdernut. Nutrient-rich bottomland forests, extending upslope over calcareous or mafic rocks. April-May; August-October. QC west to MN, south to sw. GA, Panhandle FL, n. AL, n. MS, and OK. [= RAB, C, F, G, GW, K, Pa, S, W, WH, WV, Z]



## 239. ANACARDIACEAE R. Brown 1818, nom. cons. (Cashew Family) [in SAPINDALES]

A family of about 70-81 genera and about 800-875 species, trees, shrubs, lianas, and rarely herbs, of tropical, subtropical, and temperate regions. Our representatives are all classed in subfamily Anacardioidae (Pell et al. 2011). References: Pell et al. in Kubitzki (2011); Barkley (1937).

- 1 Leaves simple ..... *Cotinus*
- 1 Leaves compound.
  - 2 Leaves even-pinnate ..... *Pistacia*
  - 2 Leaves odd-pinnate.
    - 3 Fruits both red and glabrous ..... *Schinus*
    - 3 Fruits not simultaneously red and glabrous.
      - 4 Fruits red, glandular pubescent; foliage and stems lacking contact poisons; inflorescences dense, either terminal or lateral on last year's growth ..... *Rhus*
      - 4 Fruits white or yellow, glabrous or puberulent (the hairs not glandular); foliage and stems containing contact poisons; inflorescences openly branched, axillary ..... *Toxicodendron*

*Cotinus* P. Miller 1754 (Smoketree)

A genus of 4-8 species, of se. and sc. North America and temperate Eurasia. References: Barkley (1937)=Z; Pell et al. in Kubitzki (2011).

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

\* *Cotinus coggygria* Scopoli, European Smoketree. Suburban areas; native of Europe and Asia. June. *C. coggygria* is planted as an ornamental, and is reported as naturalized in various states in ne. United States. There is little evidence of its true naturalization or persistence in our area. [= K1, K2, Pa]

*Cotinus obovata* Rafinesque, American Smoketree. Limestone woodlands and glades. Se. TN (Cumberland Plateau) (Chester, Wofford, & Kral 1997), nw. GA, and n. AL west to OK and e. and sc. TX. A small tree of limestone woodlands and glade margins, occasionally planted as an ornamental tree. [= *C. obovatus* Rafinesque – K1, K2, orthographic variant; = *C. americanus* Nuttall – S, Z]

*Pistacia* Linnaeus 1753 (Pistachio)

A genus of about 12 species, trees and shrubs, of tropical and temperate Asia, n. Africa. Mediterranean Europe, and s. North America and c. America. References: Pell et al. in Kubitzki (2011).

\* *Pistacia chinensis* Bunge, Chinese Pistachio. Uncommonly planted, rarely persistent or naturalizing; native of China, the Philippines, and Taiwan. March-April. Krings (2011) documents its occurrence in the Piedmont of NC (Wake County). [= K1; > *P. chinensis* ssp. *subintegerrima* (Stewart) Rech. f. – K2]

*Rhus* Linnaeus 1753 (Sumac)

A genus of about 35 species, trees, shrubs, and lianas, temperate and subtropical, of Eurasia, Hawaii, North America, and n. Central America. References: Barkley (1937)=Z; Pell et al. in Kubitzki (2011); Yi, Miller, & Web (2007); Hardin & Phillips (1985a); Miller, Young, & Wen (2001).

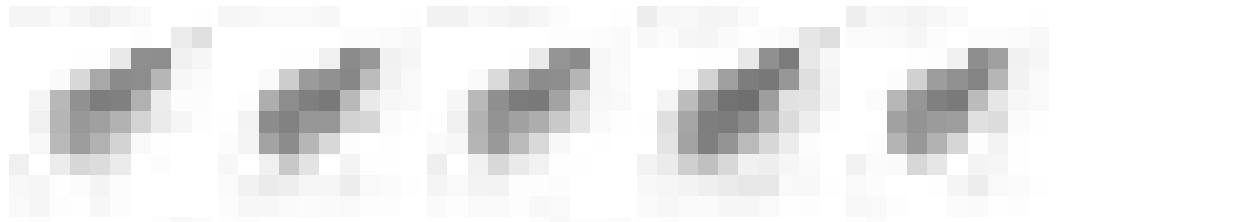
**Identification notes:** Two hybrids have been documented to occur naturally in our area: *Rhus* × *borealis* Greene (*glabra* × *typhina*) and *Rhus* × *ashei* (Small) Greene (*glabra* × *michauxii*). They are intermediate between their parents. For instance, *R. ashei* has sparsely pubescent leaves and stems, slight winging of the rachis between the terminal leaflets, potentially greater stature than *R. michauxii*, and leaflets with a length/width ratio of 2.5-3. Hardin & Phillips (1985b) discuss other natural and artificial hybrids in *Rhus*.

- 1 Leaves 3-foliolate; shrub to 2 m tall; inflorescence of small lateral and terminal clusters; [subgenus *Lobadium*].
  - 2 Terminal leaflet rhombic to ovate, toothed, acute at the tip; flowers produced before expansion of the leaves; pedicels 1-2 mm long, glabrous; petals glabrous on the inner surface; fruits 4-5 mm in diameter; [widespread in our area] ..... *R. aromatica* var. *aromatica*
  - 2 Terminal leaflets broadly rhombic or obovate, 3-lobed, and also scalloped or toothed, rounded or angled at the tip; flowers produced at or after the expansion of the leaves; pedicels 2-3 mm long, glabrous to densely woolly; petals usually hairy on the inner surface; fruits 5-6 mm in diameter; [perhaps entering our area as a disjunct from west of the Mississippi River] ..... [*R. aromatica* var. *serotina*]
- 1 Leaves (5-) 7-31-foliolate; shrub or small tree, to 12 m tall; inflorescence of dense, terminal panicles; [subgenus *Rhus*].
  - 3 Rachis of the leaf winged between each pair of adjacent leaflets; stems and petioles puberulent; leaflets entire to remotely toothed.
    - 4 Leaflets 11-25, attenuate to base, 2-9 cm long, 1-2 cm wide, **either** >3× as long as wide **or** < 4 cm long; leaflet margins entire (rarely serrate); leaflet apex rounded, obtuse, acute, or acuminate (often at least the more basal leaflets with an obtuse tip) ..... *R. copallinum* var. *copallinum*

- 4 Leaflets 5-13, rounded to base on the upper side, 4-9 cm long, 1.5-5 cm wide, > 2.5× as long as wide; leaflet margins entire or serrate; leaflet apex acute or acuminate tip.....***R. copallinum* var. *latifolia***
- 3 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.
- 5 Leaflets densely pubescent (rarely sparsely pubescent); short shrubs to 1 m tall; stems densely long-pubescent; rachis of the leaf often winged terminally; leaflets mostly ovate, averaging about 2× as long as wide, acute.....***R. michauxii***
- 5 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.
- 6 Stems essentially glabrous; pubescence of the fruit short and blunt-tipped.....***R. glabra***
- 6 Stems densely long-pubescent; pubescence of the fruit long and pointed.....***R. typhina***

***Rhus aromatica*** Aiton var. ***aromatica***, Fragrant Sumac, Squawbush. Rocky, rather dry, woodlands, usually over mafic rocks (such as gabbro or diabase) or calcareous rocks, less commonly in sandy soils. Late February-early May; late April-June. The species ranges throughout much of temperate North America; var. *aromatica* is the most eastern component of the complex, distributed from NH, ON, and MN south to Panhandle FL and TX. The foliage of *R. aromatica* bears some superficial resemblance to *Toxicodendron pubescens*. [= C, F, G, K, Pa, WV; < *R. aromatica* – RAB, W, WH; = *Schmalzia crenata* (P. Miller) Greene – S; = *R. aromatica* – Z; = *R. aromatica* ssp. *aromatica*]

***Rhus aromatica*** Aiton var. ***serotina*** (Greene), Midwestern Fragrant Sumac. Occurring just west of area, and some populations east of the Mississippi River in TN, KY, and AL may represent this taxon (D. Estes, pers. comm. 2012). [= C, K2; = *R. trilobata* Nuttall var. *serotina* (Greene) Barkley – Z; = *R. aromatica* ssp. *serotina* (Greene) R.E. Brooks]



***Rhus copallinum*** Linnaeus var. ***copallinum***, Winged Sumac, Flameleaf Sumac. Sandhills, dry woodlands, maritime thickets (especially from VA northward), old fields, roadsides. S. NY south to s. FL, mainly on the Coastal Plain and lower Piedmont. The Linnaean epithet “*copallinum*” (traditionally capitalized as “*Copallinum*”) is grammatically a noun in apposition rather than an adjective, and therefore does not change grammatical gender. [= K; < *R. copallina* – Pa, RAB, W; < *R. copallinum* – C, G, WH; = *R. copallina* var. *copallina* – F; > *R. copallinum* – S; ; > *R. leucantha* Jacquin – S; > *R. obtusifolia* (Small) Small – S; > *R. copallina* var. *leucantha* (Jacquin) DC. – Z; <> *R. copallina* var. *copallina* – Z]

***Rhus copallinum*** Linnaeus var. ***latifolia*** Engler, Eastern Winged Sumac. Rocky glades, dry woodlands. S. ME to n. IL, south to c. GA, AL, LA, and e. TX. [= K; < *R. copallina* – Pa, RAB, W; < *R. copallinum* – C, G, S; = *R. copallina* var. *latifolia* – F; < *R. copallina* var. *copallina* – Z]

***Rhus glabra*** Linnaeus, Smooth Sumac. Disturbed areas, clearings, roadsides, woodlands. Late May-July; June-October. ME west to BC, south to Panhandle FL, TX, CA, and beyond. [= RAB, C, G, K, Pa, S, W, WH, WV; > *R. glabra* var. *glabra* – F, Z; > *R. glabra* var. *laciniata* Carrière – Z]

***Rhus michauxii*** Sargent, Michaux's Sumac, Dwarf Sumac. In the fall line sandhills characteristically in submesic, loamy swales, usually associated with such species as *Paspalum bifidum*, *Helianthus divaricatus*, *Tridens carolinianus*, *Rhus copallinum*, *Anthaenantia villosa*, *Gymnopogon* sp., and *Aristida lanosa*; in the eastern Piedmont on sandy soils derived from granite; in the central Piedmont on clayey soils derived from mafic rocks such as gabbro or mafic Carolina slates, probably all of its habitats (formerly) in frequently burned situations. June; August-September. Rare and scattered (though formerly more common) from s. VA south to GA; disjunct in Alachua County, FL (just south of area). Large populations were found in sc. VA (Nottoway and Dinwiddie counties) in frequently burned military artillery “impact areas” (Fleming & Ludwig 1996). Barden & Matthews (2004) present a detailed account of its discovery by André Michaux in 1794 in what is now Union County, NC. [= RAB, K, S, Z; = *R. pumila* Michaux]

***Rhus typhina*** Linnaeus, Staghorn Sumac. Roadsides, old pastures, thickets, clearings, rock outcrops, barrens. May-June; June-September. NS and NB west to MN, south to n. GA, AL, MS, and KS. The apparently older epithet “*hirta*” was rejected in 1999. The species, especially in its cut-leaved forms, forma *laciniata* (Wood) Rehder and forma *dissecta* Rehder, is very popular in Europe as a cultivated ornamental. [= RAB, C, F, G, K, Pa, W, WV; = *R. hirta* (Linnaeus) Sudworth – S; > *R. typhina* var. *typhina* – Z; > *R. typhina* var. *laciniata* Wood – Z]

### ***Schinus*** Linnaeus 1753 (Brazilian-pepper)

A genus of about 15 species, shrubs and trees of the tropics. References: Pell et al. in Kubitzki (2011).

\* ***Schinus terebinthifolia*** Raddi, Brazilian-pepper. Disturbed areas, especially moist or wet; native of Brazil and Paraguay. A noxious invasive in the FL peninsula. [= *S. terebinthifolius* Raddi – GW, WH, orthographic variant; > *S. terebinthifolius* var. *raddianus* Engl. – K]



***Toxicodendron*** P. Miller 1754 (Poison Ivy, Poison Oak, Poison Sumac)

A genus of about 10-15 species, trees and shrubs, primarily temperate, of North America, n. South America, Indonesia, and e. Asia. References: Gillis (1971)=Z; Pell et al. in Kubitzki (2011).

- 1 Leaflets 7-13, entire; small tree ..... ***T. vernix***  
 1 Leaflets 3, toothed, lobed, or entire; shrub or vine.  
 2 Fruits pubescent or papillose; leaflets entire, coarsely toothed, undulate, or round-lobed; lower surfaces of leaflets either velvety puberulent, sometimes becoming glabrate in age (*T. pubescens*) or glabrous (glabrescent or rarely pilose beneath) but with prominent tufts of tannish hairs present in the vein axils (*T. radicans* var. *radicans*).  
 3 Leaves sparsely pubescent (rarely pilose beneath), the apex and the lobes (if present) generally acute to acuminate; drupes papillose, scabrous or puberulent; plant a high-climbing vine or stoloniferous shrub; [of mesic, swampy, or dry habitats] ..... ***T. radicans* var. *radicans***  
 3 Leaves velvety puberulent (sometimes becoming glabrate in age), the apex and the lobes (if present) generally obtuse to broadly acute; drupes pubescent (becoming glabrate); plant a stoloniferous shrub; [of dry habitats, especially sandhills] ..... ***T. pubescens***  
 2 Fruits glabrous (or very sparsely pubescent); leaflets coarsely toothed or notched (rarely entire); lower surfaces of leaflets glabrous to pubescent, but without tufts of tannish hairs in the vein axils.  
 4 Leaves densely pilose and velvety on the lower surface; leaves pubescent on the upper surface; pubescence of the leaves erect ..... ***T. radicans* var. *pubens***  
 4 Leaves glabrous to sparsely strigose on the lower surface; leaves glabrous on the upper surface; pubescence of the leaves appressed.  
 5 Leaflets suborbicular or broadly ovate, nearly as wide as long; petiole glabrous (rarely glabrescent); plant a shrub, the stems upright, entirely lacking aerial roots, not vining; fruits (3-) 4-7 mm in diameter ..... ***T. rydbergii***  
 5 Leaflets ovate to lanceolate; petiole puberulent to densely pubescent; plant a shrub or vine, the stems upright or twining; fruits 2.5-5.5 mm in diameter ..... ***T. radicans* var. *negundo***

***Toxicodendron pubescens*** P. Miller, Poison Oak. Dry woodlands, around dry rock outcrops in the Piedmont and Mountains, especially prevalent in sandhills. Late April-May; August-October. Primarily Southeastern: NY (Long Island) south to n. FL, west to e. TX, inland to WV, e. TN, c. TN, se. MO, and s. KS. The nomenclatural confusion may still not be resolved. [= C, K, WH; = *Rhus toxicodendron* – RAB, F, G; = *T. toxicodendron* (Linnaeus) Britton – S; = *T. toxicarium* Gillis – W, Z; = *T. quercifolium* (Michaux) Greene]

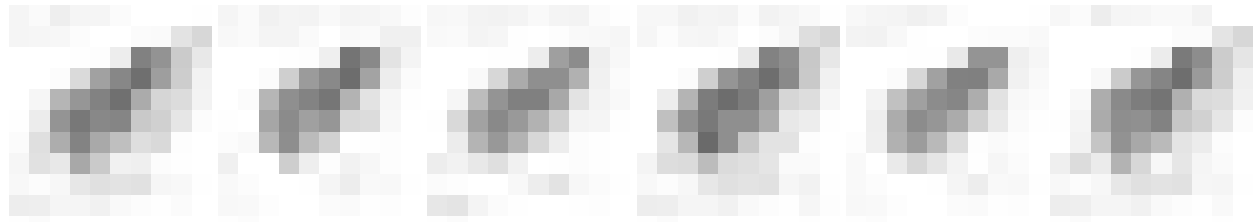
***Toxicodendron radicans*** (Linnaeus) Kuntze var. ***negundo*** (Greene) Reveal, Midwestern Poison Ivy. In a wide range of habitats, including mesic forests, rock outcrops, open areas, and disturbed ground. Late April-May; August-October. NY west to MI, MN, and NE, south to sw. VA, KY, AR, and TX, almost entirely in or west of the Appalachians. In our area seemingly mostly in the New River drainage; to be expected in nw. NC. [= C; = *Rhus radicans* var. *vulgaris* (Michaux) A.P. de Candolle forma *negundo* (Greene) Fernald – F, G; = *T. radicans* ssp. *negundo* (Greene) Gillis – K, Z; < *T. radicans* – Pa]

***Toxicodendron radicans*** (Linnaeus) Kuntze var. ***pubens*** (Engelmann ex S. Watson) Reveal. Xeric limestone sites. S. IL and MO south to se. LA and s. TX; disjunct eastward in c. KY, c. TN, and w. VA (Virginia Botanical Associates 2006). [< *T. radicans* – GW, W; = *T. radicans* ssp. *pubens* (Engelmann ex S. Watson) Gillis – K, Z; < *Rhus radicans*]

***Toxicodendron radicans*** (Linnaeus) Kuntze var. ***radicans***, Eastern Poison Ivy. In a wide range of habitats, including mesic forests, rock outcrops, swamp forests, brackish marshes, open areas, disturbed ground, usually in more mesic to hydric sites than *T. pubescens*, and particularly common in areas with fertile soils, such as bottomlands or over calcareous rocks or calcareous sands (as in maritime forests). Late April-May; August-October. Var. *radicans* is the typical poison ivy of the Atlantic and Gulf Coastal Plain, rarely found west of the Appalachians. It ranges from NS south to s. FL (and the Bahamas), west to e. TX, inland to VT, c. PA, WV, KY, and AR. It is normally a vine, climbing by adventitious roots, and can attain diameters of 10 cm and climb to the crowns of forest trees. It can also resemble *T. pubescens* in habit, producing numerous meter-high upright stems from rhizomes. *T. radicans* var. *radicans* is ubiquitous in our area, absent only from the high mountains of NC. [= C; < *Rhus radicans* Linnaeus – RAB; > *Rhus radicans* var. *radicans* – F, G, WV; > *Rhus radicans* var. *vulgaris* (Michaux) A.P. de Candolle forma *vulgaris* – F, G; < *T. radicans* – GW, Pa, S, W, WH; = *T. radicans* ssp. *radicans* – K; > *Rhus radicans* var. *vulgaris* (Michaux) A.P. de Candolle – WV]

***Toxicodendron rydbergii*** (Small ex Rydberg) Greene, Western Poison Ivy. Acid pine-oak forests and woodlands at moderate elevations. NS west to BC, south to New England, NY, n. OH, n. IL, IA, w. KS, w. TX, AZ, and OR; disjunct in the Appalachians in PA, WV, and VA. Reported for NC by Gillis (1971), but the location (Cumberland Co., in the fall-line Sandhills), does not seem plausible {investigate further with specimen}. [= C, K, Pa, Z; = *Rhus radicans* var. *rydbergii* (Small) Rehder – F, G, WV; = *T. radicans* (Linnaeus) Kuntze var. *rydbergii* (Small ex Rydberg) Erskine]

***Toxicodendron vernix*** (Linnaeus) Kuntze, Poison Sumac, Thunderwood. In peaty habitats, in the Coastal Plain frequent in streamhead pocosins and sandhill seepage bogs, in the mountains in bogs. May-early June; August-September. NS west to MN, south to c. peninsular FL and TX. The leaf rachis and leaflet petiolules are usually a dark red or maroon color. The leaves turn a very attractive shade of orange-red in autumn. [= C, GW, K, Pa, S, W, WH; = *Rhus vernix* Linnaeus – RAB, F, G, WV]



**240. SAPINDACEAE** A.L. de Jussieu 1789 (Soapberry Family) [in SAPINDALES]

A family of about 133-141 genera and 1465-1900 species, trees, shrubs, vines, and herbs, primarily of tropical (rarely temperate) regions of the Old World and New World. APG III (2009), Acevedo-Rodríguez et al. (2011), and others have recently included Hippocastanaceae and Aceraceae in the Sapindaceae. References: Acevedo-Rodríguez, van Welzen, Adema, and van der Ham in Kubitzki (2011); Buerki et al. (2009).

- 1 Leaves simple (lobed and/or toothed); fruits winged.
  - 2 Leaves 0.8-2× as long as wide, orbicular in outline, lobed, the margin often also toothed; fruit a schizocarp of 2 samaras; [subfamily *Hippocastanoideae*; tribe *Acereae*] ..... **1. *Acer***
  - 2 Leaves 3-10× as long as wide, oblanceolate, unlobed, margin entire; fruit a winged capsule; [subfamily *Dodonoideae*; tribe *Dodonaeae*] ..... **6. *Dodonaea***
- 1 Leaves compound; fruits winged or not.
  - 3 Leaves palmately compound; [subfamily *Hippocastanoideae*; tribe *Hippocastaneae*] ..... **2. *Aesculus***
  - 3 Leaves pinnately or biternately compound.
    - 4 Herbaceous vine; leaves biternately compound; [subfamily *Sapindoideae*; tribe *Paullinieae*] ..... **3. *Cardiospermum***
    - 4 Tree or shrub; leaves pinnately compound.
      - 5 Leaflets entire; fruit drupe-like; [native, of coastal hammocks of se. SC southward]; [subfamily *Sapindoideae*] ..... **5. *Sapindus***
      - 5 Leaflets coarsely toothed; fruit a samara or inflated "pod;" [native or alien, collectively widespread].
        - 6 Fruit winged; [native]; [subfamily *Hippocastanoideae*; tribe *Acereae*] ..... **1. *Acer***
        - 6 Fruit inflated; [alien ornamental, rarely escaped]; [subfamily *Sapindoideae*] ..... **4. *Koeleruteria***

**1. *Acer*** Linnaeus 1753 (Maple)

A genus of about 111-126 species, trees and shrubs, primarily north temperate. References: Murray (1970)=Z; van Gelderen, de Jong, and Oterdoom 1994); Acevedo-Rodríguez, van Welzen, Adema, and van der Ham in Kubitzki (2011).

Section *Parviflora*, Series *Caudata*: *spicatum*  
 Section *Palmata*, Series *Palmata*: *palmatum*  
 Section *Negundo*, Series *Negundo*: *negundo*  
 Section *Rubra*: *drummondii*, *rubrum*, *saccharinum*  
 Section *Macrantha*: *pensylvanicum*  
 Section *Platanoidea*: *platanoides*, *campestre*  
 Section *Acer*, Series *Acer*: *pseudoplatanus*  
 Section *Acer*, Series *Saccharodendron*:  
 Section *Ginnala*: *ginnala*

- 1 Leaves compound, divided into 3-7 (-9) leaflets; [section *Negundo*].
  - 2 Twigs glabrous ..... ***A. negundo* var. *negundo***
  - 2 Twigs puberulent ..... ***A. negundo* var. *texanum***
- 1 Leaves simple, generally shallowly to deeply 3-5 (-7) lobed.
  - 3 Leaves not toothed, or often with a few rounded, coarse, and irregular teeth on the principal lobes, these teeth 0-5 per principal lobe; sinuses between the principal leaf lobes generally broadly rounded, the sinus broader than deep.
    - 4 Petioles and young twigs exuding milky sap when broken; inflorescence peduncled, the flowers on ascending, moderately stout pedicels; paired samaras held at >135° from one another; [section *Platanoidea*]; [alien].
      - 5 Leaves 3-5-lobed, 4-8 (-10) cm wide ..... ***A. campestre***
      - 5 Leaves 5-7-lobed, 10-18 cm wide ..... ***A. platanoides***
    - 4 Petioles and young twigs exuding clear sap when broken; inflorescence sessile, the flowers on drooping, filiform pedicels; paired samaras held at <110° from one another; [section *Acer*, series *Saccharodendron*]; [native, also widely planted].
      - 6 Leaves pale, grayish, silvery-gray, or strongly glaucous beneath, glabrous, pubescent on the veins, or pubescent across the surface; leaf sinuses on either side of the terminal lobe deep, the two sides of each sinus forming an angle of < 70 degrees (the terminal lobe typically with parallel margins, or even narrower toward the base than toward the tip); leaves usually planar, but sometimes with drooping lobe tips, especially in *A. floridanum*, and especially also in sun-exposed individuals of *A. floridanum* or *A. saccharum*.
        - 7 Leaves small, (3.5-) avg. 8 (-11) cm broad; leaf undersurface usually pubescent; fruits 20-25 mm long; medium to large trees; bark gray, smooth and beech-like, becoming irregularly furrowed or plated in large individuals; [primarily of the Coastal Plain and Piedmont, extending into the Mountains in GA] ..... ***A. floridanum***
        - 7 Leaves large, (8-) avg. 15 (-20) cm broad; leaf undersurface glabrous or pubescent only on the veins; fruits 25-30 mm long; large trees; bark grayish-brown, with loose-edged plates; [primarily of the Mountains and upper Piedmont] ..... ***A. saccharum***



- 6 Leaves green beneath, moderately to densely pubescent across the surface; leaf sinuses on either side of the terminal lobe shallow, the two sides of each sinus forming an angle of > 90 degrees (the terminal lobe typically broadly triangular); leaves sometimes planar, more usually with drooping lobe tips.
- 8 Leaves small, (3-) avg. 6 (-11) cm broad; small trees, often multi-trunked and crooked; bark whitish (in part because of dense growth of crustose lichens), becoming cracked and blackened on larger stems; [primarily of the Piedmont, extending into the lower Mountains in w. SC and n. GA] ..... *A. leucoderme*
- 8 Leaves large, (8-) avg. 15 (-20) cm broad; large trees, single-trunked; bark dark brown or blackish, becoming furrowed in large individuals; [primarily of the Mountains and westward] ..... *A. nigrum*
- 3 Leaves finely to coarsely toothed, the toothing often regular, the teeth 8-50 per principal lobe; sinuses between the principal leaf lobes generally sharp, forming a definite angle (or if rounded, then the sinus much deeper than broad).
- 9 Leaves deeply lobed, the two sinuses on either side of the central lobe deep and narrow, approaching the midrib, the terminal lobe thus narrower at its base than at its middle; flowers **either** with petals (*A. palmatum*) **or** without petals (*A. saccharinum*).
- 10 Leaves green beneath (or purple in many forms); main leaf lobes 5-9, these main lobes merely toothed or in some cultivars variously further divided; [small exotic tree, commonly planted and weakly naturalizing]; [section *Palmata*] ..... *A. palmatum*
- 10 Leaves silvery white beneath; main leaf lobes 3-5, these main lobes with coarse teeth and smaller lateral lobes; [large native tree (also extensively planted)]; [section *Rubra*] ..... *A. saccharinum*
- 9 Leaves shallowly lobed, the two sinuses on either side of the central lobe broadly wedge-shaped, not approaching the midrib, the terminal lobe thus broadest at its base and progressively (though often irregularly) narrowing toward the tip; flowers with petals.
- 11 Winter buds stalked, with 2-4 valvate scales; inflorescence an elongate drooping raceme or erect panicle; petals green to bright yellow, 2-10 mm long; fruits maturing in midsummer to autumn; leaves green beneath; shrub, small tree, or medium tree (to 35 cm DBH).
- 12 Bark with narrow white stripes on a green background (best seen on stems 3-10 cm in diameter); leaf blades 12-20 (-30) cm long and wide, finely serrate (5-10 teeth per cm), pubescent beneath with yellow to orange hairs 0.1-0.3 mm long (as seen at 10× magnification); inflorescence a drooping raceme; [section *Macrantha*] ..... *A. pensylvanicum*
- 12 Bark brownish, never conspicuously striped; leaf blades 8-12 (-14) cm long and wide, coarsely serrate (2-3 teeth per cm), pubescent beneath with whitish hairs 0.3-1.0 mm long (as seen at 10× magnification); inflorescence an erect panicle; [section *Parviflora*] ..... *A. spicatum*
- 11 Winter buds sessile, with 4-10 imbricate scales; inflorescence **either** a drooping panicle (*A. pseudoplatanus*) **or** a sessile or subsessile cluster or fascicle; fruits maturing **either** in midsummer to autumn (*A. pseudoplatanus*) **or** in spring; leaves slightly to strongly glaucous-whitened beneath; medium to large tree (to 100 cm DBH).
- 13 Inflorescence a drooping panicle, flowering in May-June, fruiting August-September (and persisting overwinter); petals yellowish-green; leaf blades 8-17 cm long; [section *Acer*, series *Acer*] ..... *A. pseudoplatanus*
- 13 Inflorescence a sessile or subsessile cluster or fascicle, flowering in January-March, fruiting April-July (and dropping); petals red (rarely yellowish), 1-3 mm long; leaf blades < 10 cm long; [section *Rubra*].
- 14 Mature leaves densely white tomentose (felty-pubescent) beneath; petioles usually with white tomentum; mature samaras 2.7-5 cm long ..... *A. rubrum* var. *drummondii*
- 14 Mature leaves glabrous to densely pubescent (but not white-tomentose) beneath; petioles usually glabrous; mature samaras 1.5-3 cm long.
- 15 Leaves (3-) 5 (-9)-lobed, the central lobe 4-8 cm long, the 2 upper lateral lobes 2-5 cm long; leaf base generally cordate (rarely rounded); leaves 7-18 cm wide; [widespread, in nearly all habitats] ..... *A. rubrum* var. *rubrum*
- 15 Leaves unlobed or 3 (-5)-lobed, the central lobe 1-5 cm long, the lateral lobes (if present) 0.5-2 (-3) cm long; leaf base broadly cuneate to rounded or subcordate; leaves 2-10 cm wide; [primarily of wetlands, especially in the Coastal Plain] ..... *A. rubrum* var. *trilobum*

\* *Acer campestre* Linnaeus, Hedge Maple. Suburban woodlands, planted and persistent and weakly spreading; native of Europe and w. Asia. May. Reported to be "occasionally spreading from cultivation to moist, rocky, disturbed woods" in sc. and se. PA (Rhoads & Klein 1993; Rhoads & Block 2007). Intraspecific taxa are often recognized in its native area. [= C, F, G, K, Pa, Z]

*Acer floridanum* (Chapman) Pax, Southern Sugar Maple, Florida Maple. Bottomland forests, mesic slopes, especially common over mafic or calcareous rocks, but not at all limited to such situations. April-May; June-October. S. VA, w. KY, se. MO, e. OK, c. OK, and n. TX, south to c. peninsular FL and e. TX. It is widely planted in southern cities and towns as a street tree. Ward (2004b) discusses the reasons for accepting *A. floridanum* as the correct name for this species; the Michauxian name *A. barbatum* is associated with specimens that are demonstrably *A. saccharum*. [= *A. saccharum* ssp. *floridanum* (Chapman) Desmarais - RAB, WH, Z; = *Acer barbatum* Michaux - C, K; > *A. barbatum* var. *barbatum* - F, G; > *A. barbatum* var. *longii* (Fernald) Fernald - F, G; = *Saccharodendron floridanum* (Chapman) Nieuwland - S]

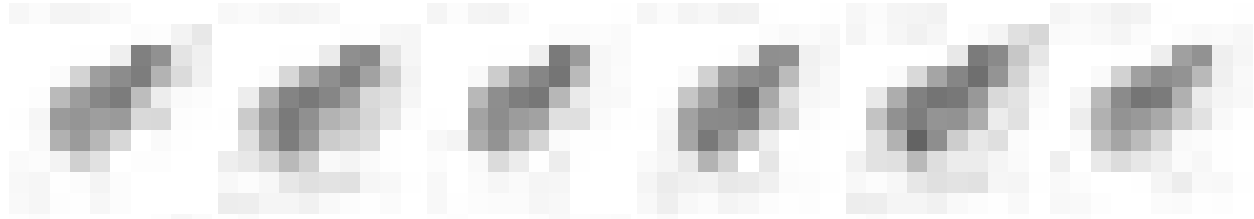
\* *Acer ginnala* Maximowicz, Amur Maple. Mt (WV), Ip (KY): disturbed areas; rare, native of e. Asia. Late May-June. Reported as "cultivated and occasionally escaped" in s. PA (Rhoads & Klein 1993; Rhoads & Block 2007). Intraspecific taxa are often recognized in its native area. [= F, K, Pa, Z] {not yet keyed}

*Acer leucoderme* Small, Chalk Maple. Rocky slopes and bluffs, particularly over mafic or calcareous rock, on the Gulf Coast in floodplains. March-April; May-September. A species of se. North America, primarily of the Piedmont from NC to AL, less commonly in the Ridge and Valley of se. TN (Chester, Wofford, & Kral 1997), low Blue Ridge of w. NC and adjacent TN and GA, Coastal Plain of Panhandle FL, GA, AL, MS, LA, and se. TX, and in sw. AR and se. OK. The leaves, at least those on lower and inner branches, tend to dry a tawny color and remain on the tree until spring, reminiscent of beech. [= K, W; = *A. saccharum* ssp. *leucoderme* (Small) Desmarais - RAB, WH, Z; = *Saccharodendron leucoderme* (Small) Nieuwland - S]

*Acer negundo* Linnaeus var. *negundo*, Eastern Box Elder, Ash-leaved Maple. Riverbanks, swamps, bottomlands, also upslope on calcareous substrates. March-April; May-October. The species, broadly treated, ranges nearly across North America, including well into the arid west along rivers. Var. *negundo* occurs from NB west to MB, south to c. peninsular FL and TX; also allegedly in nw. United States. *A. negundo* often grows on the banks of rivers, leaning out over the water at a 45 degree angle.

The leaves can resemble poison ivy (*Toxicodendron radicans*), which has alternate leaves. The coarse tooting (approaching lobing) distinguishes it from any of our ashes (*Fraxinus*). [= C; < *A. negundo* – RAB, GW, Pa, W, WH; > *A. negundo* var. *negundo* – F, G, K, Z; > *A. negundo* Linnaeus var. *violaceum* (Kirchner) Jaeger – F, G, K, Z; < *Negundo negundo* (Linnaeus) Karsten – S; < *Negundo aceroides* (Linnaeus) Moench]

***Acer negundo*** Linnaeus var. ***texanum*** Pax, Texas Box Elder. Riverbanks and bottomlands. April; June-October. Sw. NC, KY, MO, KS, and NM south to AL, MS, and TX. The status of this variety in our area is poorly known at present. [= C, F, G, K, Z; < *A. negundo* – RAB, GW, W; < *Negundo negundo* (Linnaeus) Karsten – S; < *Negundo aceroides* (Linnaeus) Moench]



***Acer nigrum*** Michaux f., Black Maple. Riverbanks, streambanks, cove forests, river slope forests. May-June; June-September. NH west to MN, south to NC, GA, AL, AR, and KS, primarily west of the Appalachians. [= C, F, G, K, Pa, W; = *A. saccharum* Marshall ssp. *nigrum* (Michaux f.) Desmarais – RAB, Z; = *Saccharodendron nigrum* (Michaux f.) Small – S; *A. saccharum* Marshall var. *viride* (Schmidt) A.E. Murray]

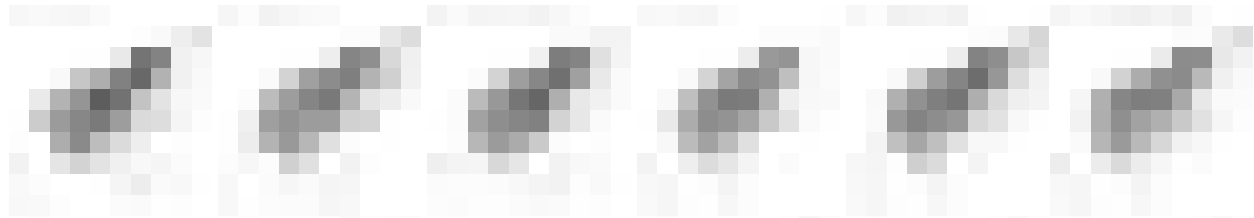
\* ***Acer palmatum*** Thunberg, Japanese Maple. Suburban woodlands; native of e. Asia. April; August-September. Frequently planted in its numerous cultivars. Intraspecific taxa are recognized in its native area. It is also reported as escaped in the DC area (Shetler & Orli 2000). [= K, Pa, Z]

***Acer pensylvanicum*** Linnaeus, Striped Maple. Dry to mesic forests. May; June-September. NS west to MB, south to w. NC, nw. SC, ne. GA, e. TN, WI, and MN. The prominently striped bark of this common, mid-elevation understory tree is unmistakable. [= RAB, C, F, G, K, Pa, S, W, Z]

\* ***Acer pictum*** Thunberg. Moist forests; native of Eurasia. [= *A. mono* Maximowicz] {not yet keyed}

\* ***Acer platanoides*** Linnaeus, Norway Maple. Suburban woodlands, disturbed forests, hedgerows; native of Europe. March-April. In much of the ne. United States, *A. platanoides* has become a noxious weed tree. A commonly planted cultivar has purple foliage. [= C, F, G, K, Pa, W, Z]

\* ***Acer pseudoplatanus*** Linnaeus, Sycamore Maple. Suburban woodlands; native of Europe. Planted widely in our area as a street and yard tree, especially in the mountains. It may be naturalized more extensively in our area; northward it is a noxious weed tree. [= C, G, K, Pa, Z; = *Acer pseudo-platanus* – F, orthographic variant]



***Acer rubrum*** Linnaeus var. ***drummondii*** (Hooker & Arnott ex Nuttall) Sargent, Swamp Red Maple, Drummond Red Maple. Cp (FL, GA, NC, SC, VA): swamps and floodplains; uncommon. January-March; April-June. *A. rubrum* var. *drummondii* is mostly southern, ranging north to NJ (?), IN, and MO. It reaches its greatest abundance in the basin of the Mississippi River. [= F, G, K; < *A. rubrum* – RAB, C, GW, WH; = *Rufacer drummondii* (Hooker & Arnott ex Nuttall) Small – S; = *A. rubrum* ssp. *drummondii* (Nuttall) A.E. Murray – Z; = *A. drummondii* Hooker & Arnott ex Nuttall]

***Acer rubrum*** Linnaeus var. ***rubrum***, Eastern Red Maple. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): upland deciduous forests, up to at least 1500m elevation, moist bottomlands and slopes; common. January-March; April-July. This variety is the most widespread and common in our area; indeed it is one of the most ubiquitous and common trees of e. North America. It is probably more abundant than formerly, because of its weedy abilities. Overall, it ranges throughout e. North America. Whether the varieties of *A. rubrum* are worthy of recognition is a matter of disagreement; I choose here to try to distinguish them. [= F, K, Z; < *A. rubrum* – RAB, C, GW, Pa, W, WH; < *A. rubrum* var. *rubrum* – G (also see var. *trilobum*); = *Rufacer rubrum* (Linnaeus) Small – S]

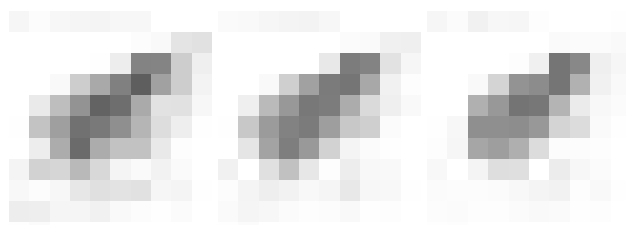
***Acer rubrum*** Linnaeus var. ***trilobum*** Torrey & A. Gray ex K. Koch, Carolina Red Maple. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, VA, WV): wetlands, especially peaty, acid sites; common (rare in Piedmont and Mountains). January-March; April-June. Primarily a Southeastern Coastal Plain variety, the range of var. *trilobum* is unclear, possibly extending well inland and northward (see F). This variety has greatly increased in abundance in the Coastal Plain of our area because of fire suppression and mechanical disturbance of peaty wetlands. Former large pocosin tracts, such as the Dismal Swamp, are now largely dominated by this tree. [= F, K, Z; < *A. rubrum* – RAB, C, GW, Pa, WH; < *A. rubrum* var. *rubrum* – G; = *Rufacer carolinianum* (Walter) Small – S]

***Acer saccharinum*** Linnaeus, Silver Maple, Soft Maple. Bottomlands, riverbanks, and disturbed areas. February-April; April-July. NS west to SK, south to Panhandle FL, LA, and OK, rare and mostly introduced east of the Appalachians and south of VA. This is an abundant tree along major rivers in the Piedmont of VA. In our area (particularly from c. NC south), the

species is more common as a street tree or an escape from cultivation than as a native tree. On the Coastal Plain of NC and SC, *A. saccharinum* is largely confined to the banks and levees of large brownwater rivers, such as the Roanoke and Congaree. The silvery undersides of the leaves are obvious in windy conditions. The hybrid *Acer*  $\times$  *freemanii* A.E. Murray [*A. rubrum*  $\times$  *saccharinum*] has been collected at scattered locations in our area. [= RAB, C, F, G, GW, K, Pa, W, WH, Z; = *Argentacer saccharinum* (Linnaeus) Small – S]

***Acer saccharum*** Marshall, Sugar Maple, Hard Maple, Sugar Tree. Cove forests, other rich forests, especially over mafic and calcareous rocks, on calcareous soils common and typical in dry-mesic forests and dry woodlands as well, less typically extending to high elevation northern hardwood forests where sometimes in acidic situations (as in Highlands County, VA), in parts of the Piedmont perhaps more common as an introduction by ornamental planting than as a native, at least south of VA. April-June; June-September. Two varieties are sometimes recognized. Var. *saccharum* is distributed from NS west to ND, south to GA, LA, and OK. Var. *schneckii* Rehder, with petioles and lower leaf surfaces densely pubescent, considered to approach our area in s. PA (Rhoads & Klein 1993), IN, IL, and MO, 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, Pa; > *A. saccharum* var. *saccharum* – F, G, K, Z; = *A. saccharum* ssp. *saccharum* – RAB, W; = *Saccharodendron barbatum* (Michaux) Nieuwland – S]

***Acer spicatum*** Lamarck, Mountain Maple. High elevation forests (northern hardwoods or spruce-fir), generally above 1500 m in NC, above 1000 m in VA, especially common in periglacial boulderfields. May-July; August-October. NL (Newfoundland), NL (Labrador), and SK south to PA, OH, and IA, and in the mountains to w. NC, e. TN, ne. GA, and ne. AL. The foliage is quite similar to that of *A. rubrum* var. *rubrum*, with which it can occur; in addition to the key characters, *A. spicatum* can be distinguished from *A. rubrum* by its leaves which have a strongly rugose texture, the secondary and tertiary veins impressed on the upper surface, distinctly raised on the lower (vs. not rugose, the secondary and tertiary veins only slightly impressed on the upper surface, and slightly raised on the lower). *A. spicatum* is also sometimes confused with *A. pensylvanicum*, but these two species are readily distinguished by their leaves (see key). [= RAB, C, F, G, K, Pa, S, W, Z]



## 2. *Aesculus* Linnaeus 1753 (Buckeye)

A genus of about 13 species, trees and shrubs, of temperate e. North America, w. North America, e. Asia, and se. Europe.

References: Hardin (1957a, 1957b)=Z; Harris, Xiang, & Thomas (2009) Acevedo-Rodríguez, van Welzen, Adema, and van der Ham in Kubitzki (2011).

**Identification notes:** The following hybrids are known from our area: *Aesculus*  $\times$  *neglecta* Lindley [*flava*  $\times$  *sylvatica*] and *Aesculus*  $\times$  *mutabilis* (Spach) Scheele [*pavia*  $\times$  *sylvatica*]. They can be recognized by their intermediate morphology.

- 1 Petals usually 5, white with a reddish mark near the cordate base of the petal blade; buds glutinous (sticky); fruit spiny; leaflets 7 (-9) per leaf; [alien, uncommonly planted, rarely naturalized]; [section *Aesculus*] ..... ***A. hippocastanum***
- 1 Petals 4 (or 4-5 in *A. parviflora*), cream-colored, yellow, red; or white (and then lacking a red blaze); buds not glutinous; fruit smooth (or with some prickles in *A. glabra* var. *glabra*); leaflets 5 (-7) per leaf; [native].
  - 2 Petals white, unmarked with red; stamens exerted, 2-4 $\times$  as long as the petals; inflorescence 2-5 dm long; [section *Macrothyrus*] ..... ***A. parviflora***
  - 2 Petals cream-colored, yellow, or red; stamens included or exerted, 1-2 $\times$  as long as the petals; inflorescence 1-2.5 dm long; [section *Pavia*].
    - 3 Stamens about 2 $\times$  as long as the petals, well-exserted beyond the corolla; petals only slightly unequal in size; fruit spiny with short prickles (rarely essentially smooth) ..... ***A. glabra* var. *glabra***
    - 3 Stamens about 1 $\times$  as long as the petals, included or barely exerted beyond the corolla; petals markedly unequal in size; fruit smooth.
      - 4 Petal margins stipitate-glandular; petals scarlet; fruits 3-6 cm in diameter ..... ***A. pavia* var. *pavia***
      - 4 Petal margins villous, not glandular; petals yellow; fruits 2-8 cm in diameter.
        - 5 Calyx and pedicels stipitate-glandular; large tree; petiolules 2-3 (-4) mm long; fruits 5-8 cm in diameter ..... ***A. flava***
        - 5 Calyx and pedicels puberulent; shrub to small tree; petiolules 3-12 mm long; fruits 2-4 cm in diameter ..... ***A. sylvatica***

***Aesculus flava*** Solander, Yellow Buckeye. Moist forests, up to nearly 2000m, especially prominent in seepy cove forests, in the Piedmont only in "montane" habitats. Late April-mid June; August-September. A broad Southern Appalachian endemic: sw. PA, s. OH, s. IN, and s. IL south through KY, WV, sw. VA, and TN to n. AL, n. GA, nw. SC, and w. NC. *A. flava* is one of the largest, most massive, and commonest trees in Southern Appalachian coves, recognizable in winter by the bark of large plate-

like slabs, thick twigs, and massive form. Meyer & Hardin (1987) discuss the nomenclatural issues relating to the names "*A. flava*" and "*A. octandra*." [= C, K, Pa, W; = *A. octandra* Marshall – RAB, F, G, Z; < *A. octandra* – S (also see *A. sylvatica*)]

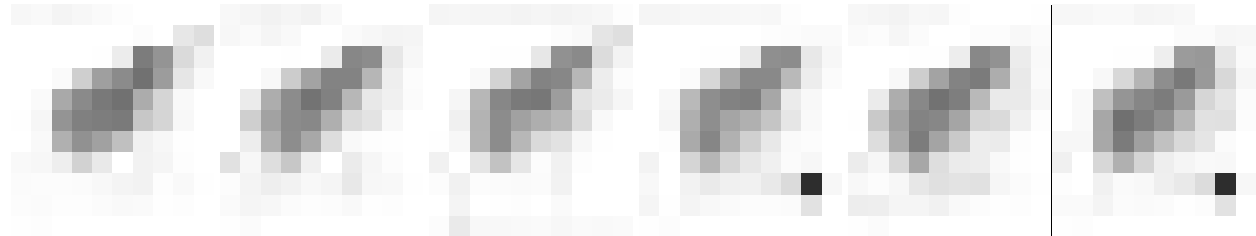
***Aesculus glabra*** Willdenow var. ***glabra***, Ohio Buckeye. Mesic forests over limestone. April-May. Largely midwestern, but ranges east to sw. PA, e. TN, and nw. GA (Jones & Coile 1988); it is also sometimes introduced eastward of that distribution. It occurs in TN counties adjacent to both VA and NC. [= C, F, G, K, Z; < *A. glabra* – Pa, S, WV]

\* ***Aesculus hippocastanum*** Linnaeus, Horsechestnut. Urban and suburban areas, perhaps not definitely naturalized, but fairly often planted as a street tree and escaping as seedlings in the vicinity of plantings; native of se. Europe. May. [= C, F, G, K, Pa, Z]

***Aesculus parviflora*** Walter, Bottlebrush Buckeye. Mesic forests on bluffs and in ravines (the SC occurrence is on Fall Line river bluffs, with shaley, subcalcareous soils). Wc. GA west to nc. AL, south to sw. GA and sw. AL; disjunct in wc. SC (Aiken County). See Wyatt (1985) for a discussion of the interesting, relictual occurrence in SC. Occasionally planted outside its native range. [= K, Pa, S, Z]

***Aesculus pavia*** Linnaeus var. ***pavia***, Red Buckeye. Swamp forests, usually stagnant, usually blackwater (not receiving significant alluvium), and especially over marl (coquina limestone). April-early May; July-August. Var. *pavia* ranges from se. NC south to c. peninsular FL and west to e. TX, extending north in the Mississippi Embayment to se. MO and s. IL, and in scattered occurrences off the Coastal Plain, as in sc. TN; also it is sometimes cultivated farther inland and persistent or slightly naturalizing. Var. *flavescens* (Sargent) Correll occurs in the Edwards Plateau of c. TX. Fernald reports this species from VA and WV, but there is likely taxonomic or nomenclatural confusion. [= K, Z; < *A. pavia* – RAB, C, G, S, W, WH; >> *A. pavia* – F; >> *A. discolor* Pursh – F]

***Aesculus sylvatica*** Bartram, Painted Buckeye. In the Piedmont in mesic, nutrient-rich forests, on bottomlands, lower slopes, and in ravines, in the Coastal Plain primarily on floodplains of brownwater (alluvium-carrying) rivers (most notably the Roanoke River in NC), in the Mountains only at low elevations. April-mid May; July-August. Primarily a Southeastern Piedmont endemic, occurring primarily in the Piedmont from sc. VA south through c. NC, c. SC, and nc. GA to nc. AL, with an extension north into e. TN. [= RAB, C, F, K, W, Z; = *A. neglecta* Lindley – G, misapplied; < *A. octandra* – S (also see *A. flava*); > *A. georgiana* Sargent]



### 3. *Cardiospermum* Linnaeus 1753 (Balloon Vine)

A genus of about 14-15 species, vines, of tropical America. References: Acevedo-Rodríguez, van Welzen, Adema, and van der Ham in Kubitzki (2011).

\* ***Cardiospermum halicacabum*** Linnaeus, Balloon Vine, Heartseed, Love-in-a-puff. Mt (GA), Pd (DE, SC), Cp (VA): disturbed areas; rare, native of tropical America. July-September. [= RAB, F, G, K, Pa, S, WH; = *C. halicababum* – C, orthographic error]

### 4. *Koelreuteria* Laxmann 1772 (Golden Rain Tree)

A genus of 4 species, trees, of temperate China, Taiwan, and Japan. References: Meyer (1976)=Z; Acevedo-Rodríguez, van Welzen, Adema, and van der Ham in Kubitzki (2011). Key based on Meyer (1976).

- 1 Leaves pinnate (rarely bipinnate in part), the leaflets coarsely crenate to lobulate; capsule valves ovate, ca. 2 × as long as wide; capsules greenish to tawny when young, aging to dark brown..... ***K. paniculata***
- 1 Leaves bipinnate, the leaflets entire to shallowly serrate; capsule valves orbicular, 0.9-1.4 × as long as wide; capsules rose-purple when young, aging to tawny-brown.
  - 2 Leaflets weakly oblique, acute to short-acuminate, entire to uniformly serrate; petals 4 (-5)..... ***K. bipinnata***
  - 2 Leaflets strongly oblique, long acuminate to caudate, entire to irregularly crenate-serrate; petals (4-) 5 ..... ***K. henryi***

\* ***Koelreuteria bipinnata*** Franchet, Bougainvillea Golden Rain Tree. Disturbed areas, roadsides; native of s. China. Becoming popular horticulturally, and producing abundant seedlings near the planted specimens; potentially invasive. [= Z]

\* ***Koelreuteria henryi*** Dümmer, Flamegold. Disturbed areas, roadsides; native of Taiwan. This taxon appears to be distinct morphologically and geographically from *K. elegans*, and warrants recognition at the species level. Becoming popular horticulturally, and producing abundant seedlings near the planted specimens; potentially invasive, and established just south of our area in peninsular FL. [= *Koelreuteria elegans* (Seem.) A.C. Smith ssp. *formosana* (Hayata) F.G. Meyer – K, WH, Z]

\* ***Koelreuteria paniculata*** Laxmann, Golden Rain Tree. Disturbed areas, roadsides, frequently cultivated as an ornamental tree, rarely escaped; native of n. China. June-August; September-October. [= RAB, C, F, G, K, Pa]

### 5. *Sapindus* Linnaeus 1753 (Soapberry)

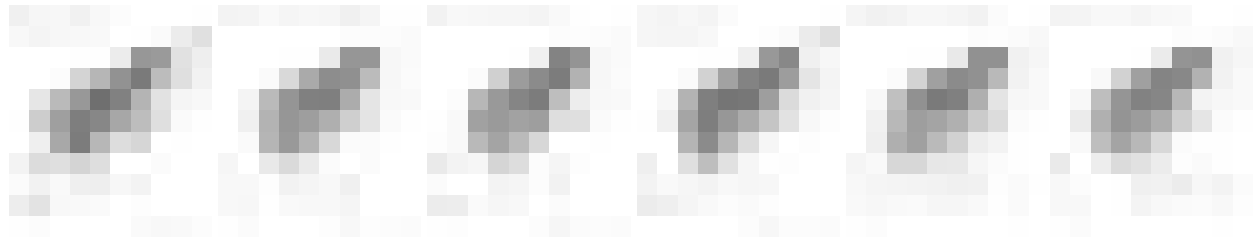
A genus of about 10-13 species, trees, of tropical and warm temperate regions of the Old and New World. References: Acevedo-Rodríguez, van Welzen, Adema, and van der Ham in Kubitzki (2011).

*Sapindus marginatus* Willdenow, Florida Soapberry. Coastal marsh hammocks, shell middens. May-June. Se. SC (?) and e. GA south to c. peninsular FL (Lee and Brevard counties), and on the Gulf Coast in s. MS. Small (1933) reports this species from SC, but there is doubt whether this species was actually ever documented to occur in SC; there are no recent records. Although sometimes combined (as by K) with the tropical *Sapindus saponaria*, I follow most recent Florida authors (Clewell 1985, Tomlinson 1986, Godfrey 1988, Nelson 1994, Nelson 1996) in maintaining it as distinct. *S. marginatus* is a species of n. FL, e. GA, and possibly SC and has wingless rachises, acuminate leaflets, and globose fruits; *S. saponaria* is a species of s. FL and tropical America and has winged rachises, rounded leaflet tips, and ovoid to globose fruits. [= RAB, S; < *S. saponaria* Linnaeus var. *saponaria* – K]

### 6. *Dodonaea* P. Miller 1754 (Varnishleaf, Hopbush)

A genus of about 65-67 species, shrubs, mainly Australian, a few species pan-tropical. References: Acevedo-Rodríguez, van Welzen, Adema, and van der Ham in Kubitzki (2011).

*Dodonaea viscosa* (Linnaeus) Jacquin, Varnishleaf, Hopbush. Dunes, dry hammocks, dry pinelands. Widespread in the Old World and New World tropics, north in FL to St. Johns County. [= S, WH; < *D. viscosa* – K]



## 241. RUTACEAE A.L. de Jussieu 1789 (Citrus Family) [in SAPINDALES]

A family of about 154-156 genera and 1800-2100 species, trees, shrubs, vines, and rarely herbs, cosmopolitan (but mainly tropical and subtropical). References: Kubitzki, Kallunki, Duretto, & Wilson in Kubitzki (2011).

- 1 Leaves **either** simple **or** unifoliolate (and appearing simple)
  - 2 Fruit a green, yellow, or orange hesperidium; [subfamily *Aurantioideae*] ..... *Citrus*
  - 2 Fruit a red or black, fleshy, drupe-like; [subfamily *Rutoideae*, tribe unresolved] ..... *Skimmia*
- 1 Leaves pinnately or palmately compound.
  - 2 Leaves 2-pinnatifid; suffrutescent herb or shrub to 1.5 m tall; [subfamily *Rutoideae*, tribe *Ruteae*] ..... *Ruta*
  - 2 Leaves palmately 3-foliolate or 1-pinnate (5-19-foliolate); shrub or tree, usually over 1.5 m tall (potentially to 20 m in *Zanthoxylum*).
    - 3 Leaves pinnately 5-19-foliolate
      - 4 Leaves opposite; stems and leaves unarmed; [subfamily *Toddalioideae*] ..... *Phellodendron*
      - 4 Leaves alternate; stems and leaves armed with prickles; [subfamily *Rutoideae*, tribe *Zanthoxyleae*] ..... *Zanthoxylum*
    - 3 Leaves palmately 3-foliolate.
      - 5 Branches conspicuously armed with stout spines; [subfamily *Aurantioideae*] ..... *Citrus*
      - 5 Branches not armed with spines; [subfamily *Toddalioideae*] ..... *Ptelea*

### *Citrus* Linnaeus 1753

(Citrus, Orange, Grapefruit, Lemon, Lime, Citron, Pummelo, Kumquat, Trifoliolate Orange)

A genus of about 27-35 species, trees, of s. and se. Asia. The circumscription has been controversial, but Araújo, Queiroz, & Machado (2003) provide compelling arguments in favor of a broad circumscription (followed here), including *Poncirus*, based on DNA analyses and other considerations. The recognition of *Poncirus* and other segregate genera would render *Citrus* paraphyletic because of the position of *Citrus medica* (the type species of *Citrus*) as basal to these genera and the rest of *Citrus*. References: Mabberley (1997)=Z; Araújo, Queiroz, & Machado (2003)=Y; Pfeil & Crisp (2008); Kubitzki, Kallunki, Duretto, & Wilson in Kubitzki (2011).

**Identification notes:** *Citrus* has simple to trifoliolate, evergreen, coriaceous, acuminate, glossy green leaves, and the familiar spherical fruits. *Citrus ×limon* (Linnaeus) Burmann f., Lemon, *C. ×paradisi* Macfadyen in Hooker (pro sp.), Grapefruit, and *C. sinensis* (Linnaeus) Osbeck,

Orange, have been grown on the Outer Banks of North Carolina in Buxton, Dare County, NC (Brown 1959). They are apparently not naturalized, being killed outright or severely damaged by occasional colder winters, and are not keyed or otherwise treated here.

- 1 Leaves trifoliolate; fruit densely pubescent, 3-6 cm long..... *C. trifoliata*  
 1 Leaves unifoliolate; fruit glabrous, 4.5-25 cm long.  
   2 Petiole winged, and with an articulation at the juncture with the blade; fruit 4.5-15 cm long ..... *C. xaurantium*  
   2 Petiole not winged, and lacking an articulation at the juncture with the blade; fruit 15-25 cm long..... *C. medica*

\* *Citrus xaurantium* Linnaeus (pro sp.), Sour Orange, Grapefruit, Sweet Orange. Cultivated horticulturally, sometimes persistent; native of se. Asia. Reported from several counties in s. and e. GA (Jones & Coile 1988). [= WH, Z; = *C. aurantium* – K (as species)]

\* *Citrus japonica* Thunberg, Kumquat. Suburban woodlands and disturbed hammocks; native of se. Asia. Reported as naturalizing in suburban woodlands in the Tallahassee (Leon Co., FL) area by Clewell & Tobe (2011). [> *Fortunella margarita* (Loureiro) Swingle – K2] {not yet keyed}

\* *Citrus medica* Linnaeus, Citron. Disturbed hammocks; native of se. Asia. Apparently naturalized in the FL Panhandle (Franklin County) (Wunderlin & Hansen 2003). [= K, S, WH]

\* *Citrus trifoliata* Linnaeus, Trifoliolate Orange, Hardy Orange. Woodlands, thickets, bottomlands, and streambanks, especially in suburban areas; native of temperate China. March-April; September-October. Planted in our area as an ornamental, as a “living fence,” and also used as a grafting stock for citrus, *C. trifoliata* is a small tree or shrub that seems to be made up almost entirely of “thorns” (actually, stipular spines). The fruits closely resemble an orange, but are small (ca. 4 cm in diameter), densely pubescent, and sour. *Citrus trifoliata* is often placed in a separate genus, *Poncirus*, but differs very little from *Citrus* morphologically, and has been shown to be phylogenetically nested within *Citrus* (Araújo, Queiroz, & Machado 2003), and thus seems best included in *Citrus*. [= Y; = *Poncirus trifoliata* (Linnaeus) Rafinesque – RAB, F, G, K, Pa, S, WH]

#### *Phellodendron* Ruprecht 1857 (Cork-tree)

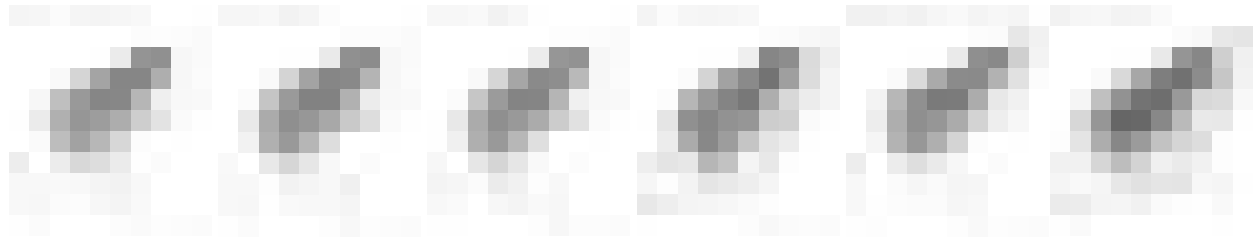
A genus of about 2 (-10) species, trees, native of e. Asia. References: Ma et al. (2006)=Z; Kubitzki, Kallunki, Duretto, & Wilson in Kubitzki (2011).

\* *Phellodendron amurense* Ruprecht, Northern Cork-tree, Amur Cork-tree, Japanese Cork-tree. Suburban woodlands; native of Japan, Taiwan, Korea, ne. China, and e. Russia. Late April-early June; August-October. [= K2, Pa, Z; > *P. japonicum* Maximowicz – C, K1]

#### *Ptelea* Linnaeus 1753 (Hop-tree, Wafer-ash, Stinking Ash)

A genus of 3-11 species, shrubs and small trees, of North America (south into Mexico). References: Bailey (1962)=Z; Kubitzki, Kallunki, Duretto, & Wilson in Kubitzki (2011).

*Ptelea trifoliata* Linnaeus, Hop-tree. Rocky bluffs, especially calcareous or mafic, open woodlands, calcareous Coastal Plain river bluffs, granitic domes. April-June; June-August. NJ, w. NY, MI, s. WI, and NE south to c. peninsular FL, c. AL, c. MS, e. and s. TX. Bailey (1962) treats two varieties in our areas, doubtfully distinguishable; they need additional study. [= Pa, RAB, WH; > *P. trifoliata* var. *mollis* – F, WV; > *P. trifoliata* var. *trifoliata* – F, WV; > *P. trifoliata* ssp. *trifoliata* var. *mollis* Torrey & A. Gray – C, K, Z; > *P. trifoliata* ssp. *trifoliata* var. *trifoliata* – C, K, Z; = *P. trifoliata* var. *trifoliata* – G; > *P. trifoliata* – S; > *P. serrata* Small – S; > *P. microcarpa* Small – S; > *P. baldwinii* Torrey & A. Gray – S]



#### *Ruta* Linnaeus 1753 (Rue)

A genus of about 7 species, perennial herbs and semi-shrubs, of the Old World. References: Kubitzki, Kallunki, Duretto, & Wilson in Kubitzki (2011).

\* *Ruta graveolens* Linnaeus, Rue. Cultivated in gardens as a medicinal herb, persistent and rarely escaping, sometimes locally abundant in pastures over limestone or gravelly floodplains; 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, Pa, S, WV]

*Skimmia* Thunberg 1783 (Skimmia)

A genus of 4 species, shrubs and small trees, native of e. Asia. References: Kubitzki, Kallunki, Duretto, & Wilson in Kubitzki (2011).

\* *Skimmia japonica* Thunberg, Japanese Skimmia. Cultivated as an ornamental, rarely escaped into suburban woodlands; native of e. Asia.

*Zanthoxylum* Linnaeus 1753 (Prickly-ash, Toothache Tree)

A genus of about 225-250 species, trees, of America, Africa, Asia, and Australia. References: Porter (1976)=Z; Kubitzki, Kallunki, Duretto, & Wilson in Kubitzki (2011).

- 1 Leaves thin in texture, pubescent; flowers in small axillary clusters.....*Z. americanum*  
 1 Leaves coriaceous in texture, glabrous and waxy; flowers in large terminal compound cymes.....*Z. clava-herculis*

*Zanthoxylum americanum* P. Miller, Prickly-ash, Toothache Tree, Northern Prickly-ash. Woodlands and forests over calcareous or mafic rocks, often forming extensive colonies near outcrops. March-April; July-August. S. QC west to e. ND, south to e. SC, c. GA, Panhandle FL, e. TN, c. TN, and OK. Sometimes planted. There is only a single known site in SC. [= RAB, C, K, Pa, W, S, WH, WV, Z; = *Xanthoxylum americanum* – F, orthographic variant]

*Zanthoxylum clava-herculis* Linnaeus, Toothache Tree, Hercules'-club, Sea-ash, Southern Prickly-ash, Pepper-bark, Tickle-tongue. Maritime forests, dunes, shell middens, shell hammocks, maritime scrub, inland (in FL and GA) in hammocks. April-May; July-September. A Southeastern Coastal Plain endemic: se. VA south to FL and west to TX, AR, and OK. The compound leaves are armed with stout prickles along the rachis. The twigs are also spiny. On the larger branches and trunks, the spines become elevated on conical, pyramidal, or cylindrical corky bases up to 5 cm long and 4 cm in diameter, giving the trunk a very peculiar appearance. Many of the common names come from the numbing effect on the mouth of chewing the leaf or twig, the flavor, smell, and effect being very similar to *Ctenium aromaticum*, Toothache Grass. In the northern part of its distribution, it is restricted to the outer Coastal Plain, nearly entirely on the barrier islands. Although normally a small tree, it can reach considerable size, up to about 60 cm DBH. In the 5 km immediately north of Buxton, Dare County, NC one can see several hundred individuals growing on open, *Uniola*-dominated dunes. Because of salt-pruning, the trees often have 5 times as wide a spread as they are tall. Some trees have a basal diameter of 30-40 cm, a short trunk less than a meter tall, a total height of 2-3 m, and a spread of 10 m. [= RAB, C, G, K, S, WH, Z; = *Xanthoxylum clava-herculis* – F, orthographic variant]

**242. SIMAROUBACEAE** A.P. de Candolle 1811 (Quassia Family) [in SAPINDALES]

A family of about 13-22 genera and 110-115 species, trees and shrubs of primarily tropical areas of the New World and Old World. The Leitneriaceae has been traditionally considered to be a monotypic family, endemic to se. North America; a variety of recent studies have suggested its inclusion in the Simaroubaceae (Angiosperm Phylogeny Group 1998, 2003, 2009; Bogle in FNA 1997). References: Clayton in Kubitzki (2011); Angiosperm Phylogeny Group (1998, 2003). [including *LEITNERIACEAE*]

- 1 Leaves pinnately compound, with prominent glands along the margin of the leaflets; perianth present, with 5 sepals and 5 petals; [species alien, aggressively naturalizing in upland sites].....*Ailanthus*  
 1 Leaves unifoliolate (appearing simple), lacking glands; perianth absent or vestigial; [species native, in wetland sites].....*Leitneria*

*Ailanthus* Desfais 1788 (Tree-of-Heaven)

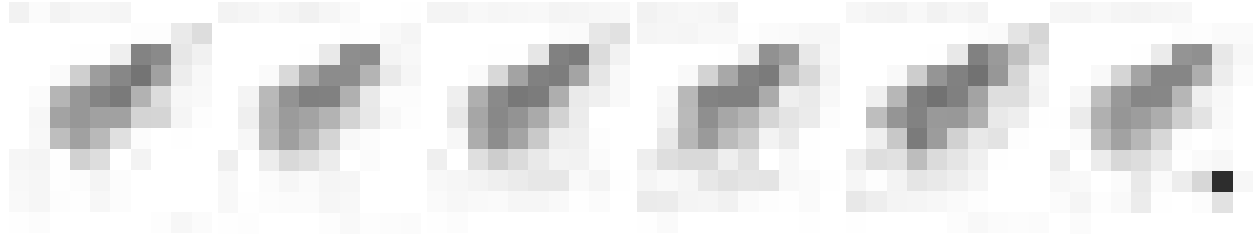
A genus of 5 species, trees, native to Asia and Australia. References: Hu (1979); Clayton in Kubitzki (2011).

\* *Ailanthus altissima* (P. Miller) Swingle, Tree-of-Heaven, Copal Tree, Stink-tree. Roadsides, forests, disturbed areas, including cities, especially in moist, fertile soils; native of e. Asia. Late May-early June; July-October. In our area, this tree is now an aggressive and noxious weed, colonizing even undisturbed forests and outcompeting the native vegetation. As serious a weed as it is here, it is (at the time of this writing, at least), much worse to the north, now the dominant tree in fencerows, woodlots, and forests in the urbanized, suburbanized, and even rural Northeast. It can be recognized vegetatively by its large pinnately compound leaves, very stout twigs (over 1 cm thick), and the characteristic and unpleasant odor of the crushed foliage. [= RAB, C, F, G, K, Pa, S, W]

*Leitneria* Chapman 1860 (Corkwood)

As reinterpreted by Schrader & Graves (2011), a genus of 2 species, one with 2 subspecies, endemic to scattered areas of se. North America. References: Schrader & Graves (2011)=Z; Bogle in FNA (1997); Channell & Wood (1962); Clayton in Kubitzki (2011).

*Leitneria floridana* Chapman, Corkwood. Swamps and cabbage palm / sawgrass marshes. February-March. Sw. GA and Panhandle FL. More western populations in se. MO, e. AR, and se. TX are now placed in *L. pilosa* J.A. Schrader & W.R. Graves ssp. *pilosa* (se. TX) and *L. pilosa* ssp. *ozarkana* J.A. Schrader & W.R. Graves (se. MO and e. AR). [= Z; < *L. floridana* – FNA, GW, K1, K2, S, WH]



### 243. MELIACEAE A.L. de Jussieu 1789 (Mahogany Family) [in SAPINDALES]

A family of about 50 genera and 565-575 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: Mabberley in Kubitzki (2011).

- 1 Leaves 2× odd-pinnately compound; fruit a drupe; [widely planted and naturalized in our area, especially southward].....*Melia*  
 1 Leaves 1× even-pinnately compound; fruit a capsule; [rarely planted and naturalized].....*Toona*

#### *Melia* Linnaeus 1753 (Chinaberry)

A genus of 3 species, trees, of the Old World tropics. References: Mabberley in Kubitzki (2011); Miller (1990)=Z.

\* *Melia azedarach* Linnaeus, Chinaberry, Carolina Mahogany, Umbrella-tree, Pride-of-India, “White Cedar,” “Persian Lilac.” Disturbed areas, abandoned rural yards and fields; native to se. Asia (Indomalaysia), commonly cultivated in our area (mainly in the Coastal Plain) and commonly escaped. April-May; September-October. The fruits are sometimes used as beads; they are very poisonous if ingested. [= RAB, C, F, G, K, S, WH, Z]

#### *Toona* (Endlicher) M. Roemer 1846 (Australian Red-cedar)

A genus of 4-5 species of se. Asia and Australia. References: Mabberley in Kubitzki (2011).

\* *Toona ciliata* M. Roemer var. *australis* (F. Mueller) Bahadur, Toon, Australian Red-cedar. Suburban woodlands; native of Australia. April-June; October-November. Naturalizing rather aggressively in Montgomery County, MD (W. Knapp, pers. comm. 2011). [= *T. ciliata* ssp. *ciliata* var. *australis* (F. Mueller) Bahadur – K2]

### 250. MALVACEAE A.L. de Jussieu 1789 (Mallow Family) [in MALVALES]

Malvaceae has always been difficult to circumscribe cleanly, relative to members of such families as Sterculiaceae and Tiliaceae. Molecular evidence now adds to morphologic evidence that traditional circumscriptions of these families are highly polyphyletic. Bayer et al. (1999) present a new classification of an expanded Malvaceae, with 9 subfamilies recognized. If circumscribed broadly (as here) to include Sterculiaceae and Tiliaceae, a family of about 243 genera and 4000-4500 species, herbs, shrubs, and trees, of cosmopolitan distribution, but especially diverse in the tropics and subtropics. This family includes several economically important species, including cotton (*Gossypium* spp.), cacao or chocolate, *Theobroma cacao* Linnaeus, and cola, *Cola acuminata* R. Brown. References: Bayer et al. (1999); Bayer & Kubitzki in Kubitzki & Bayer (2003); Fryxell (1988). [including STERCULIACEAE and TILIACEAE]

- 1 Petals absent; carpels 5, whorled, each expanding into a stalked and papery structure which bears 1-4 pea-sized seeds along its margins; tree; leaves 10-40 cm wide, 3-5 lobed, the lobes acute, the margins entire; [subfamily *Sterculioideae*].....**6. Firmiana**  
 1 Petals present; carpels 1, 5, or many, united or separate, but not as above; tree, shrub, or herb; leaves < 15 cm wide, lobed or unlobed, but if lobed then also serrate.  
 2 Epicalyx of bracts (immediately subtending the calyx) absent.  
 3 Stamens 5; [subfamily *Byttnerioideae*].  
 4 Ovary with 5 carpels and 5 styles; capsule with 5-10 seeds; corolla pink, purple, or white.....**1. Melochia**  
 4 Ovary with 1 carpel and 1 style; capsule with 1 seed; corolla orange to yellow.....**[2. Waltheria]**  
 3 Stamens >10.  
 5 Stamens free.  
 6 Tree; fruit a woody drupe; [subfamily *Tilioideae*].....**5. Tilia**  
 6 Herb or shrub; fruit a capsule; [subfamily *Grewioideae*].



- 7 Leaves rounded or subcordate at base, acute at apex; fruit much longer than broad, unarmed .....3. *Corchorus*  
 7 Leaves cuneate at base, acuminate at apex; fruit subglobose, with hooked spines.....4. *Triumfetta*  
 5 Stamens united into a staminal column adnate to the corolla at its base; [subfamily *Malvoideae*; tribe *Malveae*].  
 8 Seeds 2 or more per carpel.....14. *Abutilon*  
 8 Seed 1 per carpel.  
 9 Leaves palmately and deeply cleft (> 9/10s of the way to the midrib) into linear segments .....24. *Callirhoe*  
 9 Leaves unlobed or lobed (if lobed, < 4/5's of the way to the midrib and the lobes broad).  
 10 Flowers many in a terminal panicle; corolla white; style branches filiform, the stigmatic surface elongate along the inner side of the branches; leaves >10 cm wide, deeply 5-9-lobed; plants 1-2 m tall .....18. *Napaea*  
 10 Flowers solitary or a few in leaf axils (or many in a terminal panicle in *Sida hermaphrodita*); corolla blue-purple, yellow, or white; style branches truncate, the stigmatic surface terminal and capitate; leaves < 2 cm wide, unlobed (or leaves > 10 cm wide and deeply 3-7-lobed in *Sida hermaphrodita*); plants < 1 m tall (or 1-4 m tall in *Sida hermaphrodita*).  
 11 Corolla blue to purple; lateral walls of the carpels disintegrating at maturity of the fruit.....20. *Anoda*  
 11 Corolla yellow or white; lateral walls of the carpels persistent .....15. *Sida*  
 2 Epicalyx of bracts (immediately subtending the calyx) present.  
 12 Fruit a loculicidal capsule or fleshy and berry-like.  
 13 Fruit fleshy and berry-like; [subfamily *Malvoideae*; tribe *Hibisceae*] .....12. *Malvaviscus*  
 13 Fruit a loculicidal capsule.  
 14 Calyx spathe-like, soon falling after anthesis; [subfamily *Malvoideae*; tribe *Hibisceae*] .....9. *Abelmoschus*  
 14 Calyx radially symmetrical, 5-lobed.  
 15 Style branches short, erect, the stigmas nearly sessile; epicalyx bracts 3, large, foliaceous, and incised; seeds bearing long white fibers; [subfamily *Malvoideae*; tribe *Gossypiae*] .....13. *Gossypium*  
 15 Style branches elongate, spreading; epicalyx bracts 6-15, linear to lanceolate and untoothed; seeds sometimes pubescent but not with long white fibers; [subfamily *Malvoideae*; tribe *Hibisceae*].  
 16 Locules of the fruit several-seeded; capsule longer than broad, the apex pointed or rounded; petals yellow, white, red, or pink (if pink, then > 4 cm long, or the plant a shrub) .....7. *Hibiscus*  
 16 Locules of the fruit 1-seeded; capsule depressed-globose, indented at the apex; petals pink, 2-4 cm long.....8. *Kosteletzkya*  
 10 Fruit of radially disposed, 1- to several-seeded, dry carpels that split apart at maturity.  
 17 Bracts of the epicalyx 5 or more.  
 18 Shrubs or woody herbs, with leaves not basally disposed; flowers in axils of well-developed leaves; fruit spiny (or lacking spines in *Pavonia hastata*); [of SC southward]; [subfamily *Malvoideae*; tribe *Hibisceae*].  
 19 Bracts of the epicalyx 5-15, distinct; fruit with 0-3 spines per carpel; leaves lacking foliar nectaries .....11. *Pavonia*  
 19 Bracts of epicalyx 5, fused basally; fruit covered with numerous glochidiate spines; leaves with 1-3 foliar nectaries (glands) on undersurface near base.....10. *Urena*  
 18 Herbs, with leaves basally disposed; flowers in terminal bracteate spikes or racemes; fruit lacking spines; [collectively widespread]; [subfamily *Malvoideae*; tribe *Malveae*].  
 20 Plant 1.5-3 m tall, usually unbranched; flowers 6-10 cm across .....21. *Alcea*  
 20 Plant 0.5-1.2 m tall, branched; flowers 2-3 cm across .....22. *Althaea*  
 17 Bracts of the epicalyx 2-3; [subfamily *Malvoideae*; tribe *Malveae*].  
 21 Ovules and seeds 2 or more per carpel.  
 22 Herb 0.5-2.5 m tall, upright; petals 2-3 cm long, pink-purple; carpels not beaked at the tip.....16. *Iliamna*  
 22 Herb to 0.5 m tall, prostrate to ascending; petals 0.3-0.5 cm long, orange-red; carpels beaked at the tip .....19. *Modiola*  
 21 Ovules and seeds 1 per carpel.  
 23 Leaf blades 1.5-8× as long as wide.  
 24 Style branches filiform, the stigmatic surface elongate along the inner side of the branches.....24. *Callirhoe*  
 24 Style branches truncate, the stigmatic surface terminal and capitate .....17. *Malvastrum*  
 23 Leaf blades orbicular, about as wide as long.  
 25 Leaves deeply palmately cleft .....24. *Callirhoe*  
 25 Leaves unlobed or shallowly lobed .....23. *Malva*

### 1. *Melochia* Linnaeus 1753 (Chocolate-weed)

A genus of about 54 species, herbs and shrubs, of tropical regions, especially America. References: Brizicky (1966)=Y; Bayer & Kubitzki in Kubitzki & Bayer (2003).

- 1 Petioles >1.5 cm long; pubescence of the stem and leaves sparse, of stellate, forked, and/or simple hairs; cymes terminal on primary and secondary branches.....*M. corchorifolia*  
 1 Petioles < 1 cm long; pubescence of the stem and leaves dense (tomentose), of stellate hairs; cymes in upper leaf axils ..... *M. spicata*

\* *Melochia corchorifolia* Linnaeus, Chocolate-weed. Cp (FL, GA, NC, SC): sandy fields, especially in low, wet places; uncommon, native of the Old World tropics. [= RAB, GW, K, S, WH, Y, Z]

\*? *Melochia spicata* (Linnaeus) Fryxell, Bretonica-peluda. Cp (FL, GA\*): disturbed areas; rare, native of tropical America, the original distribution uncertain. In GA (Kartesz 1999) and FL (Brizicky 1966). [= K, WH; = *Riedlea hirsuta* (Cavanilles) Alphonse de Candolle – S; = *Melochia villosa* (P. Miller) Fawcett & Rendle – Y]

### 2. *Waltheria* Linnaeus 1753 (Raichie)

A genus of ca. 60 species, herbs and shrubs, pantropical. References: Saunders in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

\* *Waltheria indica* Linnaeus, Sleepy Morning. On ballast, perhaps only a waif. January-December. Pantropical, native north to c. peninsular FL. [= K, WH3; > *W. americana* Linnaeus – S]



### 3. *Corchorus* Linnaeus 1753 (Jute)

A genus of 40-100 species, shrubs and herbs, broadly tropical and subtropical in distribution. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

- 1 Capsule 1-2 cm long, angular, winged; seeds < 1 mm long ..... *C. aestuans*  
 1 Capsule 4-7 cm long, subterete, not winged; seeds ca. 1 mm long ..... *C. hirtus*

\* *Corchorus aestuans* Linnaeus, Jute. Roadsides, other disturbed ground; native of Asia. Reported for Thomas County, GA (Carter, Baker, & Morris 2009). [= K2, WH3; ? *C. acutangulus* Lamarck – S] {add synonymy}

\* *Corchorus hirtus* Linnaeus, Hairy Jute. Disturbed areas; native of E. Indies. [= K2, WH3; > *C. orinocensis* Kunth – S]

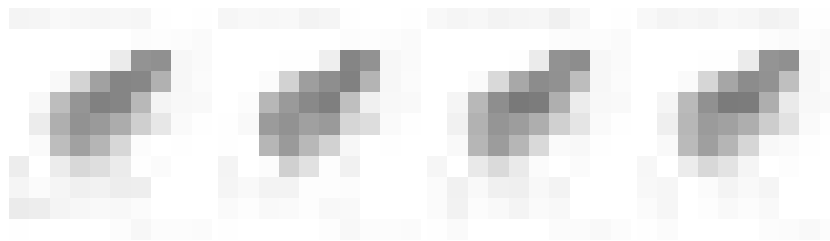
### 4. *Triumfetta* Linnaeus 1753

A genus of about 70-150 species, trees, shrubs, and herbs, of tropical regions. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

- 1 Capsule hispid; lower leaf surface not velutinous ..... *T. pentandra*  
 1 Capsule glabrous; lower leaf surface velutinous ..... *T. semitriloba*

\* *Triumfetta pentandra* A. Richard. Disturbed areas; native of tropical America. [= K, WH]

\* *Triumfetta semitriloba* Jacquin, Mosote, Burweed. Disturbed areas; native of tropical America. In sw. GA (Jones & Coile 1988) and s. peninsular FL. [= K, S, WH]



### 5. *Tilia* Linnaeus 1753 (Basswood, Whitewood, Linden, Linn)

A genus of about 25-45 species, trees, of temperate regions of North America, Europe and Asia. Hardin's (1990) treatment of American *Tilia* seems a practical and reasonable approach; it gives taxonomic status to the more distinctive (and geographically based) elements of variation, while recognizing the intergradational nature of the variation. Further investigation of this complex group is, however, warranted. References: Hardin (1990)=Z; Stace (2010)=Y; Haines (2011)=X; Bayer & Kubitzki in Kubitzki & Bayer (2003). Key adapted from Hardin (1990) and Stace (2010).

**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 Leaf blades 8-25 cm long; flowers with staminodes; [collectively common and widespread natives].  
 2 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 NC and TN] ..... *T. americana* var. *americana*

- 2 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].
- 3 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*
- 3 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*
- 1 Leaf blades 3-9 (-12) cm long; flowers lacking staminodes; [rare aliens, sparingly naturalized in suburban woodlands].
- 4 Leaves pubescent below; flowers 2-4 (-6) per cyme; fruit strongly ribbed.....[*T. platyphyllos*]
- 4 Leaves glabrous below except for tufts of hairs in the vein axils; flowers 4-15 per cyme; fruit not or slightly ribbed.
- 5 Cymes obliquely erect above the leaves; leaf blades mostly 3-6 cm long, the tertiary veins obscure as viewed from the upper side of the leaf ..... *T. cordata*
- 5 Cymes pendent below the leaves; leaf blades mostly 6-9 cm long, the tertiary veins prominent as viewed from the upper side of the leaf ..... *T. xeuropaea*

*Tilia americana* Linnaeus var. *americana*, Northern Basswood. Rich coves, rocky slopes, metabasalt boulderfields, rich north-facing river bluffs, calcareous Coastal Plain ravines. June; August-September. NB and MB south to e. VA, w. NC, and OK. In VA, var. *americana* occurs throughout the northern half of the state, with scattered populations southward in the mountains. [= C, K, Pa, X, Z; = *T. americana* - RAB, G, W, WV; > *T. americana* - F; > *T. neglecta* Spach - F, S; > *T. glabra* Ventenat - S; > *T. truncata* Spach - S]

*Tilia americana* Linnaeus var. *caroliniana* (P. Miller) Castiglioni, Southern Basswood, Carolina Basswood. Mesic forests, in the outer Coastal Plain usually associated with shell deposits, Indian shell middens, or underlying coquina limestone ("marl"). June-July; July-August. NC south to c. peninsular FL and west to OK and c. TX. [= K, WH, Z; > *T. caroliniana* P. Miller - RAB, S; > *T. floridana* Small - RAB, F, S; > *T. georgiana* Sargent - S; > *T. littoralis* Sargent - S]

*Tilia americana* Linnaeus var. *heterophylla* (Ventenat) Loudon, Mountain Basswood, White Basswood, Linn. 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. June; July-August. Centered in the Southern Appalachians: sw. PA and WV south to c. NC, wc. GA, FL Panhandle, and westward as disjunct populations to the Ozarkian Highlands of s. MO and n. AR. In VA, var. *heterophylla* dominates in sw. VA and along southern Piedmont river bluffs, with disjunct populations in calcareous ravines in the upper Coastal Plain (Surry County); it also extends less commonly into the northern VA mountains and foothills, where var. *americana* is more prevalent, but seems to be absent (or very uncommon) in the Potomac valley east of the Blue Ridge. [= C, K, Pa, WH, X, Z; = *T. heterophylla* Ventenat - RAB, F, W, WV; > *T. heterophylla* - G, S; > *T. monticola* Sargent - G; > *T. australis* Small - S; > *T. eburnea* Ashe - S; > *T. lasioclada* Sargent - S; > *T. michauxii* Nuttall - S; > *T. venulosa* Sargent]

\* *Tilia cordata* P. Miller, Small-leaved Linden, Small-leaved Lime. Suburban woodlands, uncommonly planted, rarely naturalizing; native of Europe. [= C, X, Y]

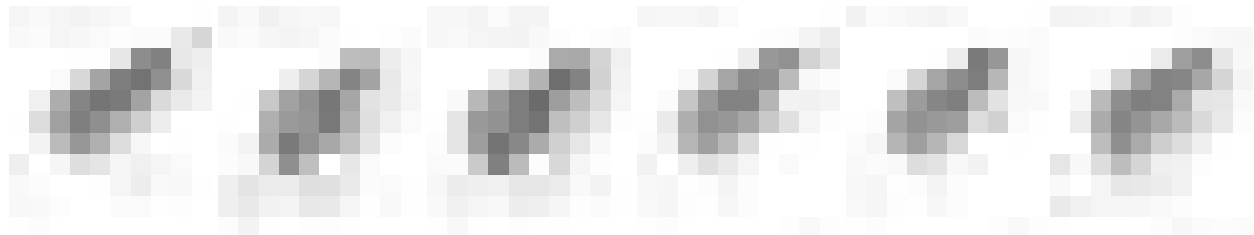
\* *Tilia xeuropaea* Linnaeus (pro sp.) [*Tilia cordata* × *platyphyllos*], Common European Linden, Lime. Suburban woodlands; uncommonly planted, rarely naturalizing, native of Europe. [= Y; = *T. xvulgaris* Hayne - X]

\* *Tilia platyphyllos* Scopoli, Large-leaved Linden, Large-leaved Lime. Uncommonly planted, uncertain if naturalizing in our area; native of Europe. [= C, X, Y] {rejected as a component of our flora, but keyed because of likelihood of naturalization}

## 6. *Firmiana* Marsili 1786 (Chinese Parasol-tree, Phoenix Tree)

A genus of about 12 species, trees, of Africa and Asia. References: Whetstone (1983)=Z; Brizicky (1966)=Y; Bayer & Kubitzki in Kubitzki & Bayer (2003).

\* *Firmiana simplex* (Linnaeus) W. Wight, Chinese Parasol-tree, Phoenix Tree. Planted and occasionally naturalized nearby; native of se. Asia, probably China. [= C, K, WH, Y, Z; = *F. plataniifolia* (Linnaeus f.) Schott & Endlicher - RAB, S]



## 7. *Hibiscus* Linnaeus 1753 (Hibiscus, Rose-mallow)

A genus of about 200-300 species, trees, shrubs, and herbs, of tropical to warm temperate areas. References: Blanchard in FNA (in prep.); Blanchard (2008)=Z; Wise & Menzel (1971); Bayer & Kubitzki in Kubitzki & Bayer (2003).

- 1 Woody shrub, the stems usually solitary from a creeping rhizome; [section *Hibiscus*] .....*H. syriacus*
- 1 Herb (sometimes robust and to as tall as 3.5 m), often several from ground level, from a crown or taproot.
- 2 Annual from a taproot, to 0.5 m tall; calyx inflated at maturity; capsule 1.0-1.3 cm long; petals 1.5-3 (-4) cm long; leaves 2-6 cm long, deeply cleft; [section *Trionum*] .....*H. trionum*
- 2 Perennial from a crown, usually 0.7-3.5 m tall; calyx not inflated at maturity; capsule 1.7-3.5 cm long; petals 4-14 cm long; leaves 4-25 cm long, deeply cleft, hastate-lobed, or not at all lobed or cleft.
- 3 Leaves and stems harshly scabrous; calyx lobes each with an elongate purplish nectary on the back; [of pine savannas and dry sandy soils of maritime forest edges, from se. NC southward]; [section *Furcaria*].....*H. aculeatus*
- 3 Leaves and stems glabrous, softly pubescent, or slightly scabrous; calyx lobes lacking nectaries; [of marshes and swamps (sometimes cultivated in drier soils), collectively widespread in our area]; [section *Muenchhusia*].
- 4 Stem glabrous; leaves glabrous; leaves either palmately 3-5-lobed, or prominently halberd-lobed at the base (uncommonly unlobed).
- 5 Leaves either palmately 3-5-lobed; petals bright scarlet .....*H. coccineus*
- 5 Leaves halberd-lobed at the base (uncommonly unlobed); petals pink or white with a purplish base .....*H. laevis*
- 4 Stem pubescent at least when young; leaves pubescent on at least one surface; leaves unlobed or slightly lobed toward the tip (except *H. grandiflorus*).
- 6 Staminal column 6.2-9.5 cm long,  $> \frac{2}{3} \times$  as long as the petals; petals 8.5-14 cm long; [e. GA southward] .....*H. grandiflorus*
- 6 Staminal column 1.2-5 cm long,  $< \frac{1}{2} \times$  as long as the petals; petals 4-12 cm long; [widespread].
- 7 Capsule pubescent (the dark surface largely or completely obscured); bracts of the involucre usually ciliate; upper leaf surface usually densely stellate-pubescent .....*H. lasiocarpus*
- 7 Capsule glabrous and dark brown to black; bracts of involucre eciliate; upper leaf surface glabrous or nearly so .....*H. moscheutos*

*Hibiscus aculeatus* Walter, Savanna Hibiscus, Comfort-root. Pine savannas, dry sandy or loamy soils of maritime forest edges. June-August; July-September. Se. NC south to sc. peninsular FL, west to LA. [= RAB, FNA, GW, K, S, WH]

*Hibiscus coccineus* Walter, Scarlet Hibiscus. Marshes, swamp forests, roadside swales, cultivated as an ornamental in yards, in much of our area presumably introduced from farther south, but sometimes appearing native. S. GA and s. AL south to s. FL. [= FNA, GW, K, S, WH]

*Hibiscus grandiflorus* Michaux, Large-flowered Hibiscus. Tidal marshes, lakeshores, wet flatwoods and savannas. E. GA (Chatham Co., adjacent to the SC border) (Jones & Coile 1988) south to s. FL, west to e. LA; e. Cuba. [= FNA, GW, K, S, WH]

*Hibiscus laevis* Allioni, Smooth Rose-mallow, Halberd-leaved Marsh-mallow, Showy Hibiscus. Freshwater marshes, exposed riverbanks, sandbars. June-August; August-October. S. PA south to FL Panhandle, west to TX; north in the interior to around the Great Lakes. [= C, FNA, K, Pa, W, WH; = *H. militaris* Cavanilles – RAB, F, G, GW, S, WV]

*Hibiscus lasiocarpus* Cavanilles, Western Rose-mallow. Marshes, swamps. KY, IN, IL, MO, KS, and NM south to Panhandle FL, AL, MS, LA, and TX. [= F, GW, S; = *H. moscheutos* Linnaeus var. *occidentalis* Torrey – C; = *H. moscheutos* Linnaeus ssp. *lasiocarpus* (Cavanilles) O.J. Blanchard – FNA, K, Z; = *H. lasiocarpus* – G, orthographic variant; < *H. moscheutos* – WH]

*Hibiscus moscheutos* Linnaeus, Eastern Rose-mallow. Marshes, swamps, river sandbars. June-September; July-October. E. MA west to MI, south to c. peninsular FL and e. TX. [> *H. moscheutos* Linnaeus ssp. *moscheutos* – RAB, GW, W; > *H. moscheutos* Linnaeus ssp. *incanus* (Wendland f.) H.E. Ahles – RAB, GW; > *H. moscheutos* Linnaeus ssp. *palustris* (Linnaeus) R.T. Clausen – RAB, GW, W; = *H. moscheutos* var. *moscheutos* – C; > *H. incanus* Wendland f. – G, S; = *H. moscheutos* ssp. *moscheutos* – FNA, K, Z; > *H. moscheutos* Linnaeus – F, G, W; > *H. oculiroseus* Britton – S; > *H. palustris* Linnaeus – F, G; > *H. moscheutos* – S; < *H. moscheutos* – Pa, WH]

\* *Hibiscus syriacus* Linnaeus, Rose-of-Sharon, Althaea. Escaped or persistent after cultivation, often spreading by rhizomes; native of e. Asia. June-September; August-October. [= RAB, C, F, FNA, G, K, Pa, S, W, WV]

\* *Hibiscus trionum* Linnaeus, Flower-of-an-hour. Fields, roadsides, railroad yards, disturbed areas; native of Europe. Reported for Ware County, GA (Carter, Baker, & Morris 2009). [= RAB, C, FNA, G, K, Pa, W, WH, WV; = *Trionum trionum* (Linnaeus) Wootton & Standley – S]



#### 8. *Kosteletzkya* K. Presl 1835 (Seashore-mallow)

A genus of about 15-30 species, herbs, of North America, sub-Saharan Africa, and Madagascar. Perhaps better included in a broadly circumscribed *Hibiscus* (Pfeil & Crisp 2005). References: Alexander (2010)=Y; Blanchard in FNA (in prep.); Blanchard (2008)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

***Kosteletzkya pentacarpos*** (Linnaeus) Ledebour, Seashore-mallow, Saltmarsh-mallow, Fen-rose. Cp (FL, GA, NC, SC, VA): brackish to freshwater tidal marshes; common. July-October. NY (Long Island) south to s. FL, west to TX; West Indies. Several varieties have often been recognized on the basis of length of hairs and of parts of the flower and inflorescence (see synonymy). While geographic trends are readily apparent, the recognition of infraspecific taxa is made problematic by the non-correlation of various characters. In recent studies, neither Blanchard (2008) nor Alexander (2010) recognize varieties in our flora area. *K. smilacifolia* A. Gray, of peninsular FL, appears to warrant specific status, as treated by Small (1933). It also appears that the Eurasian *K. pentacarpos* represents an early introduction of North American *Kosteletzkya* to the Old World (probably via ship's ballast) and is conspecific; *K. pentacarpos* (based on European material) has nomenclatural priority over *K. virginica* (Blanchard 2008). [ $<$  WH, Z;  $<$  *K. pentacarpa* – FNA, orthographic variant; = *Kosteletskya virginica* – RAB, orthographic variant;  $>$  *Kosteletzkya virginica* var. *aquilonia* Fernald – C, F, G;  $>$  *Kosteletzkya virginica* var. *virginica* – C;  $>$  *Kosteletzkya virginica* var. *virginica* – F, G;  $>$  *Kosteletzkya virginica* var. *althaeifolia* Chapman – F, G;  $>$  *Kosteletzkya virginica* (Linnaeus) K. Presl ex A. Gray – GW, K;  $>$  *Kosteletzkya althaeifolia* (Chapman) Rusby – S;  $>$  *Kosteletzkya virginica* – S; = *Kosteletzkya pentacarpos* var. *pentacarpos* – Y; = ***Hibiscus pentacarpos*** Linnaeus]

### 9. *Abelmoschus* Medikus 1787 (Okra, Gumbo)

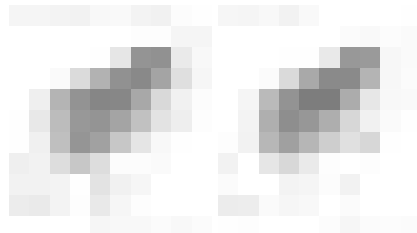
A genus of about 15 species, herbs, of the Old World tropics. Perhaps better included in a broadly circumscribed *Hibiscus* (Pfeil & Crisp 2005). References: Bates in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

\* ***Abelmoschus esculentus*** (Linnaeus) Moench, Okra, Gumbo. Frequently cultivated in gardens, rarely persistent or self-seeding the year following; native of Africa. The young capsules are a famous component of southern cooking. [= FNA, K, S, WH; = ***Hibiscus esculentus*** Linnaeus – F]

### 10. *Urena* Linnaeus 1753 (Caesarweed)

A genus of about 6 species, of tropical and subtropical regions. Perhaps better included in a broadly circumscribed *Hibiscus* (Pfeil & Crisp 2005). References: Hill in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

\* ***Urena lobata*** Linnaeus, Caesarweed, Bur Mallow, Congo Jute. Roadsides and vacant lots; native of se. Asia. Introduced to se. SC via landscaping plantings, spreading to vacant lots and roadsides (P. McMillan, pers. comm., 2005). [= FNA, GW, K, S, WH]



### 11. *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 unawned; petals white or pink, with a maroon blaze at the base; [introduced species of disturbed habitats].....***P. hastata***  
 1 Leaves ovate; calyx lobes lanceolate; carpels with 3 apical awns up to 10 mm long; petals yellow; [rare native].....***P. spinifex***

\* ***Pavonia hastata*** Cavanilles, Swampmallow. Mesic flatwoods, disturbed areas; native of tropical America. In se. GA (Jones & Coile 1988). [= K, S, WH]

***Pavonia spinifex*** (Linnaeus) Cavanilles, Gingerbush. Hammocks. E. SC; ne. FL and peninsular FL; Bermuda; Bahamas; West Indies; tropical America. Reported for the vicinity of Charleston, SC on the basis of a specimen collected by Bachman (Chapman 1878). Small (1933) considers this species as likely native, at least in FL. [= K, S, WH]

### 12. *Malvaviscus* Fabricius 1759 (Wax-mallow)

A genus of 3-4 species, herbs, of tropical and subtropical areas. Perhaps better included in a broadly circumscribed *Hibiscus* (Pfeil & Crisp 2005). References: Turner & Mendenhall (1993)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

- 1 Leaves pubescent on the lower surface.....*M. drummondii*  
 1 Leaves glabrous or nearly so on the lower surface.....*M. penduliflorus*

\* *Malvaviscus drummondii* Torrey & A. Gray, Wax-mallow, Turk's-cap Mallow. Cp (FL, GA, NC, SC): disturbed areas; rare, native of TX and n. Mexico. July-October. First reported for NC and SC by Leonard (1971b). Although Turner & Mendenhall (1993) cite Leonard's specimens as *M. arboreus* var. *arboreus*, they were correctly determined by Leonard as *M. drummondii*. Therefore the attribution of *M. arboreus* var. *arboreus* to NC by Kartesz (1999) is an error. [= S; = *M. arboreus* Dillenius ex Cavanilles var. *drummondii* (Torrey & A. Gray) Schery – K, WH, Z; = *Hibiscus drummondii* (Torrey & A. Gray) M.J. Young]

*Malvaviscus penduliflorus* DC., Turk's-cap Mallow, Mazapan. Cp (FL): disturbed areas; rare, native of tropical America. April-November. [= K, WH; = *M. arboreus* Dillenius ex Cavanilles var. *penduliflorus* (DC.) Schery; *Hibiscus*]

### 13. *Gossypium* Linnaeus 1753 (Cotton)

A genus of about 40-50 species, herbs, shrubs, and trees, of warm temperate to tropical areas. References: Fryxell (1969, 1979)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

**Identification notes:** Agricultural cotton is now a complex set of cultivars, some involving cross-breeding between the two species treated below, and some plants may not be readily identifiable to species.

- 1 Capsule 3-6 cm long, narrowly ovoid to elongate, its surface deeply pitted with oil glands; leaves 3-7-lobed, the central lobe usually > 1.5× as long as wide; stipules 1-5 cm long; corolla deep yellow; long fibers of the seed completely separable from the seed; short fibers of the seed absent or present .....*G. barbadense*  
 1 Capsule 2-3 cm long, ovoid to subglobose, its surface smooth; leaves 3-5-lobed, the central lobe usually 1.0-1.5× as long as wide; stipules 0.5-1.5 (-2.0) cm long; corolla pale yellow; long fibers of the seed firmly attached to the seed; short fibers of the seed present .....*G. hirsutum*

\* *Gossypium barbadense* Linnaeus, Sea-island Cotton, Egyptian Cotton, Pima Cotton, Extra-long-staple Cotton. Cp (GA, NC, SC): formerly cultivated, perhaps no longer present in our area; rare, native of South America, Central America, and the West Indies. Probably first domesticated about 5000-5500 years b.p. in coastal Peru and Ecuador. [= K, S, Z]

\* *Gossypium hirsutum* Linnaeus, Upland Cotton. Frequently cultivated crop, especially in sandy soils of the Coastal Plain, rarely adventive or a waif; native of Central America, South America, the West Indies, and s. FL. Probably first domesticated in the Yucatan Peninsula. [= C, G, WH, Z; > *G. hirsutum* var. *hirsutum* – K; = *G. herbaceum* Linnaeus – F, misapplied; > *G. herbaceum* – S; > *G. hirsutum* – S, misapplied]



### 14. *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. Fields, roadsides, disturbed areas; native of s. Asia. June-October. [= F, G, K, W, WH, Z; = *A. theophrasti* – Pa, RAB, orthographic variant; = *Abutilon abutilon* (Linnaeus) Rusby – S]



### 15. *Sida* Linnaeus 1753 (Sida)

A genus of about 100 species, shrubs and herbs, of tropical, subtropical, and warm temperate areas. References: Fryxell (1985)=Z; Fuertes, Fryxell, & Jansen (2003); Siedo (1999)=Y; Verdcourt (2004)=X; Bayer & Kubitzki in Kubitzki & Bayer (2003). Key adapted in part from Z.

- 1 Leaves deeply palmately lobed; plants 1-2 (-4) m tall; petals white; [section *Pseudonapaea*, to be removed from *Sida*].....*S. hermaphrodita*
- 1 Leaves unlobed; plants 0.2-1 m tall; petals yellow.
  - 2 Mericarps, styles, and stigmas 5; stem with a spine subtending each leaf; leaves usually truncate to subcordate at the base; [section *Spinosae*].....*S. spinosa*
  - 2 Mericarps, styles, and stigmas (6-) avg. 10 (-14); stem lacking spines subtending the leaves; leaves usually cuneate to rounded (cordate to subcordate in *S. cordata*) at the base.
    - 3 Leaves cordate to subcordate at the base; flowers clustered into a terminal panicle..... *S. cordifolia*
    - 3 Leaves cuneate to rounded at the base; flowers solitary in leaf axils.
      - 4 Leaves narrowly elliptic to linear, (3-) 4-20× as long as wide; [section *Ellipticifoliae*]..... *S. elliottii* var. *elliottii*
      - 4 Leaves elliptic-rhombic, mostly 2-3× as long as wide; [section *Sidae*].
        - 5 Leaves and branches borne distichously; stipules usually falcate, several-veined..... *S. acuta*
        - 5 Leaves and branches borne spirally; stipules linear, 1 (-3)-veined.....*S. rhombifolia* var. *rhombifolia*

*Sida acuta* Burman f., Broomweed. Disturbed areas; native of the Tropics, the original northern limit uncertain. June-October. [= K, WH, Z; ? *S. carpinifolia* Linnaeus f. – RAB, S; = *S. ulmifolia* P. Miller – WH, a barely later name]

\* *Sida cordifolia* Linnaeus. Disturbed sandhills, disturbed hammocks; native of tropical America. [= K, S, WH, Z]

*Sida elliottii* Torrey & A. Gray var. *elliottii*, Coastal Plain Sida. Stream banks, sandy openings, pineland pond margins, limestone glades and barrens, mesic hammocks. 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, G, S, WH; > *S. elliottii* – F, K, Z; > *S. inflexa* Fernald – F, K, Z]

*Sida hermaphrodita* (Linnaeus) Rusby, Virginia Sida, Virginia-mallow. Sandy or rocky areas along riverbanks. 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) (Spoooner 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). Spoooner et al. (1985) provide a detailed review of the species. [= C, F, G, K, Pa, S, W, WV, Z]

\* *Sida rhombifolia* Linnaeus var. *rhombifolia*, Arrowleaf Sida. Cp (GA, NC, SC, VA), Pd (GA, NC, SC), Mt (GA, SC): roadsides, fields, gardens, disturbed areas; common. April-October. Verdcourt (2004) discusses variation in this taxon, and suggests that "studies throughout the entire range of the species will necessitate recognition of more than one species." He recognizes 6 varieties in e. Africa, aside from the Linnaean var. *rhombifolia* (with type in Jamaica). [= X; < *S. rhombifolia* – RAB, C, F, G, K, S, W, WH, Z]

\* *Sida spinosa* Linnaeus, Prickly Sida, Prickly-mallow, False-mallow. Disturbed areas, wet fields; native of the Tropics. June-November. [= RAB, C, F, G, K, Pa, S, W, WH, WV, Z]



### 16. *Iliamna* Greene 1906 (Globe-mallow)

A genus of 7 species, perennial herbs, of North America. Some authors include *Iliamna* in *Sphaeralcea*. References: Bodo Slotta & Porter (2006)=Y; Porter & Wieboldt in Terwilliger (1991)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

- 1 Leaves 5-7-lobed, the lobes narrowly triangular, the sinuses acute; flowers odorless; plant to ca. 1 m in height; [sandstone outcrops on ridgetop] .....*I. corei*
- 1 Leaves 5-7-lobed, the lobes broadly triangular or deltoid, the sinuses obtuse; flowers fragrant; plant to ca. 2.5 m in height; [of river shores and along railroads] .....*I. remota*

*Iliamna corei* Sherff, Peters Mountain Mallow. In shallow soil in crevices of outcroppings of Clinch sandstone, near the summit of Peters Mountain. 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. Shores and gravel bars along rivers, and along railroad embankments. June-August; July-October. W. VA; nw. IN and ne. IL. Considered by some to be introduced only in our area, however, the VA populations are genetically different than those in IN and IL (Bodo Slotta & Porter 2006). [= F, Y, Z; < *I. remota* – C, G, W (also see *I. corei*); < *I. rivularis* (Douglas ex Hooker) Greene var. *rivularis* – K; = *Sphaeralcea remota* (Greene) Fernald]



### 17. *Malvastrum* A. Gray 1849 (False-mallow)

A genus of 14 species, herbs, of tropical and warm temperate areas. References: Hill in FNA (in prep.); Bates (1967); Bayer & Kubitzki in Kubitzki & Bayer (2003).

- 1 Leaves linear-lanceolate to lanceolate, 3.5-8× as long as wide; plant 1-5 (-8) dm tall; [of inland calcareous habitats].....***M. angustum***
- 1 Leaves broadly lanceolate to broadly ovate, 1.5-2.5× as long as wide; plant (5-) 10-20 dm tall; [of near coastal habitats, mainly FL, waifs elsewhere].
- 2 Hairs of the stems stellate with 5-12 ascending rays; leaves often shallowly 3-lobed ..... ***M. americanum***
- 2 Hairs of the stems stellate with 2-5 appressed rays; leaves unlobed.
- 3 Mericarps with minute cusps, none longer than 0.1-0.4 mm long..... ***M. corchorifolium***
- 3 Mericarps with well-developed sharp cusps, the larger 1-2 mm long ..... ***M. coromandelianum***

***Malvastrum angustum*** A. Gray, Hairy False-mallow. Mt (VA): limestone barrens; rare (VA Rare). July-August; August-October. KY, w. VA (Lee Co.), and c. TN, west to IA, KS, and OK. Discovered in our area in 1994 by J.C. Ludwig (Fleming & Ludwig 1996). [= FNA; = *Malvastrum hispidum* (Pursh) Hochreutiner – C, K, epithet misapplied; = *Malvastrum angustum* A. Gray – G, S; ? *Sphaeralcea angusta* (A. Gray) Fernald – F; = *Sidopsis hispidum* (Pursh) Rydberg, epithet misapplied; = *Sida hispida* Pursh, misapplied]

***Malvastrum americanum*** (Linnaeus) Torrey. Disturbed areas. January-December. FL, TX south through Central America to South America; West Indies; also in the Old World tropics. [= FNA, K, WH]

***Malvastrum corchorifolium*** (Desrousseaux) Britton ex Small. Cp (FL): coastal hammocks; rare. January-December. FL and AL south to Central America; West Indies. [= FNA, K, WH]

\* ***Malvastrum coromandelianum*** (Linnaeus) Garcke. Cp (FL): coastal hammocks, waif on ballast; rare, native of tropical America (TX to Argentina). January-December. Northern occurrences, such as in PA (Rhoads & Klein 1993) and NJ (Kartesz 1999), represent old records of ballast waifs. [= FNA, K, WH]



### 18. *Napaea* Linnaeus 1753 (Glade-mallow)

A monotypic genus, an herb, of temperate c. North America. References: Bayer & Kubitzki in Kubitzki & Bayer (2003).

***Napaea dioica*** Linnaeus, Glade-mallow. Mt (VA): floodplains; rare. June-August. PA and IA south to sw. VA and s. IL. The original distribution of this scarce species is difficult to determine. See the interesting discussion of this species' occurrence in VA in Wieboldt et al. (1998). [= C, F, G, K]

### 19. *Modiola* Moench 1794 (Bristly-mallow)

A monotypic genus, an herb, of North America, Central America, and South America. References: Hill in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

***Modiola caroliniana*** (Linnaeus) G. Don, Bristly-mallow. Lawns, roadsides, disturbed areas, pondshores, adventive in part of its range in our area. Late March-June (sometimes later). The original distribution unclear: sometimes considered as ranging



as a native from SC south to FL, west to TX, south into the tropics, and adventive northward, but sometimes suggested to be wholly introduced in the southeastern United States. [= RAB, C, F, G, GW, K, S, WH]

### 20. *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) Schlechtendal, Spurred Anoda. Disturbed areas; native of sw. United States, Central and South America. July-October. [= G, K; = *A. crista* – C, orthographic variant; > *A. cristata* var. *cristata* – F; > *A. cristata* var. *brachyanthera* (Reichenbach) Hochreutiner – F]

### 21. *Alcea* Linnaeus 1753 (Hollyhock)

A genus of about 50-60 species, warm temperate Eurasian (Mediterranean Europe to c. Asia). References: Hill in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

\* *Alcea rosea* Linnaeus, Hollyhock. Roadsides, dumps, frequently cultivated, less commonly escaped or persistent; native of Eurasia. Late May-August (rarely later). [= FNA, K; = *Althaea rosea* (Linnaeus) Cavanilles – RAB, C, F, G]

\* *Alcea rugosa* Alefeld, Russian Hollyhock. Reported for MD. [= FNA] {not yet keyed}

### 22. *Althaea* Linnaeus 1753 (Marsh-mallow)

A genus of about 12 species, herbs, Eurasian. References: Hill in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003).

\* *Althaea officinalis* Linnaeus, Marsh-mallow. Marshes; native of Europe. July-September. The roots of this plant were the original source of the mucilaginous paste used to make marshmallows (which are now made with a synthetic mucilage). [= C, F, FNA, G, K, Pa]



### 23. *Malva* Linnaeus 1753 (Mallow)

A genus of about 40 species, herbs, of temperate Eurasia and montane Africa. References: Hill in FNA (in prep.); Bayer & Kubitzki in Kubitzki & Bayer (2003). Key based in part on FNA.

- 1 Upper leaves deeply 5-7-lobed, the sinuses cut over halfway to the middle; petals 20-35 mm long; erect perennial..... *M. moschata*
- 1 Upper leaves less deeply lobed, rarely to as deep as halfway to the middle; petals 5-30 (-45) mm long; prostrate to erect annual or biennial.
  - 2 Epicalyx of 3 oblong-ovate bractlets; petals reddish purple, (12-) 16-30 (-45) mm long; biennial, erect, usually not branched at the base ..... *M. sylvestris*
  - 2 Epicalyx of 3 linear or linear to narrowly lanceolate bractlets; petals white or pink, 3-15 mm long; annual, sprawling, usually branched at the base (except *M. verticillata*).
    - 3 Bractlets of the epicalyx linear; petals to 3-5 mm long, white to pale lilac ..... *M. parviflora*
    - 3 Bractlets of the epicalyx broadly linear to narrowly lanceolate; petals (3-) 5- mm long, pink or purple (rarely white).
      - 4 Stems erect, usually > 5 dm long; leaf blades 3-8 (-17) cm long ..... *M. verticillata*
      - 4 Stems prostrate to ascending, to 5dm long; leaf blades 1.5-5 cm long.
        - 5 Petals 6-13 mm long, about 2× as long as the sepals; mature mericarps slightly roughened or obscurely reticulate ..... *M. neglecta*
        - 5 Petals 3-6 mm long, about 1× as long as the sepals; mature mericarps strongly rugose-reticulate ..... *M. pusilla*

\* *Malva moschata* Linnaeus, Musk Mallow, Rose Mallow. Pastures, roadsides, barnyards; native of Europe. Late May-early September. [= RAB, C, F, FNA, G, K, Pa, W, WV]

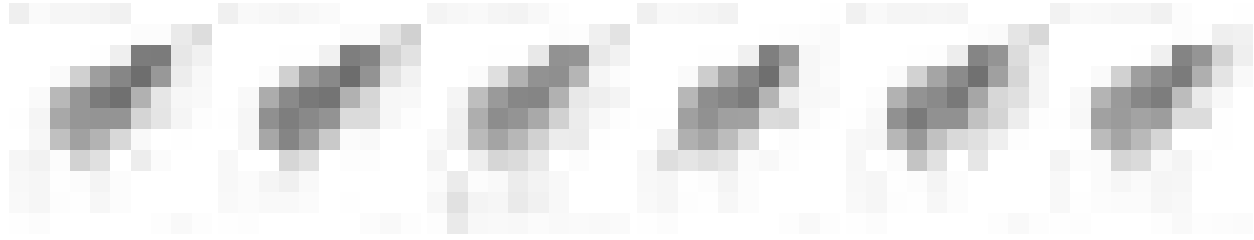
\* *Malva neglecta* Wallroth, Common Mallow, Cheeses. Pastures, roadsides, barnyards; native of Europe. April-November. [= RAB, C, F, FNA, G, K, Pa, W, WV; = *M. rotundifolia* – S, misapplied]

\* *Malva parviflora* Linnaeus, Little Mallow. Disturbed areas; native of Mediterranean Europe. [= C, F, FNA, G, K, WH]

\* *Malva pusilla* Smith, Small Mallow, Dwarf Mallow, Cheeses. Pastures, roadsides, barnyards; native of Europe. May-September. [= FNA; = *M. rotundifolia* Linnaeus – C, F, G, K, Pa, S, rejected because of uncertain application]

\* *Malva sylvestris* Linnaeus, Common Mallow, High Mallow, Cheeses. Pastures, roadsides, barnyards; native of Europe. May-September. [= RAB, C, FNA, K, Pa, S, W; > *M. sylvestris* var. *sylvestris* – F, G; > *M. sylvestris* var. *mauritanica* (Linnaeus) Boissier – F, G]

\* *Malva verticillata* Linnaeus, Whorled Mallow. Disturbed areas; native of e. Asia. July-September. Reported as an introduction as far south as s. PA (Rhoads & Klein 1993; Rhoads & Block 2007), MD, WV (Strausbaugh & Core 1978), DE, and DC. [= K, Pa, WV; > *M. verticillata* var. *verticillata* – C, F, FNA, G; > *M. verticillata* var. *crispa* Linnaeus – C, F, FNA, G]



#### 24. *Callirhoe* Nuttall 1821 (Poppy-mallow)

A genus of about 9 species, herbs, of North America. References: Dorr (1990)=Z; Bayer & Kubitzki in Kubitzki & Bayer (2003).

- 1 Calyx not subtended by an epicalyx.
  - 2 Inflorescence racemose, corymbose, or nearly umbellate; petals white, pink, or mauve; plants ascending, 1.5-8.5 dm tall; mericarps pubescent with simple, appressed hairs ..... *C. alcaeoides*
  - 2 Inflorescence paniculate; petals deep red, with a white basal spot; plants erect, 5-20 dm tall; mericarps glabrous ..... *C. pedata*
- 1 Calyx subtended by an epicalyx of 3 bractlets.
  - 3 Calyx lobes distinct and divergent in bud; stems decumbent..... *C. involucrata* var. *involucrata*
  - 3 Calyx lobes valvate in bud, forming a point; stems erect, ascending, or decumbent.
    - 4 Bractlets of the epicalyx linear, 0.1-1.7 mm wide; peduncles 1-flowered; calyx lobes lanceolate, 7-15.4 mm long; mericarps indehiscent; leaves cordate or ovate in outline, palmately deeply divided into 5-7 lobes..... *C. papaver*
    - 4 Bractlets of the epicalyx obovate, 2.5-4.6 mm wide; peduncles several-flowered; calyx lobes deltoid, 2-5 (-6.5) mm long; mericarps dehiscent; leaves triangular, not lobed or only slightly so..... *C. triangulata*

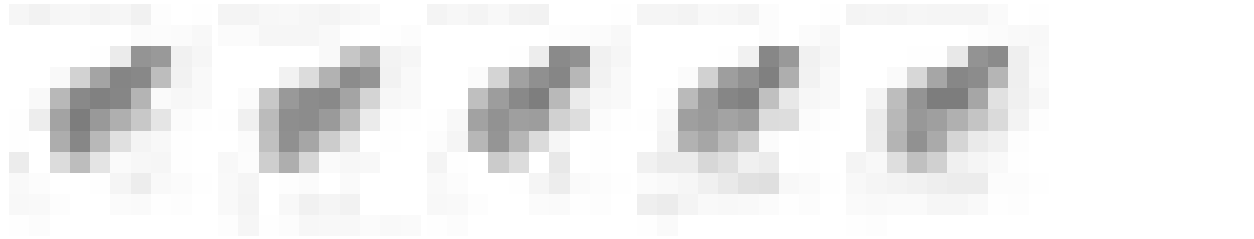
*Callirhoe alcaeoides* (Michaux) A. Gray, Pale Poppy-mallow. Calcareous prairies, glades, and other open habitats. E. NE south through e. and OK to c. TX; disjunct and scattered eastward in IA, MO, AR, nw. LA, IL, s. IN, c. KY, c. TN, and c. AL (Dorr 1990). [= C, F, G, K, Z; = *Callirhoë alcaeoides* – S, orthographic variant]

\* *Callirhoe involucrata* (Torrey & A. Gray) A. Gray var. *involucrata*, Purple Poppy-mallow. Disturbed areas; adventive from its native range in the midwestern United States. [= C, G, K, Z; < *C. involucrata* var. *involucrata* – F]

*Callirhoe papaver* (Cavanilles) A. Gray, Woods Poppy-mallow. Longleaf pine woodlands, dry hammocks, forest openings. N. peninsular FL, Panhandle FL, and sw. GA (Carter, Baker, & Morris 2009) west to e. TX and s. AR (Dorr 1990). [= F, G, K, WH, Z; = *Callirhoë papaver* – S, orthographic variant]

\* *Callirhoe pedata* (Nuttall ex Hooker) A. Gray, Palmleaf Poppy-mallow. Occasionally mowed roadside and adjacent powerline right-of-way, with other species of calcareous prairie habitats, one occurrence recorded to date; plausibly native, but perhaps only adventive from a native range in prairies and glades of the sc. United States (w. AR and e. OK, south to c. TX). Previously misidentified as *C. digitata* Nuttall. [= K, Z]

*Callirhoe triangulata* (Leavenworth) A. Gray, Sand Poppy-mallow, Clustered Poppy-mallow. Sandhills, sandy scrub, and other dry, open habitats. Sc. NC south to GA and west to ec. MA (upper Coastal Plain and lower Piedmont); also sw. WI and ne. IA south to s. IN, s. IL, and se. MO. [= C, F, G, K, Z; = *Callirhoë triangulata* – S, orthographic variant]



#### 252. THYMELAEACEAE A.L de Jussieu 1789 (Mezereum Family) [in MALVALES]

A family of about 45-53 genera and 500-800 species, mostly trees and shrubs, of cosmopolitan distribution, but especially diverse in Africa (Van der Bank, Fay, & Chase 2002). *Dirca*, *Edgeworthia*, and *Thymelaea* are all in subfamily Thymelaeoideae (Van der Bank, Fay, & Chase 2002). References: Van der Bank, Fay, & Chase (2002); Herber in Kubitzki & Bayer (2003).

- 1 Annual herb, annual; leaf blades < 2 cm long; fruits capsular, indehiscent..... *Thymelaea*
- 1 Perennial shrub; leaf blades > 2 cm long; fruits drupaceous or berrylike.

- 2 Stems jointed; leaves scattered; stamens exserted .....*Dirca*
- 2 Stems not jointed; leaves clustered toward apex of stems; stamens included .....*Edgeworthia*

***Dirca* Linnaeus 1753 (Leatherwood, Leatherbark)**

A genus of 4 species, shrubs, of North America (including Mexico). Our species is most closely related to *D. mexicana* G.L. Nesom & Mayfield (of the Sierra Madre Oriental, Tamaulipas, Mexico) and *D. decipiens* Floden (of e. MS, nw. AR, and sw. MO); the other species is *D. occidentalis* A. Gray of California (Schrader & Graves 2004; Floden, Mayfield, & Ferguson 2009). References: Nevling (1962)=Z; Floden, Mayfield, & Ferguson (2009)=Y.

***Dirca palustris* Linnaeus, Leatherwood, Leatherbark, Wicopee, Rope-bark.** Very rich forests, on slopes or bottomlands, limited to calcareous or mafic rocks such as limestone, calcareous siltstone, calcareous shale, gabbro, or amphibolite, in marl ravine bottoms in the Coastal Plain of VA, in Ashe County NC ascending to 1500 meters elevation. March-April; June-July. Widespread in e. North America, from NS and s. QC, south to Panhandle FL, AL, and OK. The curiously flexible twigs and swollen nodes are distinctive. The common names refer to the extraordinary toughness of the tan-brown bark, which was used by native Americans for cordage. [= RAB, C, F, G, K, Pa, S, W, WH, WV, Y, Z]

***Edgeworthia* Meisner 1841 (Paperbush)**

A genus of 3 species, shrubs, of e. Asia. References:

- \* *Edgeworthia papyrifera* Siebold & Zuccarini, Paperbush. Reported for Rabun County, GA by Jones & Coile (1988). [= K; = *E. chrysantha* Lindley]

***Thymelaea* P. Miller 1754 (Mezereon)**

A genus of ca. 30 species, mainly of Mediterranean Europe. References: Nevling & Barringer in FNA (in prep.).

- \* *Thymelaea passerina* (Linnaeus) Lange, Mezereon. Disturbed areas; native of Europe. AL and MS. [= K]



**255. CISTACEAE A.L. de Jussieu 1789 (Rockrose Family) [in MALVALES]**

A family of about 8 genera and 180 species, shrubs and herbs, of warm temperate and subtropical areas, centered in Mediterranean Europe. References: Arrington & Kubitzki in Kubitzki & Bayer (2003).

- 1 Shrub, usually much branched from the lower stem; flowers solitary, terminal on the branches; leaves 1-3 mm long and scalelike, or 3-7 mm long and acicular; capsule cylindric, > 2× as long as wide .....*Hudsonia*
- 1 Suffrutescent herb, usually little branched from the lower stem (often much branched above, and in *Lechea* with specialized short basal shoots at ground level); flowers axillary or terminal in branching inflorescences; leaves 4-50 mm long, mostly linear, lanceolate, oblong, or elliptic; capsule globose, subglobose, ellipsoid, ovoid, or obovoid, < 2× as long as wide.
- 2 Flowers of 2 types, the chasmogamous with 5 showy yellow petals, the cleistogamous lacking petals; pubescence of the stem stellate; leaves 10-50 mm long, alternate; plants with shoots of one type only, not producing short basal shoots; capsules 1.3-12.5 mm long, the larger capsules of chasmogamous flowers at least 2.0 mm long.....*Crocanthemum*
- 2 Flowers of 1 type, with 3 inconspicuous, dark red petals; pubescence of the stem simple; leaves 4-15 mm long (to 30 mm long in *L. pulchella* and *L. mucronata*), linear to linear-elliptic, 0.5-4 mm wide (to 13 mm wide in *L. mucronata*), alternate, opposite, or whorled; plants with shoots of two types, the short, prostrate to ascending basal shoots produced late in the season and overwintering; capsules 0.9-1.7 mm long .....*Lechea*

***Crocanthemum* Spach 1836 (Frostweed, Rockrose)**

A genus of about 24 species, of eastern North America, California, Mexico, and s. South America. The eastern North American species previously attributed to *Helianthemum* are in a clade distinct from the Old World *Helianthemum*, and should be recognized as *Crocanthemum*. References: Sorrie in FNA (in prep.); Daoud & Wilbur (1965)=Z; Wilbur & Daoud (1964)=Y; Arrington & Kubitzki in Kubitzki & Bayer (2003).

**Identification notes:** The identification of most of our species of *Crocantemum* requires an understanding of the 2 types of flowers produced. Chasmogamous flowers have showy yellow petals and larger sepals, the distinct portion of the 2 linear outer sepals usually linear, (0.7-) 1.3-5.5 mm long, the distinct portion of the 3 broader inner sepals 2.5-12 (-14) mm long. Cleistogamous flowers lack petals and have smaller sepals, the distinct portion of the 2 linear outer sepals 0.2-3 mm long, the distinct portion of the 3 broader inner sepals 1.5-4.8 mm long. In some species (*C. canadense*, *C. bicknellii*, *C. propinquum*) the chasmogamous flowers open earlier (April-July) than the cleistogamous (June-September). In others (*C. corymbosum*, *C. georgianum*, *C. nashii*, *C. rosmarinifolium*), the two types of flowers open at the same time (March-June) or cleistogamous flowers are nearly always absent (*C. carolinianum*). Capsules from chasmogamous flowers are larger and contain more seeds than those from cleistogamous flowers.

- 1 Leaves 1-4 (-7) mm wide, (5-) 7-15× as long as wide; capsules from chasmogamous flowers 2-3 mm long, with 1-3 (-6) seeds; capsules from cleistogamous flowers 1.3-1.7 mm long, with 1 (-2) seeds ..... *C. rosmarinifolium*
- 1 Leaves 2-20 mm wide, 2-6 (-8)× as long as wide; capsules from chasmogamous flowers (2.4-) 3-9 (-10.5) mm long, with 6-92 (-135) seeds; capsules from cleistogamous flowers 1.5-4.2 mm long, with 1-20 seeds.
  - 2 Leaves basally disposed, the largest and most prominent leaves in a basal rosette; stem leaves 2-5 below those subtending flowers or fruits; stem with spreading trichomes to 2.5 mm long; lower surface of leaves sparsely pubescent, the surface readily visible; cleistogamous flowers usually never produced; capsules 6-9 (-10.5) mm long, with 80-92 (-135) papillate seeds.....*C. carolinianum*
  - 2 Leaves predominantly cauline (in some species a rosette of closely spaced smaller and caducous leaves present at the ground's surface); stem leaves 5-20 below those subtending flowers or fruits; stem glabrate to densely puberulent (the pubescence not long and spreading); lower surface of leaves densely pubescent, hiding the surface; cleistogamous flowers regularly produced, either intermixed with the chasmogamous or in separate inflorescences; capsules 1.3-7 (-8.5) mm long, with 1-46 papillate, reticulate, or smooth seeds (pebbled to somewhat papillate in *H. nashii*).
- 3 Ovary and capsule densely stellate pubescent
  - 4 Inflorescence a terminal umbellate cluster; fruit 2-valved ..... *C. arenicola*
  - 4 Inflorescence a thyrse, the flowers borne in clusters the axils of leaves; fruit 3-valved.....*C. nashii*
- 3 Ovary and capsule glabrous.
  - 5 Chasmogamous flowers usually solitary, terminal or subterminal, later overtopped by lateral branches; seeds papillate, 35-46 per chasmogamous capsule, 5-9 (-12) per cleistogamous capsule; chasmogamous capsules (4-) 6-7 (-8.5) mm long, cleistogamous capsules (2-) 2.3-3.0 (-3.8) mm long; upper surface of cauline leaves with some long simple trichomes mixed with the shorter stellate trichomes .....*C. canadense*
  - 5 Chasmogamous flowers usually (1-) 2-18, rarely overtopped by lateral branches (often 1-3 in cymes in *H. georgianum*); seeds smooth or reticulate, 12-35 per chasmogamous capsule, 1-20 per cleistogamous capsule; chasmogamous capsules (2.4-) 3.5-5.7 mm long, cleistogamous capsules 1.5-4.2 mm long; upper surface of cauline leaves with the shorter stellate trichomes only.
  - 6 Chasmogamous and cleistogamous flowers borne together, the two types of flowers open at the same time (March-June); seeds smooth, 15-35 per chasmogamous capsule, 4-20 per cleistogamous capsule; outer sepals of the cleistogamous flowers 1.4-3.0 mm long; inner sepals of the cleistogamous flowers 2.0-4.8 mm long; [of the outer Coastal Plain (primarily barrier islands) of NC and SC].
    - 7 Flowers borne in dense many-flowered flat-topped cymes terminating the stem and sometimes also the main branches; capsules of the cleistogamous flowers 1.6-3.8 mm long, with 4-8 (-10) seeds; pedicels and calyx with 0.5-1.5 mm long simple trichomes mixed with the shorter stellate trichomes; outer sepals of both chasmogamous and cleistogamous flowers with an expanded, obtuse, spatulate tip, 0.3-1.2 mm wide.....*C. corymbosum*
    - 7 Flowers borne in loose 1-7-flowered cymes or racemes at the ends of the main branches; capsules of the cleistogamous flowers 3.0-4.2 mm long, with 12-20 seeds; pedicels and calyx with short stellate pubescence only; outer sepals of both chasmogamous and cleistogamous flowers linear, 0.2-0.5 mm wide .....*C. georgianum*
  - 6 Chasmogamous and cleistogamous flowers borne in separate inflorescences, the chasmogamous flowers opening earlier (April-July) than the cleistogamous flowers (June-September); seeds reticulate, 12-26 per chasmogamous capsule, 1-2 (-3) per cleistogamous capsule; outer sepals of the cleistogamous flowers 0.2-1.2 (-1.8) mm long; inner sepals of the cleistogamous flowers 1.7-2.5 (-3.0) mm long; [of the Mountains and less commonly the Piedmont of NC and VA, and very rarely the Coastal Plain of VA].
    - 8 Stems mostly 20-50 cm tall, clustered, arising from an upright caudex; distinct portion of the outer sepals of the cleistogamous flowers linear, (0.3-) 0.6-1.2 (-1.8) mm long, about 3-5× as long as wide; distinct portion of calyx of the chasmogamous flowers (2.4-) 3.5-4.5 (-8) mm long; cleistogamous capsules sharply 3-angled in cross-section; leaf with broadly cuneate base... .....*C. bicknellii*
    - 8 Stems mostly 10-30 cm tall, scattered, arising from horizontal elongate rootstocks; distinct portion of the outer sepals of the cleistogamous flowers rudimentary, knob-like, 0.2-0.5 mm long, 1-2× as long as wide; distinct portion of calyx of the chasmogamous flowers (0.7-) 1.5-3.0 (-4.0) mm long; cleistogamous capsules somewhat rounded in cross-section; leaf with narrowly cuneate to attenuate base .....*C. propinquum*

*Crocantemum arenicola* (Chapman) Barnhart, Gulf Coast Frostweed. Sandhills, dunes, scrub. Panhandle FL west to s. MS. [= FNA, S; = *Helianthemum arenicola* Chapman – K, WH, Y, Z]

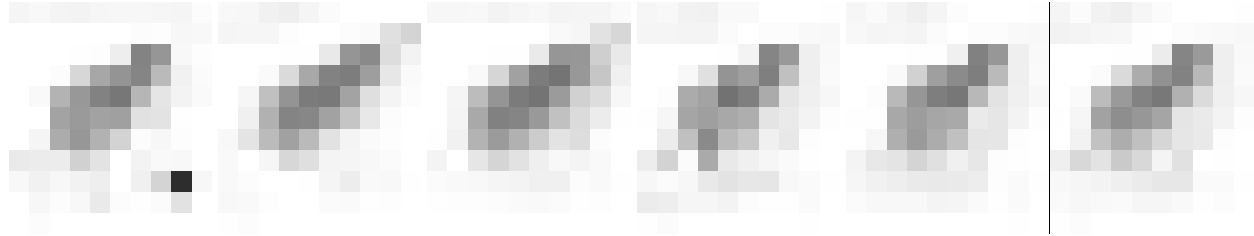
*Crocantemum bicknellii* (Fernald) Barnhart, Hoary Frostweed, Plains Frostweed, Plains Sunrose, Bicknell's Hoary Rockrose. Woodlands, glades, barrens, rock outcrops, and grassy balds, to at least 1500m in elevation. June-July (chasm.), July-September (cleist.); August-October. ME and s. ON west to MN and s. MB, south to ne. GA, e. TN, AR, KS, and CO. [= FNA, S; = *Helianthemum bicknellii* Fernald – RAB, C, F, G, K, Pa, W, Y, Z]

*Crocantemum canadense* (Linnaeus) Britton, Canada Frostweed, Canada Sunrose. Fields, woodlands, forest edges, roadsides, disturbed areas. April-May (chasm.), May-August (cleist.); June-October. NS and ME west to MI and MN, south to e. GA, e. AL, e. TN, KY, and MO. [= FNA, S; = *Helianthemum canadense* (Linnaeus) Michaux – RAB, C, F, G, K, Pa, W, WV, Y, Z; > *Helianthemum canadense* var. *canadense* – F; > *Helianthemum canadense* var. *sabulonum* Fernald – F]

*Crocantemum carolinianum* (Walter) Spach, Carolina Sunrose. Fields, savannas, dry pine flatwoods. April-May; July-August. E. NC south to s. FL, west to AR and e. TX. [= FNA, S; = *Helianthemum carolinianum* (Walter) Michaux – RAB, K, WH, Y, Z]

***Crocanthemum corymbosum*** (Michaux) Britton, Pinebarren Sunrose. Openings in maritime forests, dry hammocks. April-May; July-October. E. NC south to s. FL, east to s. MS. [= FNA, S; = *Helianthemum corymbosum* Michaux – RAB, K, WH, Y, Z]

***Crocanthemum georgianum*** (Chapman) Barnhart, Georgia Sunrose, Georgia Frostweed. Openings in maritime forests, sandy disturbed areas. April-May; May-October. E. NC south to n. FL, west to c. TX and AR. [= FNA, S; = *Helianthemum georgianum* Chapman – RAB, K, WH, Y, Z]



***Crocanthemum nashii*** (Britton) Barnhart, Florida Scrub Sunrose, Nash's Sunrose. Xeric sandhills. Endemic to peninsular FL; disjunct in se. NC (New Hanover County). May-June; July-September. [= FNA, S; = *Helianthemum nashii* Britton – K, WH, Y, Z]

***Crocanthemum propinquum*** (Bicknell) Bicknell, Low Frostweed, Creeping Sunrose. Woodlands, rock outcrops, sandy barrens and fields. June-July (chasm.), July-September (cleist.); August-October. Se. MA and se. NH south to w. NC and e. and c. TN. [= FNA; = *Helianthemum propinquum* Bicknell – RAB, C, F, G, K, Pa, W, Y, Z]

***Crocanthemum rosmarinifolium*** (Pursh) Barnhart, Rosemary Sunrose. Sandy roadsides, fields. May-June; July-October. S. NC south to Panhandle FL, west to c. TX; also disjunct in the West Indies. [= FNA, S; = *Helianthemum rosmarinifolium* Pursh – RAB, K, WH, Y, Z]

#### ***Hudsonia*** Linnaeus 1767 (Sand-heather, Golden-heather, Beach-heather)

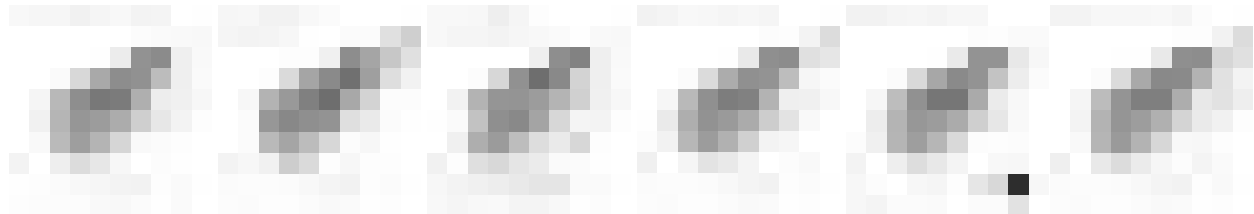
A genus of 3 species, dwarf shrubs, of ne. North America. Molecular systematics suggests that *H. tomentosa* may warrant generic status separate from *H. ericoides* and *H. montana*. References: Morse (1979)=Z; Skog & Nickerson (1972)=Y; Arrington & Kubitzki in Kubitzki & Bayer (2003). Key based in part 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]..... | <b><i>H. tomentosa</i></b> |
| 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 Coastal Plain of SC, MD, DE, and NJ].          |                            |
| 2 | Sepals obtuse to acute, lacking long-acuminate apices; stamens 10-20; leaves 3-4.5 (-6) mm long, sparsely villous; fruits cylindrical; [of the Coastal Plain of SC, MD, DE, and NJ].....   | <b><i>H. ericoides</i></b> |
| 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].....       | <b><i>H. montana</i></b>   |

***Hudsonia ericoides*** Linnaeus, Northern Golden-heather. Sandy flats in longleaf pine sandhills (SC) or Coastal Plain pitch pine barrens (DE). May; August. NL (Newfoundland) south to ME, NH, MD (Sipple 2002), and DE; disjunct in nc. SC. The disjunct occurrence in SC has every appearance of being native; it is discussed by Bozeman & Logue (1968). [= RAB, C, F, G, K, S, Z; = *H. ericoides* Linnaeus ssp. *ericoides* – Y]

***Hudsonia montana*** Nuttall, Mountain Golden-heather. 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 farther south in McDowell County, NC. 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. Dunes, sand flats, blowouts (in DE, NC, VA), high elevation quartzitic sandstone outcrops (in WV). May-July; August-September. NL (Labrador) west to MB and NT, south to WV (Panther Knob), WI, and MN, and south along the Atlantic Coast from ME to VA and ne. NC (where it reaches its southern limit in Dare County). [= RAB, C, F, G, S, WV, Z; > *H. tomentosa* var. *tomentosa* – K; = *H. ericoides* Linnaeus ssp. *tomentosa* (Nuttall) Nickerson & J. Skog – Y]



*Lechea* Linnaeus 1753 (Pinweed)  
(contributed by Bruce A. Sorrie)

A genus of about 18 species, herbs, of North America, the West Indies, and Central America. References: Hodgdon (1938)=Z; Wilbur & Daoud (1961)=Y; Sorrie & Weakley (2007b, c); Arrington & Kubitzki in Kubitzki & Bayer (2003).

**Identification notes:** *Lechea* is recognizable by its production of numerous basal shoots (usually prostrate) in the late summer and fall. These are evergreen and overwinter, and the fertile stems (usually erect or ascending) are produced from renewed growth of the basal shoots in the spring and summer.

- 1 Pubescence of the stems strongly spreading, not at all appressed; inner sepals carinate (U- or V-shaped in cross-section); plant tall, often > 5 dm tall..... *L. mucronata*
- 1 Pubescence of the stems more or less appressed, usually strongly so; inner sepals shallowly curved in cross section, not carinate; plants variable in height.
  - 2 Outer (slender) sepals equaling or exceeding the inner (broad) sepals.
    - 3 Base of the fruiting calyx clearly differentiated into a hardened, shiny, yellowish, obconic base 0.4-0.6 mm long, contrasting in color and texture with the rest of the calyx; pedicels averaging > 2 mm long..... *L. racemulosa*
    - 3 Base of the fruiting calyx not conspicuously differentiated in texture and color; pedicels averaging < 1.5 (-2) mm long.
      - 4 Capsule completely enclosed by the sepals, subglobose; leaves averaging > 10× as long as wide; plant short and usually densely bushy, < 3 dm tall..... *L. tenuifolia*
      - 4 Capsule exerted, usually conspicuously so, the sepals not enclosing the summit of the fruit, ellipsoid to ovate; leaves < 8× (usually < 6×) as long as wide; plant usually taller, 1-7 dm tall.
        - 5 Outer sepals distinctly longer than the inner sepals, usually also longer than the capsule; stem leaves usually whorled, 2 mm wide; plant erect, with short, ascending branches ..... *L. minor*
        - 5 Outer sepals shorter than to barely longer than the inner sepals, shorter than the capsule; stem leaves alternate, rarely wider than 1.5 mm wide; plant ascending (sometimes erect or spreading, branches spreading)..... *L. sessiliflora*
    - 2 Outer (slender) sepals shorter than the inner (broad) sepals.
      - 6 Capsules ellipsoid to narrowly pyriform, normally about 2× as long as wide (or even longer in *L. racemulosa*).
        - 7 Stigmas not persistent; pedicels averaging about 2 mm long; base of the fruiting calyx clearly differentiated into a hardened, shiny, yellowish, obconic base 0.4-0.6 mm long, contrasting in color and texture with the rest of the calyx..... *L. racemulosa*
        - 7 Stigmas persistent, reddish-brown, conspicuous on the summit of the capsule; base of the fruiting calyx not conspicuously differentiated in texture and color..... *L. sessiliflora*
      - 6 Capsules of a broader shape, ovoid, broadly ellipsoid, or subglobose, normally < 1.5× as long as wide.
        - 8 Capsules obviously longer than the sepals.
          - 9 Seeds 3 (-4), relatively narrow and 3-sided, like the sections of an orange; fruiting stems 2.5-5.5 dm tall; panicle ovoid to subcylindric, the principal branches subequal and relatively short; capsules clustered at branch tips, or in a dense row ..... *L. pulchella* var. *pulchella*
          - 9 Seeds 2 (-3), broad and compressed, or obscurely 3-sided; fruiting stems 3.5-8.5 dm tall; panicle subcylindric to subglobose, the principal branches diminishing upward, relatively long; capsules in a sparse row (rarely more dense) ..... *L. pulchella* var. *ramosissima*
    - 8 Capsules almost completely enveloped by the sepals.
      - 10 Leaves sparsely pubescent on the midrib and margin only beneath; branches and stems sparsely subappressed-pilose; seeds 4-6..... *L. intermedia* var. *intermedia*
      - 10 Leaves appressed pubescent on the surface beneath; branches and stems moderately to densely gray-canescenscent; seeds 2-3.
        - 11 Leaves 1.5-3.0 (-4.0) mm wide; seeds 2-4 (-5); [of coastal dunes, from ne. NC northward].
          - 12 Seeds 3-4 (-5), obscurely 3-sided and more-or-less resembling sections of an orange, or 2-sided and convex ventrally; main stems 1.0-2.5 mm diameter, strongly ascending-erect to subprocumbent; sepals strongly tinged maroon, occasionally dull brown; [s. ME and c. NH south to DE] ..... *L. maritima* var. *maritima*
          - 12 Seeds 2 (-3), 2-sided and flattish, concave ventrally; main stems 2.0-4.0 mm diameter, procumbent to ascending; sepals dull brown, occasionally tinged maroon; [se. DE south to ne. NC] ..... *L. maritima* var. *virginica*
        - 11 Leaves 0.5-1.0 mm wide; seeds **either 3 or 4-6**; [of sandhills and flatwoods, of se. NC southward].
          - 13 Seeds 3; fruiting stems 2-4 dm tall; panicles densely congested; mature calyx lobes strongly rusty-colored; [of se. NC south to s. FL and west to s. MS]..... *L. torreyi* var. *congesta*
          - 13 Seeds 4-6; fruiting stems 3-5 dm tall; panicles open and loose; mature calyx dark brown; [of ne. FL and Panhandle FL south to s. FL]..... *L. torreyi* var. *torreyi*

*Lechea deckertii* Small, Deckert's Pinweed. Xeric sands of scrub. Sc. GA (Jones & Coile 1988) south to s. FL and e. Panhandle FL. [= K, S, WH, Y, Z] {not yet keyed}

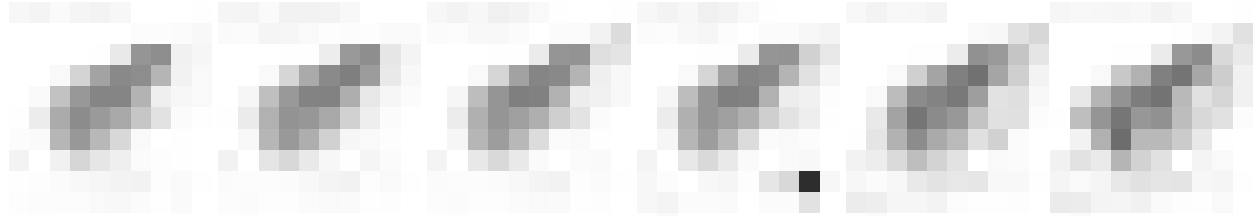
*Lechea intermedia* Leggett ex Britton var. *intermedia*, Pinweed. Dry areas. July-August; August-October. *L. intermedia* ranges from NB west to ON, MN, and SK, south to VA, n. OH, n. IL, and nw. NE. Only var. *intermedia* ranges south of New England; 3 other varieties occur in New England and Canada. [= F, K; < *L. intermedia* - C, G, Pa, W; = *L. intermedia* var. *typica* - Z]

*Lechea maritima* Leggett ex Britton, Sterns, & Poggenburg var. *maritima*. Coastal dunes. S. ME and c. NH south to DE, and disjunct in n. NB (reports of this species south to GA are apparently based on misidentifications). [= C, F, G, K, Z]

*Lechea maritima* Leggett ex Britton, Sterns, & Poggenburg var. *virginica* Hodgdon. Sandy dunes, flats, and blowouts, often associated with *Hudsonia tomentosa*. June-August; August-September. var. *virginica* is endemic from se. DE, e. MD, e. VA, and ne. NC. [= C, F, G, K, Z; < *L. maritima* - S]

*Lechea minor* Linnaeus, Thymeleaf Pinweed. Savannas, sandhills, pine-oak woodlands, sandy disturbed places. July-August; August-October. MA and VT west to s. ON and n. IN, south to c. peninsular FL and LA (primarily Coastal Plain and around the Great Lakes). [= RAB, C, F, G, K, Pa, S, W, WH, Y, Z; ? *L. thymifolia* Michaux]

*Lechea mucronata* Rafinesque. Open dry habitats, sandhills, dunes, dry hammocks, woodlands. June-August; July-October. NH west to MI and OK, south to c. peninsular FL, TX, and n. Mexico. [= C, K, W, WH; = *L. villosa* Elliott – RAB, F, G, Pa, S, Y; > *L. villosa* var. *typica* – Z]



*Lechea pulchella* Rafinesque var. *moniliformis* (Bicknell) Seymour. Dry sandy soils. Coastal Plain from Nantucket Island, MA south to s. NJ, and disjunct along the Great Lakes (a common phylogeographic pattern, lending credence to the validity of the variety). [= K; < *L. leggettii* Britton & Hollick – C; = *L. leggettii* var. *moniliformis* (Bicknell) Hodgdon – F, G, Y, Z] {not yet keyed}

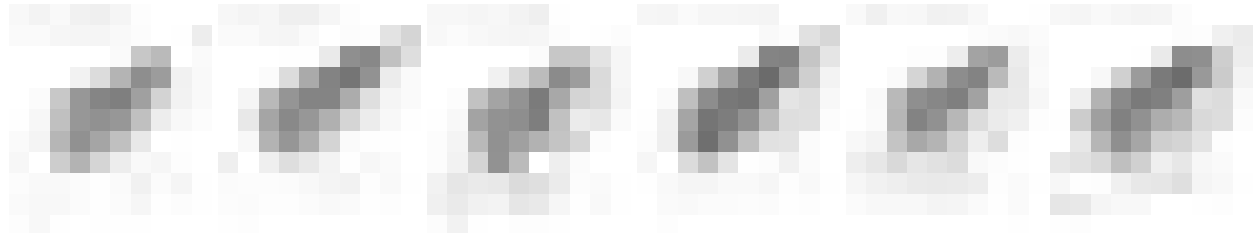
*Lechea pulchella* Rafinesque var. *pulchella*. Dry woodlands, disturbed places. June-August; August-October. Var. *pulchella* ranges from e. MA west to ne. OH, south to c. VA. [< *L. leggettii* Britton & Hollick – RAB, C; = *L. leggettii* var. *leggettii* – F, G, Y; < *L. pulchella* var. *pulchella* – K; < *L. pulchella* – Pa, W; = *L. leggettii* var. *typica* – Z]

*Lechea pulchella* Rafinesque var. *ramosissima* (Hodgdon) Sorrie & Weakley. Pine-oak woodlands, savannas, flatwoods, sandhills, openings in maritime forests, sometimes in wet, almost peaty soils. June-August; August-October. Se. VA south to n. FL and west to e. LA; disjunct in sc. TN (Coffee County). [< *L. leggettii* Britton & Hollick – RAB, C, G, S; = *L. leggettii* Britton & Hollick var. *ramosissima* Hodgdon – F, G, Y, Z; < *L. pulchella* var. *pulchella* – K; < *L. pulchella* – WH]

*Lechea racemulosa* Michaux. Dry pine woodlands, other woodlands, forest edges, old fields. June-August; 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, Pa, S, W, WV, Y, Z]

*Lechea sessiliflora* Rafinesque. Sandhills and dry flatwoods. July-August; August-October. A Southeastern Coastal Plain endemic: s. NC south to s. FL and west to s. MS. [= K, WH; = *L. patula* Leggett – RAB, Y, Z; > *L. patula* – S]

*Lechea tenuifolia* Michaux. Dry oak-pine forests and openings. June-August; August-October. S. ME south to SC (mostly inner Coastal Plain and Piedmont), and from s. IN n. IL, s. MN, and NE south to e. LA and c. TX. [= RAB, K, S, W, WV, Y; > *L. tenuifolia* var. *tenuifolia* – C, F, G; > *L. tenuifolia* var. *typica* – Z]



*Lechea torreyi* Leggett ex Britton var. *congesta* Hodgdon. Sandhills and pine flatwoods. June-July; August-October. As interpreted by Hodgdon, *L. torreyi* consists of 2 varieties, the more widespread var. *congesta* ranging from se. NC south to s. FL and west to s. MS (disjunct in Belize), and the more restricted var. *torreyi* restricted to FL. Wilbur & Daoud (1961) express doubt about the validity of the 2 varieties, but present little evidence for or against their recognition. Var. *congesta* may indeed prove to be no more than a form. [= Z; < *L. torreyi* – RAB, K, S, WH, Y]

*Lechea torreyi* Leggett ex Britton var. *torreyi*. Sandhills and pine flatwoods. June-July; August-October. Ne. FL and Panhandle FL south to s. peninsular FL. [= Z; < *L. torreyi* – K, S, WH, Y]



## 258. TROPAEOLACEAE A.L. de Jussieu ex A.P. de Candolle 1824 (Nasturtium Family) [in BRASSICALES]

A family of 1-3 genera and about 90 species, herbs, of Central and South America. References: Tucker in FNA (2010); Sparre & Andersson (1991)=Z; Bayer & Appel in Kubitzki & Bayer (2003).

*Tropaeolum* Linnaeus 1753 (Nasturtium)

A genus of about 85-90 species, herbs, of tropical Central America and South America (s. Mexico to Peru). References: Tucker in FNA (2010); Sparre & Andersson (1991)=Z.

\* *Tropaeolum majus* Linnaeus, Nasturtium. Disturbed areas, cultivated and rarely persistent or present around refuse areas; native of tropical America. Weakly persistent in widely scattered areas, as in se. PA (Rhoads & Klein 1993). *T. majus* is considered by Sparre & Andersson (1991) to be a taxon of hybrid origin, not known from wild populations. It is probably not truly established in our area. [= FNA, K, Z] {not keyed}



**261. LIMNANTHACEAE** R. Brown 1838 (False-mermaid Family, Meadow-foam Family) [in BRASSICALES]

A family of 2 genera and 8 species, herbs, of temperate North America. References: Tucker in FNA (2010); Bayer & Appel in Kubitzki & Bayer (2003).

*Floerkea* Willdenow 1801 (False-mermaid)

A peculiar and monotypic genus, an annual herb, endemic to North America. References: Tucker in FNA (2010).

*Floerkea proserpinacoides* Willdenow, False-mermaid. Moist, rich floodplain forests. April-June. NS and QC west to BC, south to n. VA, TN, and CA. [= C, F, FNA, G, K, Pa, S, W, WV]

**264. BATACEAE** von Martius ex Meisner 1842 (Batis Family) [in BRASSICALES]

A monogeneric family, of 2 species, low shrubs, of tropical and subtropical shores of the Americas, New Guinea, the Pacific, and Australia. References: Thorne in FNA (2010); Rogers (1982b); Bayer & Appel in Kubitzki & Bayer (2003).

*Batis* P. Browne 1756 (Saltwort, Beachwort, Batis)

A genus of 2 species, low shrubs, of tropical and subtropical shores of the Americas, New Guinea, the Pacific, and Australia. The only other member of the family and genus is *B. argillicola*, of New Guinea and Australia. References: Thorne in FNA (2010); Rogers (1982b)=Z; Goldblatt (1976); Bayer & Appel in Kubitzki & Bayer (2003).

*Batis maritima* Linnaeus, Saltwort, Beachwort, Batis, Turtleweed, Vidrillos. Brackish marshes. June-July; October. Se. SC south to s. FL, west to TX, and in Central and South America; West Indies; HI (where apparently introduced). *B. maritima* is alleged (as by FNA and S) to occur as far north as NC, but the documentation is unknown; there is no twentieth century evidence to place *Batis* in NC. [= RAB, FNA, GW, K, S, WH, Z]

**270. RESEDACEAE** A.P. de Candolle ex Gray 1821 (Mignonette Family) [in BRASSICALES]

A family of about 6 genera and 75-85 species, herbs and shrubs, of the northern hemisphere. References: Martín-Bravo, Tucker, & Daniel in FNA (2010); Kubitzki in Kubitzki & Bayer (2003).

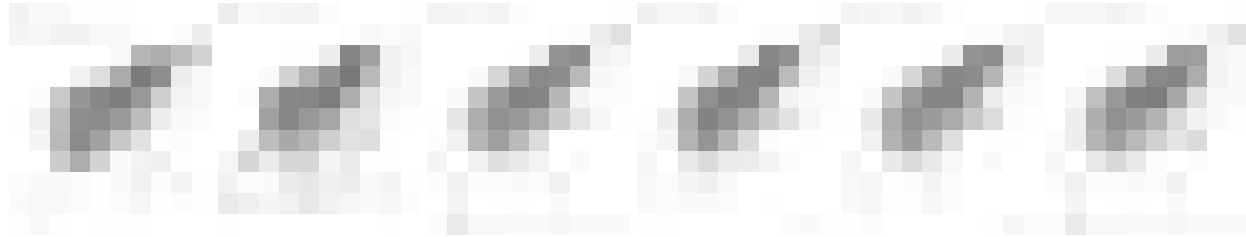
*Reseda* Linnaeus 1754 (Mignonette)

A genus of about 55-60 species, herbs, of Europe, Mediterranean region, and c. Asia. References: Martín-Bravo, Tucker, & Daniel in FNA (2010).

- 1 Upper and middle leaves deeply pinnately lobed.
  - 2 Carpels 4; petals white; seeds tuberculate .....*R. alba*
  - 2 Carpels 3; petals yellowish; seeds smooth.....*R. lutea*
- 1 Upper and middle leaves entire or finely toothed (sometimes with 1-2 lateral lobes).
  - 3 Sepals and petals 4; seeds smooth; fruits < 7 mm long, crowded, erect to ascending.....*R. luteola*



- 3 Sepals and petals 6; seeds rugose; fruits > 7 mm long, well-spaced, pendent.
- 4 Capsules 7-11 mm long; sepals (in fruit) < 5mm long ..... *R. odorata*
- 4 Capsules (well-developed) 11-15 mm long; sepals (in fruit > 5 mm long) ..... [*R. phyteuma*]
- \* *Reseda alba* Linnaeus, White Mignonette. Disturbed areas, native of the Mediterranean region. June-July. Naturalized in ne. North America, south to DE and se. PA (Rhoads & Block 2007). [= C, F, FNA, G, K, Pa]
- \* *Reseda lutea* Linnaeus, Yellow Mignonette, Wild Mignonette. Disturbed areas; native of Europe. June-July. Naturalized south to DE, se. PA, and sc PA (Rhoads & Block 2007). [= C, F, FNA, G, K, Pa, WV]
- \* *Reseda luteola* Linnaeus, Weld, Dyer's Rocket, Yellow-weed. Disturbed areas, formerly cultivated as a dye plant; native of Eurasia. June-July. Reported from se. and sc. PA (Rhoads & Block 2007) and elsewhere mainly north of our area. [= C, F, FNA, G, K, Pa]
- \* *Reseda odorata* Linnaeus, Garden Mignonette. Gardens, garden borders, and disturbed areas, doubtfully established; native of Mediterranean Europe. June-July. Reported for scattered locations in eastern North America (Kartesz 1999). [= C, FNA, G, K, Pa]
- \* *Reseda phyteuma* Linnaeus, Corn Mignonette. Disturbed areas; native of Europe. Reported from se. PA (Rhoads & Klein 1993). [= K] {no definite report for our area; not mapped; rejected as a component of our flora}



272. *CLEOMACEAE* Horaninow 1834 (Cleome Family) [in BRASSICALES]

The Cleomaceae is here circumscribed to include the members of the Capparaceae, subfamily Cleomoideae, following phylogenetic analyses which show this group to be a monophyletic clade more closely related to Brassicaceae than to the rest of Capparidaceae (Hall, Sytsma, & Iltis 2002). References: Rucker & Vanderpool in FNA (2010); Hall, Sytsma, & Iltis (2002); Judd, Sanders, & Donoghue (1994); Sanders & Judd (2000). Key based on FNA.

- 1 Stamens (8-) 10-27; petals notched or irregularly lacerate at the apex; gynophore (stipe of the pistil, above the calyx) 2-6 mm long; leaflets (1-) 3 ..... *Polanisia*
- 1 Stamens 6 (except 14-25 in *Arivela*); petals obtuse or acute at the apex; gynophore (stipe of the pistil, above the calyx) 1-80 mm long; leaflets 5-7.
  - 2 Plants with nodal spines (and sometimes with prickles on petioles and leaf veins).
    - 3 Petals 5-10 mm long; gynophore 1-4 mm long; petioles and leaf blades unarmed ..... *Hemiscola*
    - 3 Petals 10-30 mm; gynophore 45-80 mm; petioles and sometimes leaf blades prickly ..... *Tarenaya*
  - 2 Plants lacking nodal spines and lacking prickles on petioles and leaf veins.
    - 4 Filaments fused to lower half of gynophore (evident from scars near the midpoint of the gynophore of fruiting specimens) ..... *Gynandropsis*
    - 4 Filaments free from gynophore
      - 5 Bracts subtending the pedicels minute ..... *Cleoserrata*
      - 5 Bracts subtending the pedicels with expanded blades, sometimes even trifoliolate.
        - 6 Style 0.2-0.8 mm long; gynophore 3-12 mm; stamens 6; sepals fused ¼-½ their length ..... *Cleome*
        - 6 Style 1-1.2 mm long; gynophore obsolete; stamens 14-25; sepals free ..... *Arivela*

*Arivela* Rafinesque 1838

A genus of about 10 species, annual herbs, of Asia and Africa. References: Tucker in FNA (2010).

- \* *Arivela viscosa* (Linnaeus) Rafinesque, Wild Caia, Yellow Cleome. Disturbed areas; native of Asia (now pantropical). Reported for sc. GA (Carter, Baker, & Morris 2009; Jones & Coile 1988), se. PA (Rhoads & Klein 1993), and recently from Beaufort County, SC (J. Nelson, pers.comm. 2006). Reported from chrome ore piles in Newport News (Reed 1959); presumably a waif. [= FNA; = *Cleome viscosa* Linnaeus – K1, K2] {synonymy incomplete}

*Cleome* Linnaeus 1753 (Cleome, Spiderflower)

A genus of about 20 species, annual herbs, of the Old World. References: Tucker in FNA (2010); Iltis (1960)=Z; Kers in Kubitzki & Bayer (2003). [also see *Arivela*, *Cleoserrata*, *Gynandropsis*, *Hemiscola*, and *Tarenaya*]

- 1 Fruits (12-)15-25 mm long; bracts unifoliolate; leaflets linear to elliptic ..... [*C. ornithopodioides*]

1 Fruits 40-70 mm long; bracts trifoliate; leaflets oblanceolate to rhomboid-elliptic.....*C. rutidosperma*

\* *Cleome ornithopodioides* Linnaeus, Bird Spiderflower. Reported for KY, MD, PA, OH. [= FNA, K2; > *C. iberica* de Candolle] {add to synonymy}

\* *Cleome rutidosperma* DC. Disturbed areas; native of tropical Asia and Africa. Reported for SC by FNA. [= FNA, K2, WH] {add to synonymy}

#### Cleoserrata H.H. Iltis 2007

A genus of 5 species, annual herbs, of tropical America. References: Tucker in FNA (2010).

1 Petals white, tinged with pink or red; bracts at most 1 mm long, subulate; gynophore 1-2 mm long.....[*C. serrata*]

1 Petals brilliant pink to purple, fading to pink or white (rarely initially white); bracts 3-18 mm long, ovate-cordate; gynophore 30-85 mm long.....*C. speciosa*

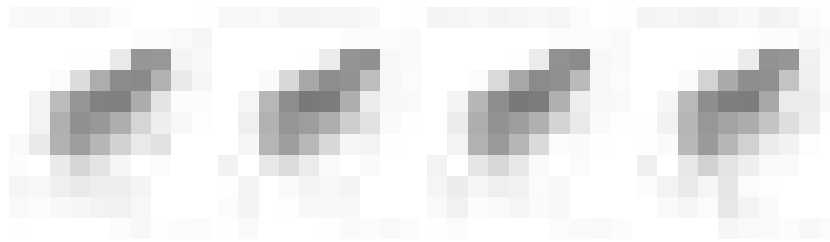
\* *Cleoserrata serrata* (Jacquin) H.H. Iltis. Disturbed areas; rare, native of tropical America. Reported as introduced in GA (Kartesz 1999). [= FNA; = *Cleome serrata* Jacquin – K; = *Neocleome serrata* (Jacquin) Small – S] {not mapped; synonymy incomplete}

\* *Cleoserrata speciosa* (Rafinesque) H.H. Iltis. Vacant lots, disturbed areas; native of Mexico. [= FNA; = *Cleome speciosa* Rafinesque – K, WH]

#### Gynandropsis de Candolle 1824

A genus of 2 species, annual or short-lived perennial herbs, pantropical. References: Tucker in FNA (2010).

\* *Gynandropsis gynandra* (Linnaeus) Briquet, Spiderwisp, Cat's-whiskers. Fields, disturbed areas; native of Africa. June-October. [= FNA; = *Cleome gynandra* Linnaeus – RAB, K1, K2, S, WH, Z]



#### Hemiscola Rafinesque 1838

A genus of 6 species, annuals, of tropical America. References: Tucker & Iltis in FNA (2010).

1 Leaflets ovate to rhomboidal; sepals lanceolate; anthers 0.9-1.0 mm long; silique 20-40 (-60) mm long.....*H. aculeata* var. *aculeata*

1 Leaflets obovate; sepals ovate; anthers 0.3-0.5 mm long; silique 15-20 mm long.....*H. diffusa*

\* *Hemiscola aculeata* (Linnaeus) Rafinesque var. *aculeata*, Prickly Spiderflower. Disturbed areas; native of tropical America. Reported for AL. [= FNA; < *Cleome aculeata* Linnaeus – K]

\* *Hemiscola diffusa* (Banks ex de Candolle) H.H. Iltis. On ballast (Mobile, AL); native of South America. [= FNA; = *Cleome diffusa* Banks ex de Candolle – K]

#### Polanisia Rafinesque 1819 (Clammy-weed)

A genus of about 6 species, of North America. References: Tucker in FNA (2010).

**Identification notes:** *Polanisia* has some resemblance to *Warea*.

1 Petals broadest toward the base, barely or not at all clawed; capsule valvate; [of xeric longleaf pine sandhills].....*P. tenuifolia*

1 Petals broadest toward the tip, narrowed to a long, distinct claw; capsule opening near the tip; [of floodplains and disturbed soils].

2 Larger petals 3.5-6.5 (-8) mm long; longest stamens 4-10 (-14) mm long.....*P. dodecandra* var. *dodecandra*

2 Larger petals (7-) 8-13 (-16) mm long; longest stamens (9-) 12-30 mm long.....*P. dodecandra* var. *trachysperma*

*Polanisia dodecandra* (Linnaeus) A.P. de Candolle var. *dodecandra*, Clammy-weed, Spider-weed. Sandy or gravelly floodplains along the James River in VA, also introduced on railroad ballast. June-September. VT west to MB, south to MD, w. VA, TN, AR, and OK. Apparently both native and introduced in our area. [= C; = *P. dodecandra* ssp. *dodecandra* – FNA, K, Pa; = *P. graveolens* Rafinesque – F, S, WV; = *P. dodecandra* – G; < *P. dodecandra* – W; = *Cleome graveolens* (Rafinesque) Sch. & Sch.]

\* *Polanisia dodecandra* (Linnaeus) A.P. de Candolle var. *trachysperma* (Torrey & A. Gray) Iltis. Disturbed areas; apparently adventive from w. North America. June-September. [= C; = *P. dodecandra* ssp. *trachysperma* (Torrey & A. Gray) Iltis – FNA, K, Pa; = *P. trachysperma* Torrey & A. Gray – F, G, S, WV]

*Polanisia tenuifolia* Torrey & A. Gray, Slenderleaf Clammy-weed, Pineland Catchfly. Sandhills. E. GA (several counties from the SC border) (Jones & Coile 1988) south to s. FL, west to s. MS. [= FNA, K, WH; = *Aldenella tenuifolia* (Torrey & A. Gray) Greene – S]



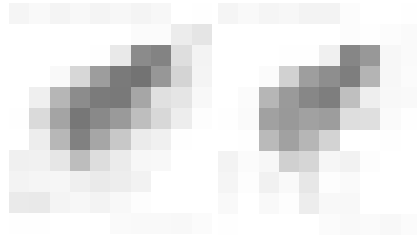
*Tarenaya* Rafinesque 1838

A genus of about 33 species, annual herbs, of South America. References: Tucker & Iltis in FNA (2010). Key based on FNA.

- 1 Sepals, ovary, and fruit glabrous; fruit about as long as gynophore; petals deep pink or purple (infrequently white).....*T. hassleriana*  
 1 Sepals, ovary, and fruit glandular-pubescent; fruit longer than gynophore; petals white or greenish-white.....*T. spinosa*

\* *Tarenaya hassleriana* (Chodat) H.H. Iltis, Cleome, Spiderflower, Pinkqueen. Gardens, disturbed areas, sandbars, riverbanks, persistent and self-seeding from cultivation as an ornamental; native of South America. June-November. The petals in bud are a pale pink to nearly white, they turn a deep pink upon opening late in the day; by morning the petals have once again faded to a pale pink or white. [= FNA; = *Cleome hassleriana* Chodat – C, K, WH; ? *C. houtteana* Schlechtendal – RAB, misapplied; < *C. spinosa* Jacquin – F, G, misapplied; = *C. hasslerana* – Pa, orthographic variant; < *Neocleome spinosa* (Jacquin) Small – S]

\* *Tarenaya spinosa* (Jacquin) Rafinesque. Disturbed areas; native of South America. [= FNA; < *Neocleome spinosa* (Jacquin) Small – S; = *Cleome spinosa* Jacquin – WH]



273. **BRASSICACEAE** Burnett 1835 or **CRUCIFERAE** A.L. de Jussieu 1789 (Mustard Family) [in BRASSICALES]

A family of about 340 genera and 3400 species, annuals, perennials, shrubs, and rarely trees and vines, of cosmopolitan distribution (but most diverse in the temperate Northern Hemisphere). References: Al-Shehbaz in FNA (2010); Rollins (1993); Al-Shehbaz (1984, 1985a, 1985b, 1986, 1987, 1988a, 1988b); Appel & Al-Shehbaz in Kubitzki & Bayer (2003).

Tribe a. Alysseae: *Alyssum*, *Berteroa*

Tribe b. Anthonieae: *Matthiola*

Tribe d. Arabideae: *Arabis*, *Draba*

Tribe e. Boechereae: *Boechera*

Tribe f. Brassiceae: *Brassica*, *Cakile*, *Coincya*, *Diplotaxis*, *Eruca*, *Erucastrum*, *Orychophragmus*, *Raphanus*, *Rapistrum*, *Sinapis*

Tribe g. Buniadeae: *Bunias*

Tribe h. Calepineae: *Calepina*

Tribe i. Camelinae: *Arabidopsis*, *Camelina*, *Capsella*, *Turritis*

Tribe j. Cardamineae: *Armoracia*, *Barbarea*, *Cardamine*, *Iodanthus*, *Leavenworthia*, *Nasturtium*, *Planodes*, *Rorippa*

Tribe k. Chorisporeae: *Chorisporea*

Tribe m. Conringeeae: *Conringia*

Tribe n. Descurainieae: *Descurainia*

Tribe o. Erysimeae: *Erysimum*

Tribe p. Euclidieae: *Braya*

Tribe s. Hesperideae: *Hesperis*

Tribe t. Iberideae: *Iberis*, *Teesdalia*

Tribe v. Isatideae: *Isatis*, *Myagrum*

Tribe w. Lepidieae: *Lepidium*

Tribe x. Lunariae: *Lunaria*

Tribe y. Malcolmieae: *Lobularia*

- Tribe z. Noccaeae: *Microthlaspi*  
 Tribe aa. Physarieae: *Paysonia*, *Physaria*  
 Tribe bb. Sisymbrieae: *Sisymbrium*  
 Tribe dd. Thelypodieae: *Warea*  
 Tribe ee. Thlaspidae: *Alliaria*, *Thlaspi*

**Warning to users: Some genera not yet included in key! *Braya*, *Bunias*, *Chorispora*, *Conringia*, *Diplotaxis*, *Eruca*, *Erucastrum*, *Iberis*, *Iodanthus*, *Leavenworthia*, *Lobularia*, *Matthiola*, *Paysonia*, *Physaria*, *Rapistrum*, *Sinapis*, *Warea***

- 1 Plants in flower  
 2 Trichomes of plant absent or, if present, unbranched ..... Key A  
 2 Trichomes of plant present with some or most or all branched ..... Key B  
 1 Plants in fruit.  
 3 Trichomes of plant absent or, if present, unbranched ..... Key C  
 3 Trichomes of plant present with some or most or all branched ..... Key D

**Key A – plants in flower, trichomes of plant absent or, if present, unbranched**

- 1 Flowers yellow.  
 2 Leaves auriculate, sagittate, or amplexicaul at base.  
 3 Upper stems glaucous.  
 4 Petals 6-30mm, clawed; [tribe *Brassicaceae*] ..... *Brassica*  
 4 Petals 2-4mm, not clawed; [tribe *Isatideae*] ..... *Isatis*  
 3 Upper stems green; [tribe *Cardamineae*].  
 5 Stems angular distally; blooming April to early June ..... *Barbarea*  
 5 Stems not angular distally; blooming April to October ..... *Rorippa*  
 2 Leaves not clasping at base.  
 6 Petals with contrasting dark veins; [tribe *Brassicaceae*] ..... *Raphanus*  
 6 Petals mostly uniform in color.  
 7 Ovaries and young fruits 2-segmented; petals 6-30 mm; [tribe *Brassicaceae*] ..... *Brassica*  
 7 Ovaries and young fruits unsegmented; petals 1-8 mm.  
 8 Stigmas distinctly 2-lobed; [tribe *Sisymbrieae*] ..... *Sisymbrium*  
 8 Stigmas entire, rarely indistinctly 2-lobed; [tribe *Cardamineae*] ..... *Rorippa*  
 1 Flowers white, pinkish, lavender, or blue.  
 9 Leaves strictly basal or basal and cauline and auriculate.  
 10 Plants with only basal leaves or cauline leaves much reduced.  
 11 Plants annual; flowers zygomorphic; petals 0.5-2.5 mm long; [tribe *Iberideae*] ..... *Teesdalia*  
 11 Plants annual or perennial; flowers actinomorphic; petals absent, rudimentary, or to 16 mm long; [tribe *Cardamineae*] ..... *Cardamine*  
 10 Plants with some well-developed cauline leaves.  
 12 Ovaries and young fruits ovate, orbicular or cordate.  
 13 Ovules 1 per ovary; [tribe *Calepineae*] ..... *Calepina*  
 13 Ovules >1 per ovary.  
 14 Ovules 2 (rarely 4) per ovary; [tribe *Lepidieae*] ..... *Lepidium*  
 14 Ovules 6-16 per ovary.  
 15 Leaves mostly entire; plants not fetid; [tribe *Noccaeae*] ..... *Microthlaspi*  
 15 Leaves often toothed; plants fetid; [tribe *Thlaspidae*] ..... *Thlaspi*  
 12 Ovaries and young fruits linear.  
 16 Plants aquatic or semi-aquatic; rooting at nodes; [tribe *Cardamineae*] ..... *Nasturtium*  
 16 Plants terrestrial, though sometimes growing partially submerged; not rooting at nodes.  
 17 Flowers blue, rarely pink or white; petals 12-32 mm; [tribe *Brassicaceae*] ..... *Orychophragmus*  
 17 Flowers white, sometimes pink; petals <16 mm.  
 18 Cauline leaves sessile; [tribe *Boechereae*] ..... *Boechera*  
 18 Cauline leaves usually petiolate; [tribe *Cardamineae*] ..... *Cardamine*  
 9 Leaves basal and cauline but not auriculate.  
 19 Plants aquatic, rooting at nodes; [tribe *Cardamineae*].  
 20 Submersed leaves dissected into filiform segments ..... *Rorippa*  
 20 Leaves not dissected into filiform segments ..... *Nasturtium*  
 19 Plants terrestrial, though sometimes growing partially submerged; not rooting at nodes.  
 21 Stamens 2 or 4.  
 22 Ovaries and young fruits linear; [tribe *Cardamineae*] ..... *Cardamine*  
 22 Ovaries and young fruits ovate, orbicular or cordate.  
 23 Flowers actinomorphic; filaments not appendaged; [tribe *Lepidieae*] ..... *Lepidium*  
 23 Flowers zygomorphic; filaments appendaged; [tribe *Iberideae*] ..... *Teesdalia*  
 21 Stamens 6.  
 24 Petals 15-30 mm long; [tribe *Lunarieae*] ..... *Lunaria*  
 24 Petals rarely to 20 mm long.  
 25 Ovaries and young fruits 2-segmented; [tribe *Brassicaceae*] ..... *Cakile*  
 25 Ovaries and young fruits unsegmented.  
 26 Ovaries and young fruits ovate, orbicular or cordate; [tribe *Lepidieae*] ..... *Lepidium*  
 26 Ovaries and young fruits linear.

- 27 Petals with contrasting dark veins; [tribe *Brassicaceae*].....*Raphanus*  
 27 Petals mostly uniform in color.  
 28 Leaves smelling of garlic when crushed, reniform or cordate, dentate; [tribe *Thlaspidaceae*].....*Alliaria*  
 28 Leaves not smelling of garlic, rarely reniform or cordate, with margins various.  
 29 Cauline leaves sessile; [tribe *Boechereae*].....*Boechera*  
 29 Cauline leaves usually petiolate; [tribe *Cardamineae*].  
 30 Base of plant usually glabrous; seeds not winged.....*Cardamine*  
 30 Base of plant pubescent; seeds winged.....*Planodes*

**Key B – plants in flower, trichomes of plant present with some or most or all branched**

- 1 Flowers yellow.  
 2 Trichomes sessile, medafixed; [tribe *Erysimeae*].....*Erysimum*  
 2 Trichomes not sessile and medafixed.  
 3 Leaves 2-3× pinnately dissected; [tribe *Descurainieae*].....*Descurainia*  
 3 Leaves not pinnately dissected.  
 4 Cauline leaves not auricled; [tribe *Alysseae*].....*Alyssum*  
 4 Cauline leaves auricled; [tribe *Camelineae*].  
 5 Annual; petals yellow to pale yellow, fading whitish.....*Camelina*  
 5 Perennial or biennial; petals creamy or pale yellow.....*Turritis*  
 1 Flowers white, pinkish, lavender, or blue.  
 6 Leaves only basal; [tribe *Arabideae*].....*Draba*  
 6 Leaves cauline.  
 7 Ovaries and young fruits not linear.  
 8 Cauline leaves sessile and auriculate; [tribe *Camelineae*].  
 9 Petals pale yellow, fading to whitish.....*Camelina*  
 9 Petals wholly white.....*Capsella*  
 8 Cauline leaves petiolate or sessile and not auriculate  
 10 Petal apices strongly bifid; [tribe *Alysseae*].....*Berteroa*  
 10 Petal apices rounded, retuse, or emarginate.  
 11 Leaves 2-3× pinnately dissected; [tribe *Descurainieae*].....*Descurainia*  
 11 Leaves not pinnately dissected.  
 12 Ovules 1-2 per ovary; [tribe *Alysseae*].....*Alyssum*  
 12 Ovules 4 or more per ovary; [tribe *Arabideae*].....*Draba*  
 7 Ovaries and young fruits linear.  
 13 Cauline leaves sessile and auriculate.  
 14 Young fruits ascending to descending; [tribe *Boechereae*].....*Boechera*  
 14 Young fruits ascending to erect or appressed to rachis.  
 15 Stems pubescent or less commonly glabrous above, not glaucous; [tribe *Arabideae*].....*Arabis*  
 15 Stems glabrous and glaucous above; [tribe *Camelineae*].....*Turritis*  
 8 Cauline leaves usually petiolate and if sessile, not auriculate.  
 16 Stigmas 2-lobed, petals > 15 mm long; [tribe *Hesperideae*].....*Hesperis*  
 16 Stigmas entire, petals < 6 mm long.  
 17 Leaves pinnately divided or lobed.  
 18 Leaves lyrate pinnatifid; [tribe *Camelineae*].....*Arabidopsis*  
 18 Leaves 2-3× pinnately dissected; [tribe *Descurainieae*].....*Descurainia*  
 17 Leaves entire or toothed.  
 19 Sepals 1-2.5 mm; of disturbed habitats; seeds uniseriate; [tribe *Camelineae*].....*Arabidopsis*  
 19 Sepals 0.7-1.2 mm or >2.5 mm; of disturbed and natural habitats; seeds biseriate; [tribe *Arabideae*].....*Draba*

**Key C – plants in fruit, trichomes of plant absent or, if present, unbranched**

- 1 Fruits silicles (< 3× as long as wide).  
 2 Fruits 2-segmented.....*Cakile*  
 2 Fruits unsegmented.  
 3 Fruits 2 cm or more wide.....*Lunaria*  
 3 Fruits < 2 cm wide.  
 4 Fruits with 20 or more seeds.....*Rorippa*  
 4 Fruits with 16 or fewer seeds.  
 5 Fruits with 1 seed.  
 6 Plants 5 dm or more tall.....*Isatis*  
 6 Plants < 5 dm tall.....*Calepina*  
 5 Fruits with 2-16 seeds.  
 7 Fruits with 2 seeds.....*Lepidium*  
 7 Fruits with more than 2 seeds.  
 8 Leaves pinnately lobed.....*Teesdalia*  
 8 Leaves not lobed.  
 9 Plants not fetid; seeds usually smooth, yellowish to medium brown.....*Microthlaspi*  
 9 Plants fetid; seeds striate or aveolate, dark gray to dark brown or black.....*Thaspi*

- 1 Fruits siliques (> 3× as long as wide).
  - 10 Fruits indehiscent or breaking into 1-seeded segments.
    - 11 Fruits not segmented, 1-seeded ..... *Isatis*
    - 11 Fruits segmented, usually more than 1-seeded.
      - 12 Styles obsolete; plants glabrous; of beaches ..... *Cakile*
      - 12 Styles 1-5 mm; plants pubescent; inland ..... *Raphanus*
  - 10 Fruits dehiscent, more than 1-seeded.
    - 13 Fruits segmented ..... *Brassica*
    - 13 Fruits unsegmented.
      - 14 Fruits latiseptate (flattened parallel to the septum).
        - 15 Replums strongly flattened; fruit valves dehiscent elastically, coiled ..... *Cardamine*
        - 15 Replums terete; fruit valves not dehiscent elastically or coiled.
          - 16 Seeds not winged ..... *Barbarea*
          - 16 Seeds winged at least distally.
            - 17 Cauline leaves pinnatifid or pinnatisect ..... *Planodes*
            - 17 Cauline leaves entire or dentate ..... *Boechera*
      - 14 Fruits terete or 4-angled.
        - 18 Plants aquatic or semi-aquatic; rooting at nodes ..... *Nasturtium*
        - 18 Plants terrestrial, though rarely growing partially submersed; not rooting at nodes.
          - 19 Leaves smelling of garlic when crushed, reniform or cordate, dentate ..... *Alliaria*
          - 19 Leaves not smelling of garlic when crush, rarely reniform or cordate, dentate or not.
            - 20 Seeds biseriate ..... *Rorippa*
            - 20 Seeds uniseriate.
              - 21 Stigma lobes obviously decurrent ..... *Orychophragmus*
              - 21 Stigma lobes sometimes distinct but not decurrent.
                - 22 Lower cauline leaves entire or dentate ..... *Boechera*
                - 22 Lower cauline leaves pinnatifid or pinnatisect.
                  - 23 Terminal leaflet lobes nearly entire to crenate or undulate ..... *Barbarea*
                  - 23 Terminal leaflet lobes sharply toothed or cut ..... *Sisymbrium*

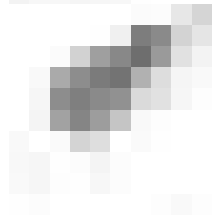
**Key D – plants in fruit, trichomes of plant present with some or most or all branched**

- 1 Fruits silicles (<3× as long as wide).
  - 2 Leaves basal only ..... *Draba*
  - 2 Plant with some cauline leaves.
    - 3 Cauline leaves sessile; blade bases auriculate, sagittate, or amplexicaule.
      - 4 Fruits obovate ..... *Capsella*
      - 4 Fruits narrowly pyriform to pyriform or broadly obovate ..... *Camelina*
    - 3 Cauline leaves petiolate or sessile and not auriculate.
      - 5 Leaves 2-3× pinnately dissected ..... *Descurainia*
      - 5 Leaves not pinnately dissected.
        - 6 Fruits with 1-2 seeds ..... *Alyssum*
        - 6 Fruits with 4 or more seeds.
          - 7 Seeds winged or margined ..... *Berteroa*
          - 7 Seeds without differentiated margin ..... *Draba*
  - 1 Fruits siliques (>3× as long as wide).
    - 8 Leaves basal only ..... *Draba*
    - 8 Plant with some cauline leaves.
      - 9 Cauline leaves sessile; blade bases auriculate, sagittate, or amplexicaule.
        - 10 Seeds biseriate ..... *Turritis*
        - 10 Seeds uniseriate.
          - 11 Siliques straight, slightly ascending to strictly erect or appressed; seeds 0.6-1.7 mm long; basal leaves <8 cm long ..... *Arabis*
          - 11 Siliques curved or straight, ascending to descending, seeds either <1mm long or <2.5 mm long, basal leaves 2.5-20 cm long ..... *Boechera*
      - 9 Cauline leaves petiolate or sessile and not auriculate.
        - 12 Trichomes sessile, medafixed ..... *Erysimum*
        - 12 Trichomes not sessile and medafixed.
          - 13 Leaves 2-3× pinnately dissected ..... *Descurainia*
          - 13 Leaves not 2-3× pinnately dissected.
            - 14 Stigmas 2-lobed with lobes connivent and decurrent to erect ..... *Hesperis*
            - 14 Stigmas entire and capitate, rarely slightly 2-lobed.
              - 15 Seeds biseriate ..... *Draba*
              - 15 Seeds uniseriate ..... *Arabidopsis*

*Alliaria* Heister ex Fabricius 1759 (Garlic Mustard)

A genus of 2 species, annual or biennial herbs, of Eurasia and n. Africa. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1988b)=Y.

\* *Alliaria petiolata* (Bieberstein) Cavara & Grande, Garlic Mustard, Hedge Garlic. Moist forests in bottomlands and on slopes; native of Europe. April-June; May-June. This species has become a noxious weed in ne. United States, invading undisturbed moist forests. Dhillon & Anderson (1999) report on physiological characteristics that make *Alliaria* a successful invader in shaded situations. [= RAB, C, FNA, K, Pa, W, Y, Z; = *Alliaria officinalis* Andrzejowski ex Bieberstein – F, G]



*Alyssum* Linnaeus 1753 (Alyssum, Madwort)

A genus of 170-190 species, herbs, of Eurasia. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

\* *Alyssum alyssoides* (Linnaeus) Linnaeus, Yellow Alyssum. Mt (VA, WV), Pd (VA), Cp (VA): roadsides, disturbed areas, especially in dry, barren soil; uncommon (rare in WV), native of Europe. June-September. [= C, F, FNA, G, K, Pa, W, Z; > *A. alyssoides* var. *alyssoides* – Y]



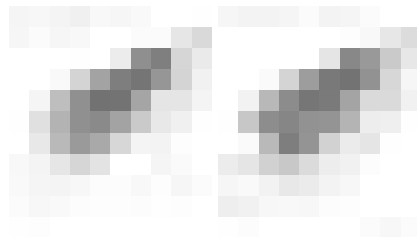
*Arabidopsis* Heynhold (Mouse-ear Cress)

A genus of about 9 species, annual and perennial herbs, circumboreal and most diverse in Eurasia. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z, Al-Shehbaz (1988a)=Y; O'Kane & Al-Shehbaz (1997)=X; O'Kane & Al-Shehbaz (2003); Koch, Bishop, & Mitchell-Olds (1999); Koch & Al-Shehbaz (2002). Key based in part on O'Kane & Al-Shehbaz (1997).

- 1 Fruit strongly flattened; petals 6-10 mm long; [native perennial, of calcareous and mafic rock outcrops] .....*A. lyrata* ssp. *lyrata*  
 1 Fruit terete; petals 2-4 mm long; [alien annual, of disturbed, weedy sites] .....*A. thaliana*

*Arabidopsis lyrata* (Linnaeus) O'Kane & Al-Shehbaz ssp. *lyrata*, Lyreleaf Rockcress, Dwarf Rockcress. Mt (GA, NC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, VA): rock crevices in or thin soil around calcareous or mafic rock outcrops; uncommon (rare in DE, GA, and NC). March-June; April-September. The species is widespread in n. North America and e. Asia, south in e. North America to NC, e. TN, and n. GA; ssp. *lyrata* is strictly North American, from NY west to AK, south to NC, GA, TN, MS, MB, SK, AB, and BC. The GA record is an old and indefinite collection ("northern Georgia") by Vasey. [= FNA, X; < *Arabis lyrata* Linnaeus – RAB, C, F, G, K, Pa, S, W, X; = *A. lyrata* var. *lyrata* – Y, Z]

\* *Arabidopsis thaliana* (Linnaeus) Heynhold, Mouse-ear Cress. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas, fields, roadsides, lawns; common (rare in DE Piedmont), native of Eurasia. March-May. *Arabidopsis thaliana* has sometimes been referred to as the white mouse of the vascular plant world, having been very extensively used as an experimental plant. [= RAB, C, F, FNA, G, K, Pa, S, W, X, Y, Z]



*Arabis* Linnaeus 1753 (Rockcress)

The circumscription of *Arabis* is in flux; there is increasing evidence that the broad circumscription traditionally employed in most North American floras includes discordant elements. Based on molecular phylogenetic studies and morphology, *Arabis* in our area should be divided into 4 genera, as follows: *Arabidopsis* (*A. lyrata*); *Arabis* sensu stricto (n=8) (*A. pycnocarpa* var. *adpressipilis*, *A. pycnocarpa* var. *pycnocarpa*, *A. georgiana*, *A. patens*); *Boechera* Löve & Löve (n=7) (*A. canadensis*, *A.*

*drummondii*, *A. laevigata* var. *burkii*, *A. laevigata* var. *laevigata*, *A. missouriensis*, *A. perstellata* var. *ampla*, *A. serotina*, *A. shortii*; and *Turritis* (*A. glabra* var. *glabra*). References: Al-Shehbaz in FNA (2010); Hopkins (1937)=Z; Rollins (1993)=Y; Al-Shehbaz (1988a)=X; Al-Shehbaz (2003)=Q; Koch, Bishop, & Mitchell-Olds (1999); Koch & Al-Shehbaz (2002). [also see *Arabidopsis*, *Boechea*, *Turritis*]

- 1 Plants matted from a branching caudex, perennial; [cultivated and rarely persistent or escaped] .....[*A. caucasica*]
- 1 Plants unbranched, biennial; [native to our area].
  - 2 Petals 6-9 mm long; siliques 2.5-7 cm long.
    - 3 Siliques (4.5-) 5-7 cm long; [endemic to w. GA and c. AL] ..... *A. georgiana*
    - 3 Siliques 2.5-4 cm long; [of se. PA, c. PA, and IN south to NC, e. TN, and AL] ..... *A. patens*
  - 2 Petals 3-5 mm long; siliques 3-6 cm long; [collectively known from NC, TN, VA, and northward and westward from those states].
    - 4 Stem pubescence primarily appressed and of 2-armed or dolabriform hairs ..... *A. pycnocarpa* var. *adpressipilis*
    - 4 Stem pubescence primarily spreading and of simple hairs ..... *A. pycnocarpa* var. *pycnocarpa*

\* *Arabis caucasica* Willdenow, Gray Rockcress. Introduced in KY and TN (Kartesz 1999). [= FNA, K1, Y; ? *A. alpina* – K2; ? *A. alpina* Linnaeus var. *albida* (Steven ex Jacquin) Paoletti] {not yet keyed}

*Arabis georgiana* R.M. Harper, Georgia Rockcress. Nutrient-rich streambanks and rock outcrops. April-May; May-early July. Endemic to n. and sw. GA and c. AL. It differs from our other species by the following combination of characters: fruits 5-7 cm long, borne appressed to ascending, leaves with bifurcate, trifurcate, or stellate hairs. See Patrick, Allison, & Krakow (1995). [= FNA, K1, K2, Y, Z]

*Arabis patens* Sullivant, Spreading Rockcress. Thin soils around calcareous or dolomitic outcrops, very rarely in nutrient-rich seepage from mafic rocks. May-June; June-August. Irregularly distributed, primarily in the sedimentary rock Appalachians, from se. PA, c. PA, and IN south to NC, e. TN, and AL. In NC, this species occurs over marble at Blowing Spring, Nantahala River Gorge, Swain County, at various sites over calcareous sedimentary rocks in the Hot Springs Window, near Hot Springs, Madison County, and in nutrient-rich seepage from amphibolite at Chimney Rock, Rutherford County. [= RAB, C, F, FNA, G, K1, Pa, S, W, X, Y, Z; = *Boechea patens* (Sullivant) Al-Shehbaz – K2, Q]

*Arabis pycnocarpa* M. Hopkins var. *adpressipilis* M. Hopkins, Slender Rockcress, Hairy Rockcress. Thin soils near outcrops of mafic or other rock weathering to nutrient-rich soils. April-May; May-June. Var. *adpressipilis* ranges from OH to IL, south to c. TN and AR; disjunct east of the mountains in NC. *A. pycnocarpa* is related to but specifically distinct from *A. hirsuta* (Linnaeus) Scopoli of Europe and *A. eschscholtziana* Andrzejowski in Ledebour of w. North America. [= FNA, Z; = *A. hirsuta* (Linnaeus) Scopoli var. *adpressipilis* (M. Hopkins) Rollins – C, F, G, Pa, X, Y; < *A. hirsuta* var. *pycnocarpa* (M. Hopkins) Rollins – K1, K2; > *A. ovata* Michaux – S, misapplied]

*Arabis pycnocarpa* M. Hopkins var. *pycnocarpa*, Slender Rockcress. Thin soils near outcrops of calcareous soils. QC west to AK, south to e. and sw. PA (Rhoads & Block 2007), AR, and AZ, primarily west of the Blue Ridge. Reports of this taxon from GA (Fernald 1950, Kartesz 1999, Hopkins 1937) are based on material collected by A.W. Chapman near Rome, and later described as *Arabis georgiana*. See discussion under *A. pycnocarpa* var. *adpressipilis*. [= FNA; = *A. hirsuta* (Linnaeus) Scopoli var. *pycnocarpa* (M. Hopkins) Rollins – C, F, G, Pa, X, Y; < *A. hirsuta* (Linnaeus) Scopoli var. *pycnocarpa* – K1, K2; = *A. pycnocarpa* M. Hopkins var. *typica* – Z]



### *Armoracia* Gaertner, B. Meyer, & Scherbius 1800 (Horseradish)

A genus of 3 species, perennial herbs, of Eurasia. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Y; Al-Shehbaz (1988a)=X.

- 1 Plant aquatic; stem submersed or prostrate; fruit unilocular .....[see *Rorippa aquatica*]
- 1 Plant terrestrial; stem erect; fruit bilocular..... *A. rusticana*

\* *Armoracia rusticana* P. Gaertner, B. Meyer, & Scherbius, Horseradish. Persistent after cultivation, sometimes spreading (generally only very locally, but sometimes greater distances, probably by water transport of rhizomes); native of Europe. April-July. The root is grated to provide the condiment. [= RAB, C, G, K1, K2, Pa, X, Y, Z; =? *A. lapathifolia* Gilibert – F; = *A. armoracia* (Linnaeus) Britton – S]





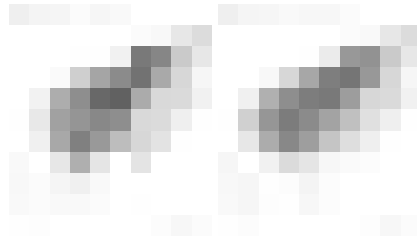
***Barbarea*** R. Brown 1812 (Winter-ress, Creasy Greens)

A genus of about 20 species, biennial and perennial herbs, semicosmopolitan. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988a)=Y; Rollins (1993)=Z.

- 1 Basal leaves with 4-10 pairs of lateral lobes; siliques 4.5-7 cm long; pedicels 1.2-1.8 mm thick .....***B. verna***  
 1 Basal leaves with 1-4 pairs of lateral lobes; siliques 1.5-3 cm long; pedicels 0.5-1.0 mm thick .....***B. vulgaris***

\* ***Barbarea verna*** (P. Miller) Ascherson, Early Winter-ress. Fields, disturbed areas; native of Eurasia. March-June. Formerly a commonly used winter and spring green in rural parts of our area. [= RAB, C, F, FNA, G, K1, K2, Pa, W, Y, Z; = *Campe verna* (P. Miller) Heller – S]

\* ***Barbarea vulgaris*** W. Aiton, Common Winter-ress, Yellow Rocket. Fields, disturbed areas; native of Eurasia. April-June. Additional study is needed of the various infraspecific or specific taxa recognized by some authors (particularly Europeans) in what is here considered a variable species; see Stace (2010), for instance. [= RAB, C, FNA, K1, K2, Pa, W, Y, Z; > *B. vulgaris* var. *vulgaris* – F, G; > *B. vulgaris* var. *arcuata* (Opiz ex J. & K. Presl) Fries – RAB, F, G; > *Campe barbarea* (Linnaeus) W. Wight ex Piper – S; > *Campe stricta* (Andrzejowski) W. Wight ex Piper – S, misapplied; > *B. vulgaris* var. *sylvestris* Fries]



***Berteroa*** A.P. de Candolle 1821 (Hoary Alyssum)

A genus of about 5 species, annual or perennial herbs, of Europe and the Middle East. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

\* ***Berteroa incana*** (Linnaeus) A.P. de Candolle, Hoary Alyssum. Disturbed areas; native of Europe. May-August. [= C, F, FNA, G, K1, K2, Pa, Y, Z]



***Boechera*** Löve & Löve 1975 (Rockcross)

Most of our native eastern North American "*Arabis*" are now in *Boechera*. References: Al-Shehbaz & Windham in FNA (2010); Windham & Al-Shehbaz (2007); Hopkins (1937) =Z; Rollins (1993)=Y; Wieboldt (1987); Al-Shehbaz (1988a)=X; Al-Shehbaz (2003)=Q; Koch, Bishop, & Mitchell-Olds (1999); Koch & Al-Shehbaz (2002).

- 1 Pedicels of flowers or fruits deflexed.....***B. canadensis***  
 1 Pedicels of flowers or fruits erect, ascending, or spreading.  
 2 Mature fruits < 4 cm long; stems branched or simple at the base.  
 3 Stem leaves (most of them) < 5 mm wide; stems branched at the base.....[see *Arabisopsis lyrata* ssp. *lyrata*]  
 3 Stem leaves (most of them) > 8 mm wide; stems simple at the base.  
 4 Lower cauline leaves glabrous or sparsely pubescent on the upper surface; fruits erect and appressed, 3-5 cm long.....[see *Arabis*]  
 4 Lower cauline leaves hirsute or strigose on the upper surface; fruits widely ascending or spreading. 1.5-4 cm long.

- 5 Petals 6-9 mm long; fruiting pedicels 10-16 mm long; mature fruits 2.5-4 cm long; pubescence of the lower leaf surface simple; seeds winged.....[see *Arabis patens*]
- 5 Petals 2-5 mm long; fruiting pedicels 2-10 (-13) mm long; mature fruits 1.5-3 cm long; pubescence of the leaf surface stellate; seeds wingless.
- 6 Petals 3-5 mm long, pink or purplish; fruiting pedicels 5-10 (-13) mm long; siliques 1.5-2 cm long; pubescence of the upper leaf surface stellate .....*B. perstellata*
- 6 Petals 2-3 mm long, white to cream; fruiting pedicels 2-3.5 mm long; siliques 1.5-3 cm long; pubescence of the upper leaf surface simple.....*B. dentata*
- 2 Mature fruits > 4 cm long; stems generally simple at the base.
- 7 Fruits erect, appressed against the stem, the fruiting inflorescence < 2 cm in diameter.
- 8 Mature fruits terete, (4-) 7-9.5 cm long; basal leaves 5-12 cm long, stellate pubescent; cauline leaves 4-12 cm long; pubescence of the stem mostly of spreading, simple hairs.....[see *Turritis*]
- 8 Mature fruits flat, 1.5-10 cm long; basal leaves 2-8 cm long, nearly glabrous; cauline leaves 1-4 cm long; pubescence of the stem mostly of appressed, forked hairs.
- 9 Mature fruits 4-10 cm long, 1.5-2.5 mm wide, with 2 rows of seeds in each locule.....*B. stricta*
- 9 Mature fruits 1.5-7 cm long, 0.7-1.1 mm wide, with 1 row of seeds in each locule .....[see *Arabis*]
- 7 Fruits ascending to spreading (not erect and appressed to the stem), the fruiting inflorescence > 4 cm in diameter.
- 10 Cauline leaves not at all auricled or sagittate-clasping at the base.
- 11 Calyx 2.9-4.8 mm long; flowering April-May; plant unbranched or with 1-3 branches (sometimes more if the main stem damaged), the inflorescence thus a raceme or slightly paniculate; mature fruits 5.2-9.8 cm long; seeds 64-80 per silique; seeds with wing 0.2-0.5 mm wide .....*B. burkii*
- 11 Calyx 2.0-3.3 mm long; flowering mid July-September; plant with numerous branches (well-developed plants usually with at least 10), the inflorescence thus a diffuse panicle; mature fruits 4.3-8.0 cm long; seeds 30-42 per silique; seeds with wing 0.1-0.2 mm wide .....*B. serotina*
- 10 Cauline leaves auricled or sagittate-clasping at the base.
- 12 Basal leaves subentire to serrate or sinuate-serrate; petals white, to 5 mm long, equaling or slightly surpassing the sepals; longest cauline leaves usually 8-18 cm long; plant glaucous.....*B. laevigata*
- 12 Basal leaves sharply serrate-dentate to strongly lacinate 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*

***Boechea burkii*** (Porter) Windham & Al-Shehbaz, *Burk's Smooth Rockcress*. Limestone barrens, shale barrens, and other dry, rocky habitats. April-May. E. and c. PA south to e. WV, ne. TN, and w. NC in the sedimentary rock Appalachians. Windham & Al-Shehbaz (2007) {}... RAB assigns this plant (as *Arabis laevigata* var. *burkii*) to NC based on somewhat aberrant specimens from high elevation cove forests; these are better assigned to *B. laevigata* var. *laevigata*. Hopkins (1937), however cites a specimen from Hot Springs, Madison County, NC, an area with plausible habitats (dry sedimentary rock woodlands, shale barrens). [= FNA, K2; = *Arabis laevigata* (Muhlenberg ex Willdenow) Poir. var. *burkii* Porter – C, K1, Pa, W, X, Y; < *A. laevigata* var. *burkii* – F, G, Z (also see *A. serotina*); < *A. burkii* (Porter) Small – S, misapplied in part; < *Boechea laevigata* – Q]

***Boechea canadensis*** (Linnaeus) Al-Shehbaz, *Sicklepod, Canada Rockcress*. Thin soils around rock outcrops, especially mafic or calcareous, and in dry to mesic, nutrient-rich, often rocky woodlands over mafic or calcareous rocks. May-July; June-August. QC and ND south to Panhandle FL and TX. [= FNA, K2, Q, WH; = *Arabis canadensis* Linnaeus – RAB, C, F, G, K1, Pa, S, W, X, Y, Z]

***Boechea dentata*** (Rafinesque) Al-Shehbaz & Zarucchi. Nutrient-rich alluvial and river bluff forests. April-May. NY west to MN, south to n. VA (along the Potomac River), nc. TN (Chester, Wofford, & Kral 1997), and AR. [= FNA; = *B. shortii* (Fernald) Al-Shehbaz – K2, Q; = *Arabis shortii* (Fernald) Gleason – C, G, K1, Pa, 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]

***Boechea laevigata*** (Muhlenberg ex Willdenow) Al-Shehbaz, *Common Smooth Rockcress*. Rocky woodlands and forests, rock outcrops, especially mafic or calcareous, but also on more acidic substrates, rarely also in bottomlands. April-May; May-June. ME west to MN and SD, south to GA, AL, MS, AR, OK, and CO. Of our *Boechea*, *B. laevigata* is the most common, being the least limited to calcareous substrates. [= FNA, K2; = *Arabis laevigata* (Muhlenberg ex Willdenow) Poir. var. *laevigata* – C, F, G, K1, Pa, 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; < *Boechea laevigata* – Q]

***Boechea missouriensis*** (Greene) Al-Shehbaz, *Missouri Rockcress*. Thin soil around outcrops of metamudstone, diabase, or granite (generally on mafic or rich granitic substrates). April-May; May-June. ME to WI, south to KY, AR, and OK; disjunct eastward in NC, SC, and GA. [= FNA, K2, Q; = *Arabis missouriensis* Greene – C, K1, Pa, X, Y; = *A. laevigata* var. *missouriensis* – RAB; > *A. missouriensis* var. *missouriensis* – F; > *A. viridis* Harger var. *viridis* – G, Z]

***Boechea perstellata*** (E.L. Braun) Al-Shehbaz. {Habitats}. {phenology}. Apparently endemic to KY and c. TN (Chester, Wofford, & Kral 1997). [= FNA, K2, Q; = *Arabis perstellata* – K1, Y; > *Arabis perstellata* E.L. Braun var. *perstellata* – X; > *Arabis perstellata* E.L. Braun var. *ampla* Rollins – X]

***Boechea serotina*** (Steele) Windham & Al-Shehbaz, Shale Barren Rockcress. Shale barrens. Mid-July-September. Endemic to Devonian and Ordovician shales of w. VA and e. WV. Wieboldt (1987) has clarified the taxonomy of this species and *A. laevigata* var. *burkii*. Also see Porter & Wieboldt (1991) for further discussion. [= FNA; = *Arabis serotina* Steele – C, K, X, Y; < *A. laevigata* var. *burkii* – F, G, Z; < *Boechea laevigata* – Q]

***Boechea stricta*** (Graham) Al-Shehbaz. {habitat}. April-June. NL (Labrador) and AK south to NJ, DE, OH, IL, NM, AZ, and CA. [= FNA, Q; = *Arabis drummondii* A. Gray – C, F, G, K, Y; > *A. drummondii* A. Gray var. *typica* – Z; = *Boechea 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)

A genus of about 40 species, herbs, of the Old World. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y. Key adapted from Z. [also see *Erucastrum*, *Sinapis*]

- 1 Upper cauline leaves petiolate, or sessile and cuneate.
  - 2 Pedicels and siliques widely spreading to divaricately ascending; siliques 2-4 cm long, terete or nearly so; [section *Rapa*] ..... ***Br. juncea***
  - 2 Pedicels and siliques erect and appressed to the rachis; siliques 1-2 cm long, more-or-less 4-angled; [section *Melanosinapis*] ..... ***Br. nigra***
- 1 Upper cauline leaves auriculate, slightly to strongly clasping the stem; [section *Rapa*].
  - 3 Petals mostly 18-25 mm long; beak of the silique (3-) 4-11 mm long ..... [***Br. oleracea***]
  - 3 Petals mostly 6-16 mm long; beak of the silique (5-) 7-15 (-22) mm long.
    - 1 Petals 10-18 mm long, pale yellow; beak of the silique usually (5-) 7-10 (-16) mm long; plant usually glaucous; siliques 5-10 cm long... ..... ***Br. napus***
    - 4 Petals 6-10 (-11) mm long, deep yellow; beaks of the silique usually (8-) 10-15 (-22) mm long; plant usually green; siliques 3-7 cm long ..... ***Br. rapa*** var. ***rapa***

\* ***Brassica juncea*** (Linnaeus) Czernajew, Leaf Mustard, Brown Mustard, Indian Mustard, Mustard Greens, Chinese Mustard. Fields, disturbed areas; native of Eurasia. April-June. This species is apparently a recently derived polyploid (n=18) of *B. nigra* (n=8) and *B. rapa* (n=10). The seeds of this species are one source of table mustard; other components include *B. nigra* and *Sinapis alba*. [= RAB, C, G, K, Pa, W, Y, Z; > *B. juncea* – S; > *B. japonica* (Thunberg) Siebold ex Miquel – S]

\* ***Brassica napus*** Linnaeus, Rutabaga, Rape, Canola, Colza, Swede. Fields, disturbed areas; native of Eurasia. May-July. This species is apparently a recently derived polyploid (n=19) of *B. oleracea* (n=9) and *B. rapa* (n=10). The seeds of this species are the source of 'canola' oil, the name recently coined by marketers from 'Canadian' + 'oil' + 'low' + 'acid' to avoid the negative connotation of the ancient name 'rape'. [= K, W, Y, Z; < *B. napus* – RAB (also see *B. rapa*)]

\* ***Brassica nigra*** (Linnaeus) W.D.J. Koch, Black Mustard, Charlock. Fields, disturbed areas; native of Eurasia. May-August. The seeds of this species are one source of table mustard; other species used include *B. juncea* and *Sinapis alba*. [= C, F, G, K, Pa, S, Y, Z; = *Sinapis nigra* Linnaeus]

\* ***Brassica oleracea*** Linnaeus. Commonly cultivated in our area in a variety of forms, including *B. oleracea* var. *acephala* A.P. de Candolle (Collard Greens, Kale), *B. oleracea* var. *capitata* Linnaeus (Cabbage), *B. oleracea* var. *italica* Plenck (Broccoli), *B. oleracea* var. *botrytis* Linnaeus (Cauliflower), *B. oleracea* var. *gemmifera* Zenk (Brussels Sprouts), and *B. oleracea* var. *gongylodes* Linnaeus (Kohlrabi). [= FNA, K]

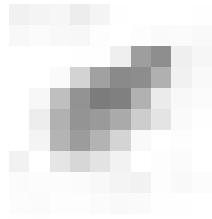
\* ***Brassica rapa*** Linnaeus var. ***rapa***, Turnip, Bird's-rape, Field Rape, Field Mustard, Bok-choy, Chinese Cabbage. Fields, disturbed areas; native of Europe. March-June. *B. rapa* is cultivated in a variety of forms, *B. rapa* var. *chinensis* (Linnaeus) Kitam. (Bok-choy or Pak-choi) and *B. rapa* var. *amplexicaulis* Tanaka & Ono (Chinese Cabbage). [= K; < *B. rapa* – C, Pa, Y, Z; < *B. napus* – RAB; > *B. rapa* – G; > *B. campestris* Linnaeus – G, S]



***Braya*** Sternberg & Hoppe 1815

A genus of about 6 species, perennial herbs, of alpine and arctic Eurasia and North America. References: Harris in FNA (2010); Rollins (1993)=Z.

\* *Braya humilis* (C. A. Meyer) B.L. Robinson ssp. *humilis*. Pasture; native of boreal and arctic North America and Asia. [= FNA; > *B. humilis* – C, K1, Z; > *B. humilis* var. *leiocarpa* (Trautvetter) Fernald – F, G; < *Neotorularia humilis* (C.A. Meyer) Hedge & J. Léonard]



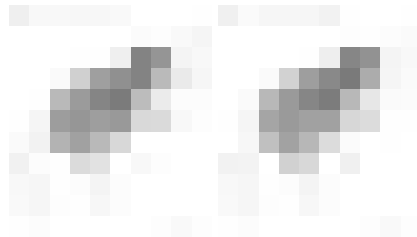
***Bunias* Linnaeus 1753 (Warty-cabbage)**

A genus of 3 species, herbs, of Eurasia. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z.

- 1 Plant an annual; cauline leaves < 5 cm long; siliques 10-12 mm long, more-or-less straight, 4-winged, spiny; seeds 3-4 per silique ..... *B. erucago*
- 1 Plant a perennial; cauline leaves > 10 cm long; siliques 5-10 mm long, usually curved, not winged, verrucose; seeds 1-2 per silique ..... *B. orientalis*

\* *Bunias erucago* Linnaeus, Southern Warty-cabbage. Disturbed areas; native of Europe. April-June. [= C, FNA, K2, Z]

\* *Bunias orientalis* Linnaeus, Warty-cabbage, Turkish Rocket. Disturbed areas; native of Europe. May-July. [= C, F, FNA, G, K2, Pa, Z]



***Cakile* P. Miller 1754 (Sea Rocket)**

A genus of about 7-8 species, annual herbs, primarily of coastal North America, Europe, and North Africa. References: Rodman in FNA (2010); Rollins (1993)=Z; Rodman (1974)=Y; Al-Shehbaz (1985b)=X.

**Identification notes:** The siliques of *Cakile* are divided near their middle by an abscission zone into two halves, each with a single seed: the upper abscises and disperses by water or wind, the lower remains attached to the parent plant. The size of the two segments and the contour of the abscised surface remaining on the lower segment are important taxonomic characters.

- 1 Lower silique segment with 2 opposite lateral horns or wings on the sides prolonged upward into sharp triangular wedges, concave in between; petals lavender (rarely white), 8-14 mm long, 3-6 mm wide; most of the leaves deeply pinnatifid into 6-9 lobes..... *C. maritima* ssp. *maritima*
- 1 Lower silique segment without lateral horns, triangular wedges absent to 1.5 mm high; petals white (rarely lavender), 4-10 mm long, 1.4-3 mm wide; most of the leaves with a few to many irregular teeth (or pinnatifid in *C. lanceolata* ssp. *pseudoconstricta*).
- 2 Inflorescences usually >20 cm long; [of the Gulf Coast] ..... *C. lanceolata* ssp. *pseudoconstricta*
- 2 Inflorescences 10-20 cm long; [collectively widespread].
- 3 Siliques 3-4 mm wide, the beak conical and acute at the apex; [of the Gulf Coast] ..... *C. constricta*
- 3 Siliques 5-9 mm wide, the beak somewhat flattened and typically rather blunt; [of the Atlantic Coast].
- 4 Upper fruit segment 7-15 mm long, 4-angled (to weakly 8-ribbed); articulating surface of lower fruit segment flat to concave and with 2 (-6) small teeth projecting upward or the sides prolonged upward into 2 opposite triangular wedges; [of NC northward to NL (Labrador)] ..... *C. edentula*
- 4 Upper fruit segment 12-20 mm long, 8-ribbed; articulating surface of lower fruit segment flat (to slightly convex or concave) and without teeth; [of NC southward to St. Lucie County, FL] ..... *C. harperi*

*Cakile constricta* Rodman, Gulf Coast Sea Rocket. Beaches, coastal sands. February-October. Panhandle FL west to TX. [= FNA, GW, K1, K2, X, Y, Z; < *C. lanceolata* (Willdenow) O.E. Schulz – S, WH]

*Cakile edentula* (Bigelow) Hooker, Northeastern Sea Rocket. Beaches, at or near the wrack line. May-June (-October). NL (Labrador) south to NC; introduced in various other shores around the world, including w. North America and Australia. See *C. harperi* for discussion of the relation between these taxa. [= RAB, Pa, S; = *C. edentula* var. *edentula* – C, F, G; = *C. edentula* ssp. *edentula* – GW; = *C. edentula* ssp. *edentula* var. *edentula* – FNA, K1, K2, X, Y, Z]

***Cakile harperi*** Small, Southeastern Sea Rocket. Beaches, at or near the wrack line. May-June (-October). A Southeastern Coastal Plain endemic: e. NC south to the east coast of c. peninsular FL. Rodman (1974) and most authors since have treated *C. harperi* as *C. edentula* ssp. *harperi* (Small) Rodman. Rodman further treats the Great Lakes and ne. United States coastal populations (respectively) as *C. edentula* ssp. *edentula* var. *lacustris* Fernald and *C. edentula* ssp. *edentula* var. *edentula*. Rodman points out the morphologic distinctions between the three taxa, the chemical differences between "*edentula*" and "*harperi*," and the rarity or absence of intermediates in areas of pairwise overlap between the 3 entities. The geographic / morphologic pattern is not clinal, but is rather a sharp step function, with an overlap in the distribution of (and rare hybridization between) two largely distinct taxa. The few intermediates can be interpreted as hybrids or very limited and local introgression between otherwise distinct (though related) taxa. *C. harperi* shows greater chemical similarity to *C. constricta* Rodman and *C. lanceolata* (Willdenow) O.E. Schultz than to *C. edentula*, and also shows some morphologic affinities with these more southern taxa. For these reasons I prefer the simplicity of treating the three taxa as binomial species. [= RAB, S; = *C. edentula* (Bigelow) Hooker ssp. *harperi* (Small) Rodman – FNA, GW, K1, K2, WH, X, Y, Z]

***Cakile lanceolata*** (Willdenow) O.E. Schulz ssp. ***pseudoconstricta*** Rodman. Beaches, coastal sands. January-December. FL, AL, LA, TX, Tamaulipas. [= FNA, K1, K2, X, Y, Z; < *C. lanceolata* – GW, S, WH]

\* ***Cakile maritima*** Scopoli ssp. ***maritima***, European Sea Rocket. Beaches, at or near the wrack line; native of Europe. The other subspecies are also European but are apparently not introduced in our area. The NC location was on ballast at Wilmington, and is apparently not persistent. VA locations are, however, well-established. [= FNA, X, Y; < *C. maritima* – C, F, G, K1, K2, Z; = *C. cakile* (Linnaeus) Karstens – S]



#### ***Calepina*** Adanson 1763

A genus of 2 species, annual herbs, of c. and sw. Asia. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

\* ***Calepina irregularis*** (Asso) Thellung. Fields, disturbed areas; native of Eurasia. April. Reported for e. MD by Knapp et al. (2011). [= RAB, C, FNA, K1, K2, Y, Z]



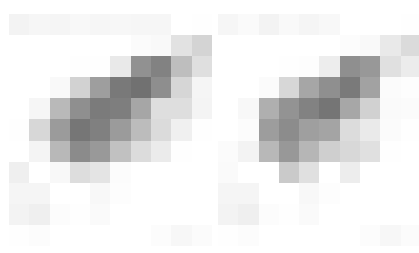
#### ***Camelina*** Crantz 1762 (Gold-of-pleasure, False-flax)

A genus of 6-8 species, herbs, of se. Europe and the Middle East. References: Al-Shehbaz & Beilstein in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

- 1 Siliques 4-7 mm long; leaves and stem rough-hairy, the stellate trichomes exceeded by simple trichomes (which are 1-2 mm long).....*C. microcarpa*
- 1 Siliques 7-12 mm long; leaves and stem glabrate to sparsely hairy, the stellate trichomes as long as the few simple trichomes.....*C. sativa*

\* ***Camelina microcarpa*** Andrzejowski ex A.P. de Candolle, Lesser Gold-of-pleasure. Fields, disturbed areas; native of Eurasia. April-May. [= RAB, C, F, FNA, G, K1, K2, Pa, S, W, Y, Z]

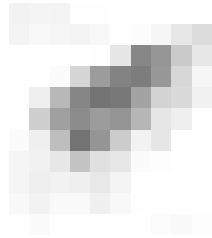
\* ***Camelina sativa*** (Linnaeus) Crantz, Gold-of-pleasure, False-flax. Fields, disturbed areas; native of Eurasia. April-May. [= RAB, C, F, FNA, G, Pa, S, WV, Y, Z; > *C. sativa* ssp. *sativa* – K1, K2]



*Capsella* Medikus 1792 (Shepherd's Purse)

A genus of 1-4 species, annual or biennial herbs, of Europe. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1986)=Y; Stace (2010)=X.

\* *Capsella bursa-pastoris* (Linnaeus) Medikus, Common Shepherd's Purse. Fields, roadsides, gardens, disturbed areas; native of Europe. March-June. *C. rubella* Reuter, Pink Shepherd's Purse, is sometimes distinguished (as by F, G, Stace 2010), and occurs in our area. It is alleged to be diploid (vs. tetraploid), to have pink petals 1-2 mm long (vs. white, 2-3 mm long), and lateral margins of the fruit concave (vs. straight to convex). Al-Shehbaz (1986) considered the character correlations to be poor, not warranting taxonomic recognition. [= RAB, C, FNA, K1, K2, Pa, W, Y, Z; > *C. bursa-pastoris* – F, G, X; > *C. rubella* Reuter – F, G, X; > *C. gracilis* Gren. – F; = *Bursa bursa-pastoris* (Linnaeus) Britton – S]



*Cardamine* Linnaeus 1753 (Bittercress, Toothwort)

A genus of about 200 species, herbs, cosmopolitan. *Dentaria* should apparently be included (Sweeney & Price 2000). References: Al-Shehbaz, Marhold, & Lihová in FNA (2010); Rollins (1993)=Z; Sweeney & Price (2001)=Y; Al-Shehbaz (1988a)=X; Sweeney & Price (2000); Franzke et al. (1998). Key based in part on Turrill, Evans, & Gilliam (1994) and Y.

- 1 Leaves palmately divided (if 1-ternate, then palmately so, the terminal leaflets on a petiolule the same length as the those of the lateral leaflets); [*Dentaria*].
  - 2 Plants entirely glabrous (including on the leaf margins); leaflets highly dissected with linear to filiform segments; [in our area known from Piedmont of NC and VA].....*C. dissecta*
  - 2 Plants with marginal leaf trichomes, and often also pubescent on the stem, inflorescence, and petioles; leaflets entire, toothed, or deeply lobed; [collectively widespread in our area].
    - 3 Trichomes of leaf margins appressed and ca. 0.1 mm long; stem leaves 2 (-3), opposite; lateral leaflets of stem leaves very rarely incised, the leaf being (and appearing merely 3-foliolate, though teeth may be prominent and lacerate); basal leaves usually present at flowering.
      - 4 Rhizome with 2-3 cm long segments, each separated by a narrow and fragile connecting portion (which typically is broken on herbarium specimens), and lacking "teeth" (actually prominent reduced leaves); leaflets of the stem leaves (2.5×-) avg. 5× (-7×) as long as wide (thus proportionately much narrower than the leaflets of the basal leaves); central leaflet of stem leaves (2.5-) avg. 3.25 (-4) cm long × (0.5-) avg. 0.75 (-1.0) cm wide; taste of fresh plants relatively mildly mustardy .....*C. angustata*
      - 4 Rhizome elongate and of uniform diameter, lacking definite segments, but with periodic "teeth" (prominent reduced leaves) along it; leaflets of the stem leaves (2×-) avg. 3× (-4×) as long as wide (thus proportionately similar to the leaflets of the basal leaves); central leaflet of stem leaves (4-) avg. 6 (-8) cm long × (1.5-) avg. 2 (-2.5) cm wide; taste of fresh plant strong, like horseradish or wasabi ....  
.....*C. diphylla*
    - 3 Trichomes of leaf margins erect and 0.2-0.3 mm long; stem leaves 3, whorled; lateral leaflets of stem leaves usually incised into 2 main lobes, giving the leaf a superficially somewhat 5-parted appearance; basal leaves usually absent (or often present in *C. maxima*) at flowering.
      - 5 Rhizome with 2-3 cm long segments, each separated by a narrow and fragile connecting portion (which typically is broken on herbarium specimens); upper stem pubescent.....*C. concatenata*
      - 5 Rhizome elongate, with alternating thicker and thinner portions (but not fragile and easily separating); upper stem glabrous .....  
.....*C. maxima*
- 1 Leaves simple, pinnately lobed, or pinnately divided (if 1-ternate, then pinnately so, the terminal leaflet on a longer petiolule than those of the lateral leaflets); [*Cardamine* in the narrow sense].
  - 6 Cauline leaves simple, sometimes the lower to middle cauline leaves with 1-2 pairs of very small lateral lobes.
    - 7 Plant from a tuberous or bulbous base, erect and generally unbranched, not stoloniferous or rooting down from upper nodes after flowering; petals 7-20 mm long.
      - 8 Stem glabrous; corolla white, rarely pink; stem leaves 4-12; silique 1.5-3 cm long, plus a 3-7 mm beak .....*C. bulbosa*
      - 8 Stem cinereous-pubescent; corolla pink to lavender, rarely white; stem leaves 2-5; silique 1-2 cm long, plus a 2-4 mm beak .....

- ..... *C. douglassii*
- 7 Plant from a fibrous root system, frequently much branched from the base, some of the branches becoming stoloniferous and rooting down at the upper nodes after flowering; petals 2-10 mm long or absent.
- 9 Petals absent or present, if present 0.7-2 mm long; silique 5-10 (-15) mm long, plus a 0.5-1.0 mm beak, on thick pedicels 1-3 (-6) mm long ..... *C. longii*
- 9 Petals present, 2-10 mm long; silique 8-21 mm long, plus a 1-3 mm beak, on slender pedicels 10-20 mm long.
- 10 Petals 5-10 mm long, the tips spreading or ascending; anthers oblong, about 1 mm long; stylar beak of the silique 2-3 mm; mid-cauline and upper cauline leaves cordate, often clasping around the stem or branch; basal leaves with 0-1 pairs of lateral leaflets ...
- ..... *C. rotundifolia*
- 10 Petals 3-5 mm long, the tips ascending or erect; anthers orbicular, ca. 0.3 mm across; stylar beak of the silique 1-1.5 mm; mid-cauline and upper cauline leaves cuneate, rounded, or truncate (rarely the mid-cauline leaves subcordate, but not clasping); basal leaves with 1-3 pairs of lateral leaflets ..... *C. micranthera*
- 6 Cauline leaves 1-ternate or pinnatifid (if 1-ternate, the lateral leaflets about as large as the terminal leaflet).
- 11 Cauline leaves with 3-5 leaflets; petals 4-10 mm long; plant a perennial.
- 12 Stem glabrous at base; lower leaves green underneath; petioles auriculate at the base, the auricles 1-5 mm long, acute to acuminate; leaves 3 (-5)-foliolate; siliques 22-40 mm long ..... *C. clematidis*
- 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 7-10 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 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*
- 17 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.
- 18 Leaflets petiolulate; stems flexuous; [alien weed] ..... *C. flexuosa*
- 18 Leaflets decurrent on the rachis; stems typically erect; [native] ..... *C. pensylvanica*

*Cardamine angustata* O.E. Schulz, Eastern Slender Toothwort. Rich, mesic forests. March-May; April-June. NJ and IN south to n. GA, c. TN, and ne. MS; disjunct in the Ouachita Mountains of AR. Var. *ouachitana* E.B. Smith, alleged to differ from var. *angustata* in its non-ciliate leaves (vs. leaves with margins ciliate with antrorse trichomes 0.1 mm long), is apparently not a valid taxon. [= C, FNA, K, Pa, 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. Swampy forests and bogs, primarily (but not strictly) in circumneutral soils over limestone or mafic rocks. March-May; April-May. ME west to MB, south to FL, LA, and TX. [= RAB, F, FNA, G, GW, K, Pa, S, W, Z; = *C. rhomboidea* (Persoon) A.P. de Candolle - C, X]

*Cardamine clematidis* Shuttleworth ex A. Gray, Mountain Bittercress. Shaded brookbanks, rock outcrops with seepage, at high elevations (1200m and above). April-May; June-July. Endemic to the high elevation Southern Appalachians of w. NC, e. TN, sw. VA, and ne. GA (Brasstown Bald). [= C, FNA, K, S, W, X, Z; < *C. clematidis* Shuttleworth ex Gray - RAB, F, G, GW (also see *C. flagellifera*)]

*Cardamine concatenata* (Michaux) O. Schwarz, Cutleaf Toothwort. Rich, mesic forests. March-May; April-May. ME, QC and MN south to FL Panhandle, LA, OK, and TX. [= RAB, C, FNA, K, Pa, X, Y, Z; = *Dentaria laciniata* Muhlenberg ex Willdenow - G, GW, S, W; > *Dentaria laciniata* var. *laciniata* - F; > *D. laciniata* var. *coalescens* Fernald - F]

*Cardamine diphylla* (Michaux) A. Wood, Crinkleroot, Toothwort. Rich, mesic forests. April-May; May-June. NB west to MN, south to n. GA, SC, and AL. [= RAB, C, K, Pa, X, Y, Z; = *Dentaria diphylla* Michaux - F, G, W; > *Dentaria diphylla* - S; > *Dentaria incisa* Small - S]

*Cardamine dissecta* (Leavenworth) Al-Shehbaz, Dissected Toothwort. Rich, mesic forests. March-April; April-May. Al-Shehbaz (1988c) describes the range as separated into four areas: c. AL (3 counties); c. NC and sc. VA (6 counties); nw. GA, c. TN, and s. KY (18 counties); and se. IN, ne. KY, and s. OH (6 counties). He states that *C. dissecta* is easily distinguished from its relatives "by its glabrous leaves that are divided into filiform to narrowly linear segments." See Al-Shehbaz (1988c) for additional discussion of the systematics, nomenclature, ecology, and distribution of this species. First reported for VA by Wieboldt et al. (1998). [= C, FNA, K, X, Y, Z; = *Cardamine angustata* var. *multifida* (Muhlenberg ex Elliott) H.E. 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. 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. Mid March-early April; April-May. NY, ON, and MN south to c. NC, sc. TN, AL, and MO. [= RAB, C, F, FNA, G, K, GW, Pa, X, Z]

***Cardamine flagellifera*** O.E. Schulz var. *flagellifera*, Large-flowered Blue Ridge Bittercress. In seepages, on streambanks, and in moist cove or bottomland forests, mainly at moderate to low elevations. 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. clematidis*, as pointed out by Dudley (1974). Rollins's division of this species into two varieties (following Small's recognition of two species) needs further evaluation. [= K, Z; < *C. flagellifera* – C, FNA, W, X; < *C. clematidis* – RAB, GW; = *C. flagellifera* – S]

***Cardamine flagellifera*** O.E. Schulz var. *hugeri* (Small) Rollins, Small-flowered Blue Ridge Bittercress. In seepages, on streambanks, and in moist cove or bottomland forests, mainly at moderate to low elevations. March-April; June-July. Endemic to the Southern Appalachians of NC and TN. [= K, Z; < *C. flagellifera* – C, FNA, W, X; < *C. clematidis* – RAB, GW; = *C. hugeri* Small – S]

\* ***Cardamine flexuosa*** Withering, Woodland Bittercress. Disturbed sites; native of Eurasia. February-May. Lihová et al. (2006) show that Asiatic "*C. flexuosa*" is a distinct taxon from European *C. flexuosa* and will need a new name; at least some of our material is the Asiatic species, whose proper name is unclear (Lihová et al. 2006). Both the European and Asiatic taxa are allotetraploids of unclear parentage. [< *C. flexuosa* Withering – RAB, F, FNA, Pa, X; > *C. debilis* D. Don – K, Z; > *C. flexuosa* – K, Z]

\* ***Cardamine hirsuta*** Linnaeus, Hairy Bittercress. Disturbed areas, including fields and gardens; native of Europe. February-May (or irregularly earlier in response to mild winter weather). [= RAB, C, F, FNA, G, GW, K, Pa, S, W, X, Z]

\* ***Cardamine impatiens*** Linnaeus, Narrowleaf Bittercress. Alluvial floodplains (in the New River drainage in NC and VA); native of Europe. June-July. See Poindexter (2006). Reported for MD (Knapp et al. 2011). [= C, F, K, Pa, X, Z]



***Cardamine longii*** Fernald, Long's Bittercress. Tidal freshwater marshes and cypress-gum swamps. June-September. Coastal in distribution, irregularly from ME south to SC (or FL). Difficult to distinguish from depauperate or submerged forms of *C. pensylvanica* with few leaflets; the short style (capsule beak) and short and thick pedicels appear to be the most reliable characteristics. [= C, F, FNA, K, X, Z]

***Cardamine maxima*** (Nuttall) Wood, Large Toothwort. Moist forests. April-May. NB, ON, and MI south to NJ, PA, OH, WV (?), and KY (?). [= FNA, K, Pa, Y, Z; = *C. ×maxima* – C; = *Dentaria maxima* Nuttall – F, G]

***Cardamine micranthera*** Rollins, Streambank Bittercress, Small-anthered Bittercress. Sand and gravel bars in creeks, swampy floodplain woods, seepage over rocks. April-May; May-June. A narrow endemic, known only from Stokes County, NC and Patrick County, VA; apparently extirpated from Forsyth County, NC. The description and key in RAB are partly in error, being based on the inadequate and unrepresentative material available at the time. *C. micranthera* is most closely related to *C. rotundifolia*, but also shows some affinities to *C. pensylvanica*. It can be distinguished from *C. rotundifolia* by the characters in the key; additionally, *C. micranthera* does not form proliferative branches from the upper nodes, generally branching from the base in vigorous plants, or unbranched in smaller plants. It can be distinguished from *C. pensylvanica* by its predominately simple leaves, especially those on the upper stem, the larger flowers, the petals 3-5 mm long (vs. 1.5-3 mm long), the fruiting pedicels thin, 10-20 mm long, spreading to ascending (vs. thick, 4-10 mm long, ascending). Wieboldt (1992) reasonably speculates that *C. micranthera* may be an in-breeding relative derived from *C. rotundifolia* in the Piedmont/Mountain interface. [= RAB, FNA, K, X, Z]

***Cardamine parviflora*** Linnaeus var. *arenicola* (Britton) O.E. Schulz, Sand Bittercress. Various habitats, primarily seasonally wet areas with shallow soil or sand, also on mafic outcrop glades, as on greenstone, diabase, and nutrient-rich granites. March-May. The typical variety is Eurasian; our variety is widespread in e. North America, also occurring in the Pacific Northwest. Our plant may warrant specific status. [= RAB, C, F, K, X, Z; < *C. parviflora* – FNA, G, GW, Pa, S, W; = *C. arenicola* Britton – S]

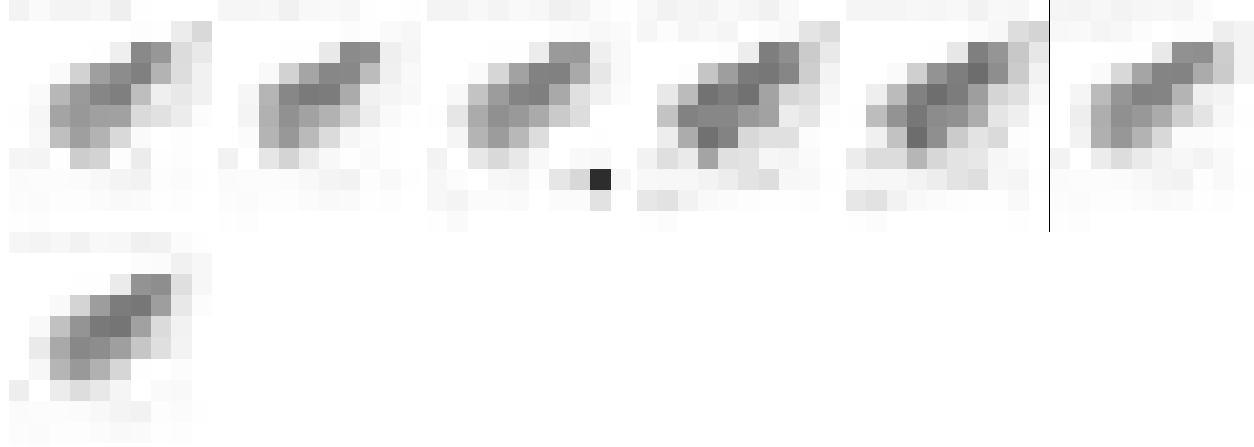
***Cardamine pensylvanica*** Muhlenberg ex Willdenow, Quaker Bittercress. Various wet habitats, especially swampy depressions, streambanks, small woodland seeps. March-May. NL (Newfoundland), NL (Labrador), NT, and AK south to FL,



TX, and CA. [= RAB, C, FNA, G, GW, K, Pa, S, W, X, Z; > *C. pennsylvanica* var. *pennsylvanica* – F; > *C. pennsylvanica* var. *brittoniana* Farwell – F]

***Cardamine pratensis*** Linnaeus var. ***palustris*** Wimmer & Graebner, American Cuckoo-flower, Lady's-smock. Bogs and swamps. April-July. Var. *palustris* ranges from Canada south to NJ, VA, OH, IN, MN, and BC. The Eurasian var. *pratensis*, with pink (vs. white) flowers, is introduced in ne. North America and may occur in our area. These two varieties may not be distinguishable; Rollins combines var. *palustris* into var. *pratensis*. [= C, F, G; < *C. pratensis* – FNA, Pa; < *C. pratensis* var. *pratensis* – K, Z]

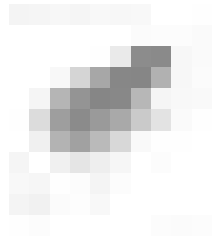
***Cardamine rotundifolia*** Michaux, American Bittercress, Mountain Watercress. Seepages, streambanks, swampy depressions. April-May; June-July. Characteristically, *C. rotundifolia* branches from the upper nodes while in flower, the branches rooting down and proliferating vegetatively. A Central/Southern Appalachian endemic: n. DE, PA, and w. NY, west to OH and KY, south to w. NC and n. GA. [= RAB, C, F, G, GW, K, Pa, S, W, X, Z]



***Chorispora*** R. Brown ex A.P. de Candolle 1821 (Chorispora)

A genus of 11 species, herbs, of Central Asia and the Middle East. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1988d)=Y.

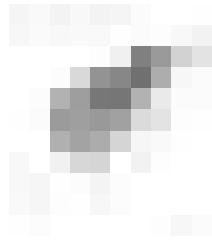
\* ***Chorispora tenella*** (Pallas) A.P. de Candolle, Chorispora, Blue Mustard. Disturbed areas; native of w. Asia. Well established in the w. United States, and occurs at scattered locations eastward, as in c. and w. TN (Chester, Wofford, & Kral 1997) and s. PA (Rhoads & Block 2007). [= C, FNA, K, Pa, Y, Z]



***Coincya*** Porta & Rigo ex Rouy 1891 (Wallflower-cabbage, Coincya)

A genus of 6 species, of c. and s. Europe and n. Africa. References: Warwick in FNA (2010); Rollins (1993)=Z; Leadlay & Heywood (1990)=Y; Al-Shehbaz (1985b)=X; Naczi & Thieret (1996)=Q.

\* ***Coincya monensis*** (Linnaeus) Greuter & Burdet ssp. ***recurvata*** (Allioni) Leadlay, Wallflower-cabbage, Coincya. Mt (NC, VA, WV), Cp (DE): roadsides; uncommon (rare in NC and WV), native of Eurasia. May-July. Rollins (1961) discusses the occurrence of this species in w. NC. Poindexter & Murrell (2011) report the first occurrence for VA. See Naczi & Thieret (1996) for an excellent discussion of this species' occurrence in North America. [= FNA, K, Q; < *C. monensis* – Pa; ? *Brassica erucastrum* – RAB, misidentified; ? *Hutera cheiranthos* (Villars) Gomez-Campo – X; = *C. monensis* ssp. *recurvata* var. *recurvata* – Y, Z; ? *Rhynchosinapis cheiranthos* (Villars) Dandy; ? *C. cheiranthos* (Villars) Greuter & Burdet]



*Conringia* Adanson 1763 (Hare's-ear Mustard)

A genus of 6 species, herbs, of Europe and the Middle East. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

\* *Conringia orientalis* (Linnaeus) Andrzejowski, Hare's-ear Mustard, Treacle Mustard. Disturbed areas; native of Eurasia. April-June. [= RAB, C, F, FNA, G, K, Pa, S, WV, Y, Z]



*Descurainia* Webb & Berthelot 1836 (Tansy-mustard, Flixweed)

A genus of ca. 40 species, primarily of North and South America. References: Goodson & Al-Shehbaz in FNA (2010); Rollins (1993)=Z, Al-Shehbaz (1988b)=Y; Detling (1939)=X.

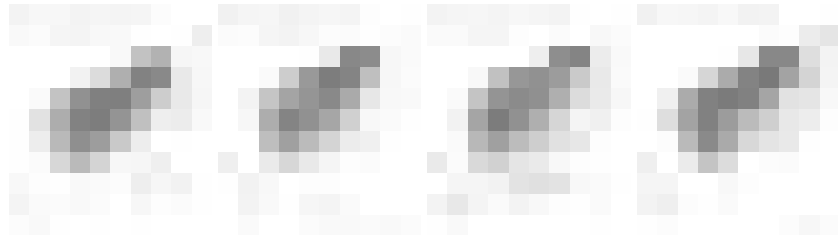
- 1 Silique 10-25 (-30) mm long, acute to acuminate, the seeds mostly in 1 row .....*D. sophia*
- 1 Silique 5-10 (-13) mm long, obtuse or clavate, the seeds mostly in 2 rows.
  - 2 Leaves densely gray-canescenscent; angle between fruiting pedicels and rachis ca. 75 degrees; pedicels glandular-puberulent, 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 canescenscent); 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. Dry rocky openings and woodlands. April-August. QC west to NT, south to VA, TN, and TX; introduced in the Coastal Plain of NC. [= C, F, G, Pa; = *D. brachycarpa* (Richardson) O.E. Schulz – RAB; = *D. pinnata* ssp. *brachycarpa* (Richardson) Detling – K, X, Y, Z; = *Sophia millefolia* Rydberg – S; < *D. pinnata* – W; > *D. pinnata* var. *brachycarpa* – WV; > *D. pinnata* var. *pinnata* – WV, misidentified; < *D. pinnata* ssp. *brachycarpa* – FNA]

\* *Descurainia pinnata* (Walter) Britton var. *intermedia* (Rydberg) C.L. Hitchcock. Waste areas near wool-combing mills; native of w. North America. Also reported for WV (Kartesz 1999). [= *Descurainia pinnata* ssp. *intermedia* (Rydberg) Detling – K, X, Y, Z; = *Sophia intermedia* Rydberg – S; < *D. pinnata* ssp. *brachycarpa* – FNA]

*Descurainia pinnata* (Walter) Britton var. *pinnata*, Southeastern Tansy-mustard. Open sandy areas, especially roadsides. February-May. E. NC south to FL, west to TX and OK. [= C, F, G; = *D. pinnata* – RAB; = *D. pinnata* ssp. *pinnata* – FNA, K, X, Y, Z; = *Sophia pinnata* (Walter) T.J. Howell – S]

\* *Descurainia sophia* (Linnaeus) Webb ex Prantl, Herb Sophia. Disturbed areas; native of Eurasia. April-August. [= RAB, C, F, FNA, G, K, Pa, WV, X, Y, Z; = *Sophia sophia* (Linnaeus) Britton – S]



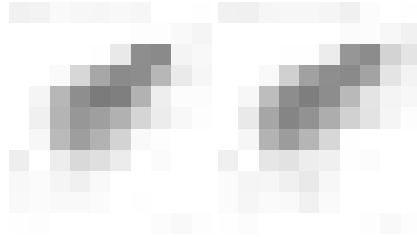
*Diplotaxis* A.P. de Candolle 1821 (Wall-rocket)

A genus of ca. 30 species, herbs, of Eurasia and Africa. References: Martínez-Laborde in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

- 1 Leaves mostly basal or very low-cauline; plant annual or biennial; siliques lacking a gynophore (stipe) between the sepal scars and the base of the valves; [section *Anocarpum*] .....*D. muralis*
- 1 Leaves mostly cauline; plant perennial, becoming somewhat woody at the base; siliques with a 0.5-2 mm gynophore (stipe) between the sepal scars and the base of the valves; [section *Diplotaxis*] .....*D. tenuifolia*

\* *Diplotaxis muralis* (Linnaeus) A.P. de Candolle, Annual Wall-rocket, Sand-rocket, Stinking Wall-rocket. Disturbed areas; native of Europe. June-September. The report of this species for NC by Ahles & Radford (1959) was based on a misidentification of *Coincya muralis* (Naczi & Thieret 1996). [= C, F, FNA, G, K, Pa, S, Y, Z]

\* *Diplotaxis tenuifolia* (Linnaeus) A.P. de Candolle, Perennial Wall-rocket, Flixweed. Disturbed areas, ballast; native of Europe. July-October. [= C, F, FNA, G, K, Pa, S, Y, Z]



*Draba* Linnaeus 1753 (Draba, Whitlow-grass)

A genus of about 350 species, herbs, of Northern Hemisphere and Andean South America, particularly in arctic and alpine habitats. Molecular phylogenetic studies show that *Erophila* should be included in *Draba* (Koch & Al-Shehbaz 2002). References: Al-Shehbaz, Windham, & Elven in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y; Koch & Al-Shehbaz (2002).

- 1 Leaves all basal; petals deeply bifid (about 1/2 way to base).....*D. verna*
- 1 Leaves basal and cauline (the basal sometimes withering by fruiting); petals merely emarginate.
  - 2 Silique twisted; petals 5-6 mm long; styles conspicuous, 1.5-3 mm long; perennial; [on calcareous rock outcrops].....*D. ramosissima*
  - 2 Silique not twisted; petals 0-5 mm long; styles absent to inconspicuous, 0-0.25 mm long; winter-annuals; [mostly in open situations in sandy or clayey soils, not over limestone].
    - 3 Silique 1-6 mm long; leaves extending upward into the lower branches of the inflorescence.
      - 4 Pubescence of the lower leaves of stalked cruciform trichomes; siliques densely pubescent; fruiting branches congested, mostly < 1 cm long and appearing almost glomerate; seeds 4-8 per silique, each 1.0-1.5 mm long.....*D. aprica*
      - 4 Pubescence of the lower leaves of sessile cruciform trichomes; siliques glabrous; fruiting branches elongate; seeds 8-15 per silique, each 0.5-0.8 mm long.....*D. brachycarpa*
    - 3 Silique 8-14 mm long; leaves low-cauline, not extending upward into the lower branches of the inflorescence.
      - 5 Inflorescence congested, the fruiting portion ca. 1.5 cm long; trichomes of the upper leaf surface simple or once-forked; pedicels glabrous.....*D. reptans*
      - 5 Inflorescence not congested, the fruiting portion mostly > 2.5 cm long; trichomes of the upper leaf surface dendritic; pedicels pubescent.
        - 6 Silique ca. 3-6× as long as wide, 5-15 mm long, 1.2-2.2 (-2.8) mm wide, pubescent with simple or branched trichomes.....*D. cuneifolia* var. *cuneifolia*
        - 6 Silique ca. 2× as long as wide, 5-8 mm long, 2.5-3.7 mm wide, pubescent with simple trichomes.....*D. platycarpa*

*Draba aprica* Beadle, Flatrock Draba, Open-ground Whitlow-grass, Sun-loving Draba, Granite Whitlow-wort. Shallow soils around and under *Juniperus virginiana* on granitic flatrocks and amphibolite outcrops. March-April; April-May. Ozark highlands of AR, MO, and OK; disjunct on granitic flatrocks in SC and GA. [= RAB, FNA, G, K, S, W, Y, Z]

*Draba brachycarpa* Nuttall ex Torrey & A. Gray, Short-fruited Draba. Granitic flatrocks, open places (fields, roadsides, woodland margins, disturbed areas). February-April; March-May. VA west to IN and KS, south to FL and TX. [= RAB, C, F, FNA, G, K, S, W, Y, Z]

*Draba cuneifolia* Nuttall ex Torrey & A. Gray var. *cuneifolia*. Open blackland prairies, preferring rocky, bare soil, also waste areas around wool-combing mills, possibly other habitats. February-March; March-April. All three varieties are primarily distributed in sw. United States, but the species extends as a native at least as far east as c. GA (Houston County) (Echols 2007) and AL, where it occurs in prairies and on limestone outcrops (Diamond & Woods 2009). [= FNA, K, Z; < *D. cuneifolia* – RAB, C, F, G, S]

*Draba platycarpa* Torrey & A. Gray. Waste areas around wool-combing mill; perhaps not established, native of sw. North America. [= FNA, K, Z]

*Draba ramosissima* Desvaux, Rocktwist, Appalachian Draba. In crevices of rock outcrops, or in dry talus slopes, over a variety of rock types (including limestone, dolostone, schist, gneiss, shale). April-May; May-July. W. MD and e. WV south through w.VA and e. KY south to w. NC and e. TN. [= RAB, FNA, K, S, W, WV, Z]

*Draba reptans* (Lamarck) Fernald. Dry soil. February-March; March-April. MA and ON west to WA, south to NC, GA, TX and CA. The few occurrences in our area seem to make little ecological or phytogeographic sense; they may represent introductions. The first collection in our area was, however, by Walter. [= RAB, FNA, K, Pa, Z; > *D. reptans* var. *reptans* – C, F, G; > *D. caroliniana* Walter – S]

\* *Draba verna* Linnaeus, Whitlow-grass. Disturbed areas, especially in dry, barren soils, including granitic flatrocks; native of Europe. February-April; March-May. [= RAB, C, FNA, K, Pa, S, W, WV, Z; > *D. verna* var. *verna* – F, G; > *D. verna* var. *boerhaavii* van Hall – F, G; = *Erophila verna* (Linnaeus) Besser]



*Eruca* P. Miller 1754 (Rocket-salad, Arugula)

A monotypic genus, an annual herb, native to Mediterranean Europe. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

\* *Eruca vesicaria* (Linnaeus) Cavanilles *ssp. sativa* (P. Miller) Thellung, Garden Rocket, Rocket-salad, Arugula. Cultivated as a salad green, persistent around gardens or occurring as a waif; native of Mediterranean Europe. May-June. [= FNA, K1, Y, Z; = *E. sativa* P. Miller – C, F, K2, Pa, WV; < *E. vesicaria* – G; < *E. eruca* (Linnaeus) Ascherson & Graebner – S]



*Erucastrum* K.B. Presl 1826 (Dog-mustard)

A genus of ca. 22 species, herbs, of Africa, Europe, and Arabia. References: Warwick in FNA (2010); Rollins (1993)=Z; Luken, Thieret, & Kartesz (1993); Al-Shehbaz (1985b)=Y.

\* *Erucastrum gallicum* (Willdenow) O.E. Schulz, Dog-mustard, Rocket-weed, French Rocket. Disturbed areas; native of Europe. April-September. Luken, Thieret, and Kartesz (1993) discuss the introduction and spread of *E. gallicum* in North America. While only weakly naturalized in our area, *E. gallicum* seems likely to increase in abundance. The report of *Brassica erucastrum* for NC in RAB is apparently based on material of *Coincya muralis* (Naczi & Thieret (1996). [= C, F, FNA, G, K, Pa, Y, Z; = *Brassica erucastrum* Linnaeus]



*Erysimum* Linnaeus 1753 (Wallflower, Treacle Mustard)

A genus of ca. 150-180 species, of the Northern Hemisphere. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988d)=Y; Rollins (1993)=Z.

- 1 Petals 13-25 (-30) mm long, 4-11 (-13) mm wide; seeds 2-3 mm long; biennial or perennial; [native, usually in thin rocky soil] .....  
 ..... *E. capitatum* var. *capitatum*
- 1 Petals 3.5-10 mm long, 1.5-3 mm wide; seeds ca. 1 mm long; annual or biennial; [introduced, usually in disturbed situations].
- 2 Sepals 1.8-3.5 mm long; petals 3.5-5.5 mm long; fruits (1-) 1.5-2.5 (-4) cm long; pedicels slender (much narrower than the fruit), 5-13 (-16) mm long ..... *E. cheiranthoides*
- 2 Sepals 4.5-6 mm long; petals 6-9 (-11) mm long; fruits (2-) 3-8 (-10) cm long; pedicels thick (as wide as the fruit or nearly so), 2-9 (-15) mm long.
- 3 Biennial or perennial; fruit 3-5.8 (-7) cm long; fruiting pedicel somewhat narrower than the fruit ..... *E. inconspicuum*
- 3 Annual; fruit (2-) 3-8 (-10) cm long; fruiting pedicel as wide as the fruit ..... *E. repandum*

*Erysimum capitatum* (Douglas ex Hooker) E.L. Greene var. *capitatum*, Western Wallflower. Shale barrens and shale woodlands, limestone bluffs and calcareous rocky woodlands. 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 (Alleghany and Bath counties), e. WV (Grant and Pendleton counties), and in ec. TN (Chester, Wofford, & Kral 1997). [= FNA, K1, K2, 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. Fields, gardens, roadsides, along railroads, other disturbed areas; native of Eurasia. June-July; July-August. [= RAB, C, F, FNA, G, K1, K2, Pa, W, WV, Y, Z; = *Cheirinia cheiranthoides* (Linnaeus) Link - S]

\* *Erysimum inconspicuum* (S. Watson) MacMillan, Shy Wallflower. Disturbed soils, especially over calcareous rocks; native of w. North America. June. NS, QC, YT, and AK, south to MD, PA, AR, OK, CO, UT, NV, and OR. [= F, FNA, G; = *E. inconspicuum* var. *inconspicuum* - K1, K2, Z; < *E. inconspicuum* - C, Y; = *E. inconspicuum* - F, FNA, G]

\* *Erysimum repandum* Linnaeus, Treacle Mustard, Bushy Wallflower. Disturbed areas; native of Eurasia. April-May; May-July. [= RAB, C, F, FNA, G, K1, K2, Pa, WV, Y, Z; = *Cheirinia repanda* (Linnaeus) Link - S]

*Hesperis* Linnaeus 1753 (Dame's Rocket)

A genus of ca. 25 species, herbs, of Eurasia and n. Africa. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988d)=Y; Rollins (1993)=Z.

\* *Hesperis matronalis* Linnaeus, Dame's Rocket. Bottomlands, roadsides, moist forests; native of Europe. April-August. The flowers are white or pink. [= RAB, C, F, FNA, G, K1, K2, Pa, S, W, WV, Y, Z]

*Iberis* Linnaeus 1753 (Candytuft)

A genus of ca. 40 species, herbs, of Eurasia and n. Africa. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z.

\* *Iberis amara* Linnaeus, Annual Candytuft. Disturbed areas; native of Europe. June-August. Reported from PA, WV, and KY (Kartesz 1999). [= C, FNA, K1, K2, Z]

\* *Iberis sempervirens* Linnaeus, Evergreen Candytuft, is reported for NC and TN by Kartesz (1999), but the specimens he cites are from cultivated material. [= FNA, K1, K2] {rejected; not keyed}



***Iodanthus*** Torrey & A. Gray 1840 (Purple Rocket)

A monotypic genus, a perennial herb, of e. North America. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988a)=Y; Rollins (1993)=Z.

**Identification notes:** *Iodanthus pinnatifidus* somewhat resembles *Hesperis matronalis* in overall appearance, but differs in the following ways: petals 10-13 mm long (vs. 20-25 mm long), siliques 2-4 cm long (vs. 5-10 cm long), pubescence of the lower stem of simple trichomes (vs. branched trichomes).

*Iodanthus pinnatifidus* (Michaux) Steudel, Purple Rocket. Rich forests of bottomlands and lower slopes. May-June. W. PA west to MN and IA, south through WV and e. and c. TN to AL and TX. [= C, F, FNA, G, K1, K2, Pa, S, WV, Y, Z]



***Isatis*** Linnaeus 1753 (Woad)

A genus of about 50 species, herbs, of Eurasia and n. Africa. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z.

\* *Isatis tinctoria* Linnaeus, Woad. Disturbed areas; native of Eurasia. April-June. Formerly cultivated as an important source of a blue dye. [= C, F, FNA, G, K1, K2, W, WV, Z]



***Leavenworthia*** Torrey 1837 (Glade Cress)

A genus of 8 species, annual herbs, endemic to e. North America. References: Al-Shehbaz & Beck in FNA (2010); Al-Shehbaz (1988a)=Y; Rollins (1993)=Z. Key adapted from Rollins (1993).

- 1 Petals entire, white, < 7 mm long; leaf lobes deeply dentate, the terminal lobe only slightly larger than the larger lateral lobes.....*L. uniflora*
- 1 Petals deeply to shallowly emarginate (notched at the tip), yellow, white, or lavender, 7-15 mm long; leaf lobes entire to shallowly dentate, the terminal lobe markedly larger than the largest lateral lobes.
  - 2 Siliques conspicuously torulose (constricted between the seeds), even when young.....*L. torulosa*
  - 2 Siliques not torulose (constricted between the seeds) (or slightly so in *L. stylosa*).
    - 3 Petals 7-10 mm long, shallowly emarginate; style 1-3 mm long; siliques flat; [of AL, GA, KY, and TN].
      - 4 Petals yellow; [of AL and TN] .....*L. exigua* var. *lutea*
      - 4 Petals white to pale lavender; [of KY, TN, and nw. GA].
        - 5 Styles 1-2 mm long; sepals pale lavender; [of TN and nw. GA] .....*L. exigua* var. *exigua*
        - 5 Styles 2-3 mm long; sepals green; [of KY] .....*L. exigua* var. *laciniata*
    - 3 Petals 10-16 mm long, deeply emarginate; styles 2.5-7 mm long; siliques thick or flat; [of AL and TN].
      - 6 Siliques thin, flat; styles 1.5-5.5 mm long; petals white to lavender; [of n. AL].
        - 7 Styles 2-5.5 mm long; mature siliques cuneate at the base and acute at the tip; [of Colbert, Franklin, and Lawrence counties, AL]..

- .....*L. alabamica* var. *alabamica*  
 7 Styles 1.5-2 (-3) mm long; mature siliques rounded at the base and at the tip; [of Morgan County, AL].....  
 .....*L. alabamica* var. *brachystyla*  
 6 Siliques thick, fleshy; styles 2.5-7 mm long; petals yellow, white, or lavender; [of n. AL and c. TN].  
 8 Siliques 12-15 mm long, 3-4 mm wide; seeds slightly elongate, cleft at one side of the long axis; [of Sumner, Smith, Wilson,  
 Davidson, Rutherford, Bedford, and Maury counties, TN] .....*L. stylosa*  
 8 Siliques 6-12 mm long, 4-5 mm wide; seeds orbicular, cleft at the basal end; [of Lawrence and Morgan counties, AL].  
 9 Siliques 6-10 mm long; styles 3-6 mm long; petals white to yellow, 10-13 mm long; [of Lawrence and Morgan counties, AL]...  
 .....*L. crassa* var. *crassa*  
 9 Siliques 8-12 mm long; styles 1.5-3.5 mm long; petals yellow, 9-11 mm long; [of Morgan County, AL] .....  
 .....*L. crassa* var. *elongata*

*Leavenworthia alabamica* Rollins var. *alabamica*. Limestone glades. March-April. Endemic to n. AL (Colbert, Franklin, and Lawrence counties). [= K1, K2, Y, Z; < *L. alabamica* – FNA]

*Leavenworthia alabamica* Rollins var. *brachystyla* Rollins. Limestone glades, other calcareous sites. March-May. Endemic to n. AL (Morgan County). [= K1, K2, Y, Z; < *L. alabamica* – FNA]

*Leavenworthia crassa* Rollins var. *crassa*. Limestone glades, disturbed calcareous soils nearby. March-May. Endemic to n. AL (Lawrence and Morgan counties). [= K1, K2, Y, Z; < *L. crassa* – FNA]

*Leavenworthia crassa* Rollins var. *elongata* Rollins. Limestone glades, disturbed calcareous soils nearby. March-April. Endemic to n. AL (Morgan County). [= K1, K2, Y, Z; < *L. crassa* – FNA]

*Leavenworthia exigua* Rollins var. *exigua*. Limestone glades, disturbed calcareous sites nearby. Endemic to the Central Basin of c. TN (8 counties) (Chester, Wofford, & Kral 1997), western Highland Rim (Decatur and Perry counties), and the Ridge and Valley of nw. GA (Walker and Catoosa counties). [= K1, K2, Y, Z; < *L. exigua* – FNA]

*Leavenworthia exigua* Rollins var. *laciniata* Rollins. Limestone glades, disturbed calcareous sites nearby. April. Endemic to the Western Highland Rim and w. Knobs of c. KY (Bullitt and Jefferson counties). [= C, K1, K2, Y, Z; < *L. exigua* – FNA]



*Leavenworthia exigua* Rollins var. *lutea* Rollins. Limestone glades, disturbed calcareous sites nearby. March-April. Endemic to the Central Basin of n. AL (Jefferson County) and c. TN (Bedford and Maury counties) (Chester, Wofford, & Kral 1997). [= K1, K2, Y, Z; < *L. exigua* – FNA]

*Leavenworthia stylosa* A. Gray. Limestone glades, disturbed calcareous sites nearby. March-April. Endemic to the Central Basin of c. TN (Sumner, Smith, Wilson, Davidson, Rutherford, Bedford, and Maury counties) (Chester, Wofford, & Kral 1997). [= FNA, K1, K2, S, Y, Z]

*Leavenworthia torulosa* A. Gray. Limestone glades, disturbed calcareous sites nearby. March-April. Endemic to the Central Basin of c. TN (10 counties), the Ridge and Valley of e. TN (Bradley and Meigs counties), and the Western Highland Rim of KY (Logan, Simpson, Todd, and Warren counties). [= C, F, FNA, G, K1, K2, S, Y, Z]

*Leavenworthia uniflora* (Michaux) Britton. Limestone glades, disturbed calcareous sites nearby. Endemic to the Central Basin of c. TN (8 counties), the Ridge and Valley of e. TN (Hamilton, Meigs, Bledsoe, and Knox counties), nw. GA (Walker and Murray counties), and c. KY (15 counties). [= C, F, FNA, G, K1, K2, S, Y, Z]



### *Lepidium* Linnaeus 1753 (Pepperwort, Peppergrass, Pepperweed)

A genus of ca. 220 species, herbs, cosmopolitan. Al-Shehbaz, Mummenhof, & Appel (2002) discuss the inclusion of *Cardaria* and *Coronopus* in *Lepidium*. References: Al-Shehbaz & Gaskin in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1986a, 1986b)=Y; Al-Shehbaz, Mummenhof, & Appel (2002)=X.

section *Lepidium*: perfoliatum, graminifolium

section *Cardamon*: sativum

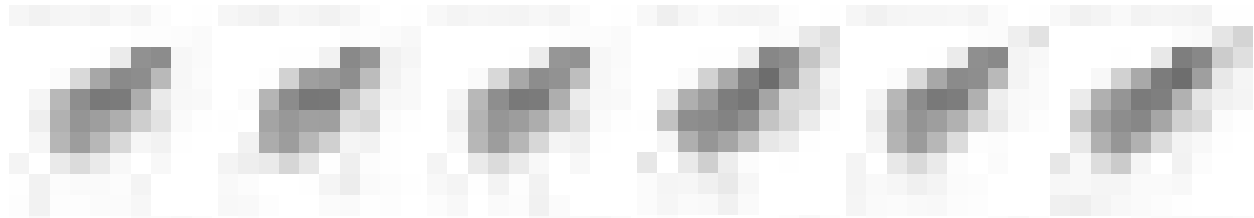
section *Lepia*: campestris

section *Dileptium*: austrinum, densiflorum, oblongum, virginicum ssp. virginicum  
 ??: didymum, draba, ruderale, africanum, bonariense, lasiocarpum, schinzii, coronopus

1 Upper cauline leaves perfoliate or sagittate.

1

- \* *Lepidium africanum* (Burm. f.) A.P. de Candolle, African Pepperwort. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= K, Y, Z]
- \* *Lepidium austrinum* Small, Southern Pepperwort. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our primary area. March-June. Also reported from MS (Bryson 1991, FNA). For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= FNA, K, Y, Z]
- \* *Lepidium bonariense* Linnaeus, Argentinian Pepperwort. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= K, Y, Z]
- \* *Lepidium campestre* (Linnaeus) R. Brown, Field Pepperwort, Cow Cress, Field Cress. Disturbed areas; native of Europe. March-June. [= RAB, C, F, FNA, G, K, Pa, W, WV, S, Y, Z; = *Neolepia campestre* (Linnaeus) W.A. Weber]
- \* *Lepidium coronopus* (Linnaeus) Al-Shehbaz. Disturbed areas; native of Europe. [= FNA; > *Lepidium squamatum* Forsskål - X; > *Coronopus squamatus* (Forsskål) Ascherson - C, K, Pa; > *Coronopus procumbens* Gilibert - F, G; = *Carara coronopus* (Linnaeus) Medikus - S]
- \* *Lepidium densiflorum* Schrader, Prairie Pepperweed, Green-flowered Peppergrass. Disturbed areas; native of w. North America. May-June. [= C, F, FNA, G, Pa, S, WV; > *L. densiflorum* var. *densiflorum* - K, Y, Z]



- \* *Lepidium didymum* Linnaeus, Wart-cress, Lesser Swine-cress. Fields, roadsides, disturbed areas; native of South America. [= FNA, X; = *Coronopus didymus* (Linnaeus) Smith - RAB, C, F, G, K, Pa, Y, Z; = *Carara didyma* (Linnaeus) Britton - S]
- \* *Lepidium draba* Linnaeus, Hoary Cress. Disturbed areas; native of Eurasia. April-August. Reported for VA by Harvill et al. (1992). Al-Shehbaz (1986) discusses 2 subspecies of *L. draba* (as *Cardaria draba*). [= FNA; = *L. draba* ssp. *draba* - X; = *Cardaria draba* (Linnaeus) Desvaux - C, F, G, Pa, Z; = *Cardaria draba* ssp. *draba* - K, Y]
- \* *Lepidium graminifolium* Linnaeus, Grassleaf Pepperwort. Introduced, especially on ballast, south to MD, PA. April-June. [= K, Y, Z]
- \* *Lepidium lasiocarpum* Nuttall ssp. *lasiocarpum*. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. March-June. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= FNA; = *L. lasiocarpum* var. *lasiocarpum* - K, Z; < *L. lasiocarpum* - Y]
- \* *Lepidium oblongum* Small. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986). [= FNA, Y; > *L. oblongum* var. *oblongum* - K, Z]
- \* *Lepidium perfoliatum* Linnaeus, Perfoliate Pepperwort, Claspig Pepperweed, Shieldcress. Disturbed areas; native of Europe. April-May. [= RAB, C, F, FNA, G, K, Pa, Y, Z]



- \* *Lepidium ruderale* Linnaeus, Narrowleaf Pepperwort, Stinking Pepperweed. Disturbed areas; native of Europe. April-June. [= RAB, C, F, FNA, G, K, S, Y, Z]
- \* *Lepidium sativum* Linnaeus, Garden Cress. Disturbed areas. Reported for scattered locations in sc. and se. PA (Rhoads & Block 2007) and VA (K based on Massey 1961). May-August. [= C, F, FNA, G, K, Pa, 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 virginicum* Linnaeus ssp. *virginicum*, Poor Man's Pepper. Disturbed areas. April-June (and sporadically later). *L. virginicum* var. *virginicum* is widespread in e. and c. North America; also introduced in various places elsewhere in the world. Rollins (1993) interprets *L. virginicum* as having seven additional varieties, all in western North America and Central America. For North America, FNA recognizes two subspecies, a course followed here. [= FNA; = *L. virginicum* var. *virginicum* - C, G, K, Y, Z; < *L. virginicum* - RAB, F, Pa, S, W, WV]





***Lobularia*** Desvaux 1815 (Sweet Alyssum)

A genus of 4 species, herbs, of Eurasia and Macaronesia. References: Borgen in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y.

\* ***Lobularia maritima*** (Linnaeus) Desvaux, Sweet Alyssum. Disturbed areas, lawns; native of Europe. June-November. The NC occurrences are doubtfully established, from gardens and a "lawn." [= C, F, FNA, G, K, Pa, Y, Z]



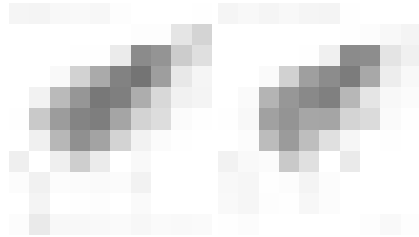
***Lunaria*** Linnaeus 1753 (Honesty)

A genus of 3 species, biennial herbs, of Europe. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1987)=Y. Key based on Z.

- 1 Upper cauline leaves coarsely and irregularly dentate, the teeth acute to obtuse, sometimes with a mucro or short linear tip < 0.5 mm long; siliques broadly rounded at both ends (when mature – young siliques may be cuneate and acute); plant annual or biennial..... ***L. annua***
- 1 Upper cauline leaves spinulose-dentate, the teeth acuminate and usually with a linear tip > 0.5 mm long; siliques cuneate at the base, acute at the tip; plant perennial ..... [***L. rediviva***]

\* ***Lunaria annua*** Linnaeus, Annual Honesty, Silver-dollar. Escaped from cultivation around gardens, not usually persistent; native of se. Europe. April-June. [= C, F, FNA, G, K, Pa, Z]

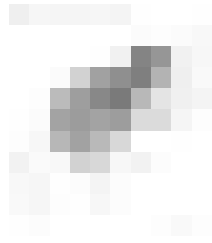
\* ***Lunaria rediviva*** Linnaeus, Perennial Honesty. Cultivated ornamental, perhaps persistent around gardens; rare, native of Europe. Reported for VA by Kartesz (1999), on the basis of a specimen at VPI. April-June. [= C, F, FNA, G, K, Pa, Z]



***Matthiola*** W.T. Aiton 1812 (Stock)

A genus of about 50 species, herbs, mainly of Eurasia and Africa. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z.

\* ***Matthiola incana*** (Linnaeus) R. Brown, Stock. Disturbed dunes, sandy fields, vacant lots; native of Europe. Reported for the Buxton area, Dare County, NC, by Burk (1961). [= FNA, K, Z]



***Microthlaspi*** F.K. Meyer 1973 (Penny-cress)

A genus of 4 species, annual herbs, of Europe, Asia, and n. Africa. Mummenhoff & Koch (1994) and Meyer (1973, 1979) discuss the reasons for separating *Microthlaspi* from *Thlaspi*. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Thieret & Baird (1985)=Y; Mummenhoff & Koch (1994)=X; Al-Shehbaz (1986)=V.

\* ***Microthlaspi perfoliatum*** (Linnaeus) F.K. Meyer, Perfoliate Penny-cress, Thoroughwort Penny-cress. Fields, disturbed areas; native of Europe. March-May; April-June. [= FNA, K, X; = *Thlaspi perfoliatum* Linnaeus – RAB, C, F, G, Pa, V, W, WV, Y, Z]



***Myagrum*** Linnaeus 1753

A genus of 1 species, an annual herb, native of s. Europe and sw. Asia. References: Al-Shehbaz in FNA (2010).

\* ***Myagrum perfoliatum*** Linnaeus. {habitat}; native of Mediterranean Europe and w. Asia. Reported for VA (FNA). [= FNA]



***Nasturtium*** R. Brown 1812 (Watercress)

A genus of 5 species, perennial herbs, of Eurasia, n. Africa, and North America. Al-Shehbaz & Price (1998) summarize the reasons for separating *Nasturtium* from *Rorippa*; Franzke et al. (1998) provide corroboration based on molecular analysis. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Stuckey (1972)=Y; Green (1962)=X; Al-Shehbaz & Price (1998)=V; Al-Shehbaz (1988a)=Q; Franzke et al. (1998).

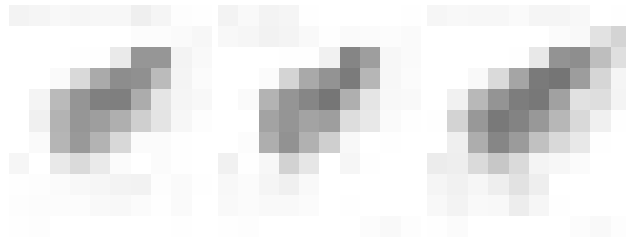
- 1 Petioles of emergent leaves lacking auricles toward the base; seeds yellowish-brown, finely reticulate, with 400-500 polygonal depressions on each side ..... ***N. floridanum***
- 1 Petioles of emergent leaves auriculate toward the base; seeds reddish-brown, rather coarsely reticulate, with 25-150 (-175) polygonal depressions on each side.
  - 2 Mature siliques 1-1.5 mm wide, terete or subterete; seeds in 1 row in each locule of the silique; seeds with (75-) 100-150 (-175) polygonal depressions on each side..... ***N. microphyllum***
  - 2 Mature siliques (1.8-) 2-3 mm wide, flattened; seeds in 2 rows in each locule of the silique; seeds with 25-50 (-60) polygonal depressions on each side..... ***N. officinale***

***Nasturtium floridanum*** (Al-Shehbaz & Rollins) Al-Shehbaz & R.A. Price, Florida Watercress. Spring runs, blackwater bottomlands. March-May. Ne. FL and e. Panhandle FL south to s. FL; endemic to FL, but north to counties adjacent to se. GA. [= FNA, V; = *Rorippa floridana* Al-Shehbaz & Rollins – K, WH, Z; < *Nasturtium microphyllum* Boenninghausen ex Reichenbach – GW, misapplied; *Nasturtium stylosum* Shuttleworth ex O.E. Schulz] {synonymy incomplete}

\* ***Nasturtium microphyllum*** Boenninghausen ex Reichenbach, Narrow-fruited Watercress. Streams, springs; native of Europe. See Green (1962) for additional information. [= FNA, Pa, 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. Streams, springs, seepages; native of Eurasia. April-July. [= FNA, GW, Pa, V, WV; = *Rorippa nasturtium-aquaticum* (Linnaeus) Hayek – C, K, Q, WH, X, Z; < *Nasturtium officinale* – RAB, G, W (also see *N. microphyllum*); > *Nasturtium officinale* var. *officinale* – F; > *Nasturtium officinale* var. *siifolium* (Reichenbach) W.D.J. Koch – F; = *Sisymbrium nasturtium-aquaticum* Linnaeus – S]



***Orychophragmus* Bunge 1833 (Purple-mistress)**

A genus of 7 species, herbs, of s. Europe and n. Africa. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z.

\* *Orychophragmus violaceus* (Linnaeus) O.E. Schulz, Purple-mistress. Disturbed areas; native of Mediterranean Europe. March-May. Introduced and apparently well established in and around Richmond, VA; originally reported as *Moricandia arvensis* (Rollins 1993), a misidentification. [= FNA; >> *Moricandia arvensis* (Linnaeus) A.P. de Candolle – K, Z, misidentification]



***Paysonia* O'Kane & Al-Shehbaz 2002 (Bladderpod)**

A genus of 8-9 species, herbs, endemic to southeastern United States. O'Kane & Al-Shehbaz (2002) clearly show that *Paysonia* is not a part of *Lesquerella*, which itself is included within *Physaria*. References: O'Kane in FNA (2010); Rollins (1993)=Z; Rollins & Shaw (1973)=Y; O'Kane & Al-Shehbaz (2002)=X; Al-Shehbaz (1987)=V. Key adapted from X and Z.

- 1 Cauline leaves cuneate or petiolate at the base, not auriculate; flowers yellow .....[see *Physaria*]
- 1 Cauline leaves expanded at the base, usually auriculate; flowers yellow or white.
  - 2 Siliques strongly compressed parallel to the plane of the septum, orbicular; valves pubescent with a mixture of large, simple, bulbous-based trichomes and smaller branched trichomes; flowers yellow ..... *Paysonia lescurii*
  - 2 Siliques not compressed, nearly globose, subglobose, pyriform, or slightly bilobed; valves glabrous or pubescent with only a single type of trichome; flowers white or yellow.
    - 3 Flowers white; siliques pyriform, depressed globose, or slightly bilobed; septum (of the silique) perforate or nearly absent.
      - 4 Siliques glabrous or very sparsely pubescent, subpyriform; valves (of the silique) papery, densely pubescent on the interior; styles glabrous ..... *Paysonia perforata*
      - 4 Siliques densely pubescent, depressed globose or slightly bilobed; valves (of the silique) glabrous on the interior; styles hirsute ..... *Paysonia stonensis*
    - 3 Flowers yellow; siliques globose to subglobose; septum (of the silique) complete.
      - 5 Siliques densely pubescent; styles pubescent (at least near base) ..... *Paysonia densipila*
      - 5 Siliques glabrous; styles glabrous ..... *Paysonia lyrata*

*Paysonia densipila* (Rollins) O'Kane & Al-Shehbaz, Duck River Bladderpod. Calcareous glades, sometimes in fields and bottomlands. Endemic to an area from c. TN south to n. AL. [= FNA, X; = *Lesquerella densipila* Rollins – K, V, Y, Z]

*Paysonia lescurii* (A. Gray) O'Kane & Al-Shehbaz, Lescur's Bladderpod. Calcareous glades, fields, bottomlands. Endemic to an area from sc. KY south through c. TN to n. AL. [= FNA, X; = *Lesquerella lescurii* (A. Gray) S. Watson – K, S, V, Y, Z]

*Paysonia lyrata* (Rollins) O'Kane & Al-Shehbaz, Lyreleaf Bladderpod. Calcareous glades. Endemic to Colbert, Franklin, and Lawrence counties, AL. [= FNA, X; = *Lesquerella lyrata* Rollins – K, V, Y, Z]

*Paysonia perforata* (Rollins) O'Kane & Al-Shehbaz, Spring Creek Bladderpod. Calcareous glades, fields, pastures. Endemic to Rutherford and Wilson counties, TN (Chester, Wofford, & Kral 1997). [= FNA, X; = *Lesquerella perforata* Rollins – K, V, Y, Z]

*Paysonia stonensis* (Rollins) O'Kane & Al-Shehbaz, Stones River Bladderpod. Floodplains, fields, pastures. Endemic to Rutherford County, TN (Chester, Wofford, & Kral 1997). [= FNA, X; = *Lesquerella stonensis* Rollins – K, V, Y, Z]



**Physaria** (Nuttall ex Torrey & A. Gray) A. Gray

A genus of about 98 herbs, of temperate North America and South America (Al-Shehbaz & O'Kane 2002). The genus is most diverse in sw. North America. References: O'Kane in FNA (2010); Rollins (1993)=Z; Rollins & Shaw (1973)=Y; Al-Shehbaz & O'Kane (2002)=X; Al-Shehbaz (1987)=V. Key adapted from Rollins (1993).

- 1 Cauline leaves expanded at the base, usually auriculate; flowers yellow or white..... [see *Paysonia*]
- 1 Cauline leaves cuneate or petiolate at the base, not auriculate; flowers yellow.
  - 2 Fruits (1-) 2-3 mm long, slightly pubescent on the exterior; petals 3.5-6.5 (-7.5) mm long, bright yellow; biennial or perennial from branched, woody caudex..... *P. globosa*
  - 2 Fruits 3-8 mm long, glabrous on the exterior; petals 5-11 mm long, either pale yellow or bright yellow to orange; annual, biennial, or short-lived perennial from a fine taproot.
    - 3 Stems to 2.5 dm long; basal leaves 1-2.4 cm long, entire or sinuate; petals pale yellow..... [*P. filiformis*]
    - 3 Stems 1-7 dm long; basal leaves 1.5-5 (-8) cm long, lyrate-pinnatifid (rarely merely dentate or entire); petals bright yellow to orange.
      - 4 Fruiting pedicels sigmoid, 5-15 (-25) mm long; gynophore 0.5-1 mm long..... *P. gordonii*
      - 4 Fruiting pedicels straight or slightly curved, (7-) 10-20 (-25) mm long; gynophore 1-2 mm long..... *P. gracilis* ssp. *gracilis*

*Physaria filiformis* (Rollins) O'Kane & Al-Shehbaz, Missouri Bladderpod. Reported for AL (FNA), apparently erroneously (Yatskievich, 2010, pers. comm.). [= FNA, X; = *Lesquerella filiformis* Rollins – K, V, Y, Z] {rejected}

*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 gordonii* (A. Gray) O'Kane & Al-Shehbaz, Gordon's Bladderpod. Mt (VA): shaly roadside; rare, native of farther west. Rollins (1993) reports this species (identification unconfirmed) as a waif along the Blue Ridge Parkway, VA; it may not be established. [= FNA; > *P. gordonii* ssp. *gordonii* – X; > *Lesquerella gordonii* (A. Gray) S. Watson var. *gordonii* – Z; = *Lesquerella gordonii* – K, Y]

*Physaria gracilis* (Hooker) S. Watson ssp. *gracilis*. TN, IL, MO, and OK south to AL, MS, LA, and TX. [= X; < *Lesquerella gracilis* – F, G; = *Lesquerella gracilis* (Hooker) S. Watson ssp. *gracilis* – K, V, Z] {not yet keyed}



**Planodes** E.L. Greene 1912 (Virginia-cress)

A genus of 2 species, of North America and Mexico. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (2010)=Z; Al-Shehbaz (1988a)=Y; Rollins (1993)=Z.

*Planodes virginicum* (Linnaeus) E.L. Greene, Virginia-cress, Sibara. Disturbed areas, fields, roadsides. February-June. VA west to IL, IA, and KS, south to FL and TX. A native weed, presumably much more common now than formerly. [= FNA, Z; = *Sibara virginica* (Linnaeus) Rollins – RAB, C, F, G, K, W, WV, Y, Z; = *Arabis virginica* (Linnaeus) Poirlet – S]



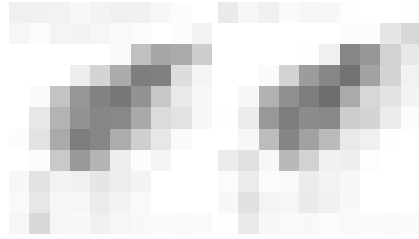
**Raphanus** Linnaeus 1753 (Radish)

A genus of 3 species, herbs, of the Old World. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y; Stace (2010)=X.

- 1 Siliques moniliform (constricted between the seeds), the silique body about the same diameter for most of its length, longitudinally grooved; petals usually yellow, fading white (rarely purple); seeds 4-12 per silique ..... *R. raphanistrum* ssp. *raphanistrum*
- 1 Siliques not moniliform, the silique body tapered from its widest point below the middle to the apex, smooth or slightly longitudinally grooved; petals usually purple (rarely white); seeds 1-3 (-5) per silique ..... *R. sativus*

\* *Raphanus raphanistrum* Linnaeus ssp. *raphanistrum*, Wild Radish, Jointed Charlock, White Charlock. Fields, roadsides, disturbed areas; native of Mediterranean Europe. March-June (and sporadically later). European authors (such as Stace 2010) recognize several infraspecific taxa in *R. raphanistrum*; North American material represents ssp. *raphanistrum*. [= *R. raphanistrum* ssp. *raphanistrum* – FNA, X; < RAB, C, F, G, K, Pa, W, WH, WV, Y, Z]

\* *Raphanus sativus* Linnaeus, Radish, Garden Radish. Persistent after cultivation or as a "throwout"; native of Mediterranean Europe. April-June. Cultivated for at least 5000 years. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, WV, X, Y, Z]



*Rapistrum* Crantz 1769 (Bastard-cabbage)

A genus of 2 species, herbs, of Europe. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y.

\* *Rapistrum rugosum* (Linnaeus) Allioni, Annual Bastard-cabbage. Waste areas around wool-combing mills, other disturbed ground; native of Mediterranean Europe. Also naturalized at scattered sites in e. TN (Chester, Wofford, & Kral 1997), PA (Rhoads & Klein 1993), and elsewhere. [= C, F, FNA, Z; > *R. rugosum* var. *rugosum* – G; > *R. rugosum* ssp. *rugosum* – K, Y]



*Rorippa* Scopoli (Yellow Cress, Marshcress)

A genus of about 75 species, herbs, cosmopolitan. The separation of *Nasturtium* from *Rorippa* is warranted (Al-Shehbaz & Price 1998); Franzke et al. (1998) provide corroboration based on molecular analysis. The species treated here as *R. aquatica* has been placed in several genera in recent years. References: Al-Shehbaz in FNA (2010); Al-Shehbaz (1988a)=X; Rollins (1993)=Z; Stuckey (1972)=Y; Al-Shehbaz & Bates (1987)=V; Les, Anderson, & Cleland (1995)=U; Al-Shehbaz (1988a)=Q. Key modified from FNA.

- 1 Plant a submerged aquatic, rooting from lower nodes; leaves of two forms, the submerged pectinately divided, the emergent simple, sometimes lobed; fruit <2.5× as long as wide; petals white ..... *R. aquatica*
- 1 Plant terrestrial or of wet places, not rooting from lower nodes; leaves of one form, pinnately lobed or simple; fruit >2.5× as long as wide; petals yellow or pale yellow (or absent).
- 2 Plant a rhizomatous, colony-forming perennial; petals (2.0-) 2.8-6.0 mm long; siliques 3-15× as long as wide.
- 3 Stems branched at the base, decumbent to ascending; leaf sinuses not reaching the midrib, the lateral segments entire to weakly toothed; siliques 3-6× as long as wide ..... [*R. sinuata*]
- 3 Stems branched in the upper portions, erect; leaf sinuses reaching the midrib, the lateral segments often sharply toothed; siliques 6-15× as long as wide ..... *R. sylvestris*
- 2 Plant a taprooted annual or biennial; petals 0-3.5 mm long; siliques either 2-9 (-10)× or 15-50× as long as wide.
- 4 Flowers nearly sessile; petals absent; lower fruiting pedicels 0.5-1.5 mm long; siliques (3-) 5.4-8.5 (-10.2) mm long, (1.4-) 1.8-2.6 (-3.3) mm wide, mostly 3-5× as long as wide ..... *R. sessiliflora*
- 4 Flowers clearly pedicellate; petals present (or absent in *R. dubia*); lower fruiting pedicels > 4 mm long; siliques 4-20 mm long, either 2-9 (-10)× or 15-50× as long as wide.
- 5 Siliques (7-) 10-40 mm long, 15-50× as long as wide.
- 6 Siliques straight, (15-) 25-40 mm long, 0.7-0.9 (-1.0) mm wide; seeds uniseriate ..... *R. dubia*
- 6 Siliques curved, (7-) 10-24 (-30) mm long, 1-1.5 (-2) mm wide; seeds biseriate ..... *R. indica*

- 5 Siliques 2.5-12.5 (-20.4) mm long, 2-9 (-10)× as long as wide.
- 7 Siliques (5.2-) 8.5-12.5 (-20.4) mm long, (4-) 6-9 (-10)× as long as wide; leaves deeply pinnatifid, the pinnae themselves toothed, lobed or dissected; seeds 0.4-0.5 mm long, 100-150 per silique ..... **R. teres**
- 7 Siliques 2.5-9 mm long, 2-5× as long as wide; leaves serrate, lobed, or pinnately dissected, the pinnae (when present) merely toothed; seeds 0.5-0.9 mm long, 20-80 per silique.
- 8 Leaves hirsute on the lower surface; stems hirsute usually up to the terminal raceme..... **R. palustris ssp. hispida**
- 8 Leaves glabrous on the lower surface; stems glabrous or sparsely hirsute..... **R. palustris ssp. palustris**

**Rorippa aquatica** (Eaton) E.J. Palmer & Steyermark, Lake Cress. Shallow water of swamps and lake margins. VT west to MN, south to s. GA, FL, and e. TX, widely scattered and probably dispersed by waterfowl. See Al-Shehbaz & Bates (1987) and Les, Anderson, & Cleland (1995) for additional information on this interesting plant. Apparently most closely related to *Rorippa*, and here included there. [= FNA, = *Neobeckia aquatica* (Eaton) Greene – K, S, U; = *Armoracia lacustris* (A. Gray) Al-Shehbaz & V. Bates – C, Q, V, Z; = *Armoracia aquatica* (Eaton) Wiegand – F, G, GW; = *Rorippa americana* (A. Gray) Britton]

\* **Rorippa dubia** (Persoon) H. Hara. Disturbed wet places; native of se. Asia. [= FNA; = *R. indica* (Linnaeus) Hiern var. *apetala* Hochreutiner – K1, K2, Z] {add X, Y to synonymy}

\* **Rorippa indica** (Linnaeus) Hiern, Indian Yellow-cress. River banks and bars; native of se. Asia. Reported for VA (VBA, G. Fleming, pers. comm. 2009). [= C, Y; = *R. indica* var. *indica* – K1, K2, Z] {add X to synonymy}

**Rorippa palustris** (Linnaeus) Besser ssp. **hispida** (Desvaux) Jonsell. Moist soils. NL (Labrador) to AK, south to c. VA (Amelia County), IL, NE, NM, and n. CA. Al-Shehbaz (1988a) considers reports of this taxon in the Southeast to be misidentifications of var. *fernaldiana*. [= FNA, K; = *Rorippa palustris* var. *hispida* (desvaux) Rydberg – C, Z; = *Rorippa islandica* (Oeder) Bolbás var. *hispida* (Desvaux) Butters & Abbe – F, G; < *Rorippa palustris* – Pa; = *Radicula hispida* (Desvaux) Heller – S; = *Rorippa palustris* ssp. *hispida* (Desvaux) Jonsell var. *hispida* – Y]

**Rorippa palustris** (Linnaeus) Besser ssp. **palustris**, Marshcress. Marshes, bogs, seeps. May-October. ME and NB west to SK, south to FL, TX, ID, and n. South America. [> *Rorippa palustris* var. *palustris* – C, Z; > *Rorippa islandica* var. *islandica* – F, G, misapplied; = *Rorippa palustris* ssp. *palustris* – K, X; < *Rorippa palustris* – Pa; = *Radicula palustris* (Linnaeus) Moench – S; = *Rorippa palustris* ssp. *palustris* var. *palustris* – Y; > *Rorippa palustris* var. *fernaldiana* (Butters & Abbe) R. Stuckey – C, Z; = *Rorippa islandica* (Oeder) Bolbás – RAB, misapplied; > *Rorippa islandica* var. *fernaldiana* Butters & Abbe – F, G, WV, misapplied; < *Rorippa palustris* – GW, W; > *Rorippa palustris* ssp. *fernaldiana* (Butters & Abbe) Jonsell – K, X; > *Rorippa palustris* ssp. *glabra* (O.E. Schulz) R. Stuckey var. *fernaldiana* (Butters & Abbe) R. Stuckey – Y]

**Rorippa sessiliflora** (Nuttall ex Torrey & A. Gray) A.S. Hitchcock, Stalkless Marshcress. Wet places, marshes, swamps. April-July. MD, WV (Cusick 1994), OH, IN, IL, MN, and NE south to Panhandle FL, s. AL, LA, and c. TX. [= RAB, C, F, FNA, G, GW, K, W, X, Y, Z; = *Radicula sessiliflora* (Nuttall ex Torrey & A. Gray) E.L. Greene – S]

**Rorippa sinuata** (Nuttall) A.S. Hitchcock. Riverbanks, pond margins. C. and w. North America, east to ON, MN, WI, IL, w. KY, TN, AR, and LA. [= C, F, FNA, G, GW, K, X, Y, Z]

\* **Rorippa sylvestris** (Linnaeus) Besser, Creeping Yellow Cress. Lawns, disturbed moist to wet soils; native of Eurasia. May-August. [= RAB, C, F, FNA, G, GW, K, Pa, W, WV, X, Y, Z; = *Radicula sylvestris* (Linnaeus) Druce – S]

**Rorippa teres** (Michaux) R. Stuckey. Cypress-gum ponds, marshes, swamps, ditches, disturbed wet areas. March-May. Se. NC south to s. FL, west to se. OK, sw. TX, and s. and w. Mexico (Sinaloa). [= C, FNA, K; > *Rorippa teres* var. *teres* – GW, X, Y, Z; = *Rorippa walteri* – RAB; = *Radicula walteri* (Elliott) E.L. Greene – S]



***Sinapis* Linnaeus 1753 (Mustard)**

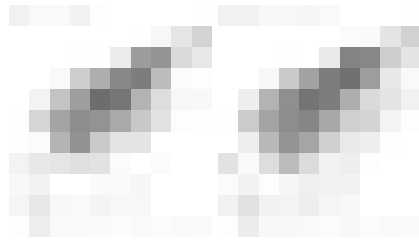
A genus of 7 species, herbs, of s. Europe. References: Warwick in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985b)=Y. Key adapted from Z and C.

- 1 Beak of silique strongly compressed; silique densely covered with long, stiff trichomes, ca. 4 mm in diameter; pedicels slender, mostly at right angles to the rachis; seeds 4-8 per silique; [section *Sinapis*]..... **S. alba**

1 Beak of silique conical; silique glabrous or nearly so, ca. 2 mm in diameter; pedicels thick, erect to spreading; seeds 7-13 per silique; [section *Ceratosinapis*] .....*S. arvensis*

\* *Sinapis alba* Linnaeus, White Mustard, Yellow Mustard. Disturbed areas; native of Mediterranean Europe. April-June. The seeds of this species are one source of table mustard; other species used include *Brassica juncea* and *B. nigra*. [= C, K, Pa, S, Y, Z; ? *Brassica hirta* – RAB, F, G, WV]

\* *Sinapis arvensis* Linnaeus, Charlock, Crunchweed, Wild Mustard. Disturbed areas; native of Mediterranean Europe. April-July. [= C, K, Pa, S, Y, Z; ? *Brassica kaber* (A.P. de Candolle) L.C. Wheeler – RAB, G; > *Brassica kaber* var. *pinatifida* (Stokes) L.C. Wheeler – F, WV]



*Sisymbrium* Linnaeus (Jim Hill Mustard)

A genus of about 41 species, herbs, mainly northern hemisphere. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1986b, 1988)=Y.

1 Silique linear, 5-10 cm long; spreading from the rachis; pedicels 5-20 mm long; petals 6-8 mm long ..... *S. altissimum*

1 Silique subulate, 0.8-1.5 cm long, appressed to the rachis; pedicels 1-3 mm long; petals 3-4 mm long ..... *S. officinale*

\* *Sisymbrium altissimum* Linnaeus, Tumble Mustard, Jim Hill Mustard. Fields, disturbed areas; native of Eurasia. May-June. [= RAB, C, F, FNA, G, Pa, W, WV, Y, Z; = *Norta altissima* (Linnaeus) Britton – 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; native of Europe. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986b). [= C, F, FNA, G, K, Y, Z] {not keyed}

\* *Sisymbrium loeselii* Linnaeus. Disturbed areas, waif around wool-combing mills; native of e. Europe and w. Asia. [= C, F, FNA, G, K, Y, Z] {not yet keyed}

\* *Sisymbrium officinale* (Linnaeus) Scopoli, Hedge Mustard. Fields, pastures, barnyards, disturbed areas; native of Europe. [= C, FNA, K, Pa, WH, Y, Z; > *S. officinale* var. *leiocarpum* A.P. de Candolle – RAB, F, G, W, WV; > *S. officinale* var. *officinale* – RAB, F, G, W, WV; = *Erysimum officinale* Linnaeus – S]

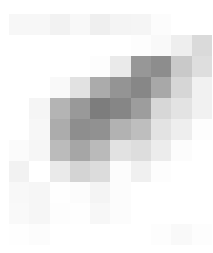
\* *Sisymbrium turchaninowii* Sonderegger, Russian Rocket. Waif around wool-combing mills in Coastal Plain of SC; there appears to be little evidence that it is established in our area. For further information and keys, see Rollins (1993) and Al-Shehbaz (1986b). [= K, Y, Z] {not keyed}



*Teesdalia* Aiton f. 1812 (Shepherd's Cress)

A genus of 3 species, herbs, of Europe, n. Africa, and the Middle East. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Appel (1998); Al-Shehbaz (1986)=Y.

\* *Teesdalia nudicaulis* (Linnaeus) Aiton f., Shepherd's Cress, Hedge Mustard, Bank Cress. Lawns, fields, roadsides, disturbed areas; native of Europe. March-April; April-June. [= RAB, C, F, FNA, G, K, Y, Z]



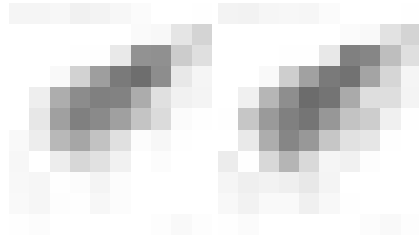
***Thlaspi* Linnaeus 1753 (Penny-cress)**

A genus of about 6 species, as much more narrowly circumscribed, annual herbs, native to Eurasia and n. Africa. Mummenhoff & Koch (1994), Meyer (1973, 1979), and Koch & Al-Shehbaz (2004) discuss the reasons for separating *Microthlaspi* from *Thlaspi*. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1986)=Y. [also see *Microthlaspi*]

- 1 Siliques 5-8 mm long, 2-4 mm wide; seeds brown, alveolate; lower stem with scattered long hairs; fresh plant smelling of garlic when crushed; [section *Pterotropis*]..... ***T. alliaceum***  
 1 Siliques (8-) 10-17 mm long, 7-12 mm wide; seeds brown, concentrically ridged; lower stem glabrous; fresh plant not smelling of garlic when crushed; [section *Thlaspi*] ..... ***T. arvense***

\* ***Thlaspi alliaceum*** Linnaeus, Garlic Penny-cress. Fields, disturbed areas, roadsides; native of Europe. March-April; April-May. [= RAB, FNA, K, Pa, Y, Z]

\* ***Thlaspi arvense*** Linnaeus, Field Penny-cress, Frenchweed. Fields, disturbed areas; native of Europe. March-June; April-July. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, WV, Y, Z]



***Turritis* Linnaeus 1753 (Tower Mustard)**

A genus of 2 species, annual or biennial herbs, circumboreal. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1988a)=Y; Koch, Bishop, & Mitchell-Olds (1999); Koch & Al-Shehbaz (2002).

***Turritis glabra*** Linnaeus, Tower Mustard. Open disturbed areas, forest edges. May-June; July-August. Circumboreal, south in North America to NC, sc. TN (Chester, Wofford, & Kral 1997), AR, KS, NM, and CA. Possibly only an introduction in our area. [= FNA; = *Arabis glabra* (Linnaeus) Bernhardi – RAB, C, F, G, W; > *A. glabra* var. *glabra* – Y, Z]



***Warea* Nuttall 1834 (Warea, Pineland-cress)**

A genus of 4 species, annual herbs, of se. North America. The genus is endemic to se. United States, consisting of our species and two others of peninsular FL. This is the only genus of tribe *Thelypodieae* in our area. References: Al-Shehbaz in FNA (2010); Rollins (1993)=Z; Al-Shehbaz (1985a)=Y; Channell & James (1964).

**Identification notes:** *Warea* (Brassicaceae) and *Polanisia* (Cleomaceae) are superficially similar. The genus is quite showy and conspicuous, reminiscent of a small *Cleome* because of its white to pink, clawed petals and silique borne on a long gynophore.

- 1 Leaves cuneate at the base; petals white to pink..... ***W. cuneifolia***  
 1 Leaves rounded or slightly auriculate at the base; petals deep purple..... ***W. sessilifolia***



*Warea cuneifolia* (Muhlenberg ex Nuttall) Nuttall, Carolina Warea, Carolina Pineland-cress. Xeric white sands of sandhills, primarily in Sandhill Region. July-September; August-September. Sc. NC south to Panhandle FL and se. AL. [= RAB, FNA, K, S, WH, Y, Z]

*Warea sessilifolia* Nash, Sessile-leaf Warea, Sessile-leaf Pineland-cress. Sandhills. August-September. Panhandle FL and adjacent AL (Pike County) and wc. GA (Stewart County) (Sorrie 1998b). [= FNA, K, S, WH, Y, Z]



277. **OLACACEAE** A.L. de Jussieu ex R. Brown in Tuckey 1818 (Olax Family) [in SANTALALES]

A family of about 14 genera and 100 species, trees, shrubs, and woody vines, pantropical in distribution. Sometimes further divided, as by Nickrent et al. (2010), in which case *Ximenia* is placed in Ximeniaceae. References: Nickrent et al. (2010).

*Ximenia* Linnaeus 1753 (Tallow-wood)

A genus of about 8 species, root-parasitic shrubs, tropical. *Ximenia* is placed in the segregate family Ximeniaceae by Nickrent et al. (2010).

*Ximenia americana* Linnaeus, Tallow-wood, Hog-plum. Hammocks, pine flatwoods, scrub. FL peninsula, north to Duval County, FL; Bahamas, West Indies, neotropics, paleotropics. [= K, S, WH]



279. **SANTALACEAE** R. Brown 1820 (Sandalwood Family) [in SANTALALES]

A family of about 41 genera and 930 species, trees, shrubs, and herbs, primarily of tropical and warm temperate regions of the Old World and New World. All members of the family are hemiparasitic, attaching to the stems or roots of other plants. Viscaceae are closely related to and should either be included in the Santalaceae (Angiosperm Phylogeny Group 2003, 2009), as done here, or the contrasting approach should be taken, involving the segregation of smaller, monophyletic families (Nickrent et al. 2010). In our area, this would mean Santalaceae s.s. (*Nestronia*), Cervantesiaceae (*Pyralaria*), Thesiaceae (*Buckleya*), Comandraceae (*Comandra*), and Viscaceae (*Phoradendron*) (Nickrent et al. 2010). References: Nickrent et al. (2010); Nickrent & Malécot (2001).

- 1 Leaves alternate; monoecious herb or shrub.
  - 2 Herb, < 2 (-3) dm tall; leaves 1-4 cm long, glabrous; inflorescence a terminal panicle of cymes; [tribe *Comandreae* or family **COMANDRACEAE**] ..... **Comandra**
  - 2 Shrub, > 4 dm tall; leaves 5-15 cm long, pubescent; inflorescence a terminal raceme; [tribe *Pyralarieae* or family **CERVANTESIACEAE**] ..  
..... **Pyralaria**
- 1 Leaves opposite; dioecious shrubs.
  - 3 Aerial shrubs, parasitic on treetrunks and branches; leaves coriaceous, brittle when live; [tribe *Visceae* or family **VISCACEAE**].....  
..... **Phoradendron**
  - 3 Terrestrial shrubs, parasitic via root connections; leaves herbaceous, flexible when live.
    - 4 Staminate flowers in terminal umbel-like dichasia; pistillate flowers (and fruits) solitary, terminal; clumped shrub to 4 m tall; [tribe *Thesiae* or family **THESIACEAE**] ..... **Buckleya**
    - 4 Staminate flowers in axillary umbels; pistillate flowers (and fruits) solitary, axillary; rhizomatous shrub to 1 m tall; [tribe *Santaleae* or family **SANTALACEAE**] ..... **Nestronia**

*Buckleya* Torrey (Piratebush)

A genus of 5 species, shrubs, of temperate e. North America and e. Asia; the 3 species other than our own are *B. lanceolata* of Japan, and *B. henryi*, *B. graebneriana*, and *B. angulosa* of China. *Buckleya* is placed in the segregate family Thesiaceae by Nickrent et al. (2010). References: Carvell & Eshbaugh 1982=Z; Massey et al. (1983).

***Buckleya distichophylla*** (Nuttall) Torrey, Piratebush. Dry or rocky bluffs and slopes. April-May; June-October. A Southern Appalachian endemic: sw. VA south through ne. TN to sw. NC, in the western edge of the Blue Ridge and to the west in the Ridge and Valley. It is apparently parasitic on a variety of hosts – not limited to *Tsuga*, as has sometimes been reported. The branches are often mistaken for a compound leaf. [= RAB, C, F, G, K, S, W, Z]

#### ***Comandra*** Nuttall (Bastard-toadflax)

A genus of 2 species (the only other species European). *Comandra* is placed in the segregate family Comandraceae by Nickrent et al. (2010).

***Comandra umbellata*** (Linnaeus) Nuttall var. *umbellata*, Eastern Bastard-toadflax. Dry forests and woodlands, woodland borders. April-June; July. Var. *umbellata* ranges from ME to MI, south to n. GA and AL; other varieties are western. [= C; < *C. umbellata* – RAB, Pa, W, WV; = *C. umbellata* ssp. *umbellata* – K; ? *C. umbellata* – S; > *C. umbellata* – F, G; > *C. richardsiana* – F, G]

#### ***Nestronia*** Rafinesque (Nestronia)

A monotypic genus, a shrub, endemic to se. United States. *Nestronia* is placed in a much more narrowly circumscribed Santalaceae by Nickrent et al. (2010). References: Libby & Bloom (1998).

**Identification notes:** In its clonal, usually knee-high growth, *Nestronia* has something of the aspect of an opposite-leaved lowbush blueberry.

***Nestronia umbellula*** Rafinesque, Nestronia, Conjuror's-nut, Leechbrush. Relatively mesic sites in sandhills in the upper Coastal Plain, mesic to dry Piedmont oak forests. April-May; July. Sc. VA south and west to sc. GA, se. AL, nc. AL, and sc. TN; disjunct in sc. KY. See Libby & Bloom (1998) for an interesting discussion and county distribution map. It sometimes forms colonies (presumably clones) several hectares in size. [= RAB, C, F, G, K, S, W]

#### ***Phoradendron*** Nuttall 1848 (Mistletoe)

A genus of about 235 species, epiphytic hemiparasites, of tropical and rarely temperate America. *Phoradendron* is placed in the segregate family Viscaceae by Nickrent et al. (2010). References: Abbott & Thompson (2011)=X; Kuijt (2003)=Y; Kuijt (1982)=Z.

***Phoradendron leucarpum*** (Rafinesque) Reveal & M.C. Johnston ssp. *leucarpum*, American Mistletoe, Christmas Mistletoe. Parasitic on various species of trees, especially abundant in swamp forests (perhaps because they are less frequently cut and have older, more mature hardwoods). October-November (-March); November-January (-May). Kuijt (2003) interprets this as a species with four subspecies; ssp. *serotinum* is the eastern component, ranging from NJ west to s. OH, s. IN, and s. MO, south to s. FL and s. TX; this interpretation is supported by genetic studies currently underway (Hawkins et al., in prep.). The other three subspecies are distributed in sw. United States and n. Mexico. The same four subspecies are recognized by Abbott & Thompson, under what appears to be the correct species name: *P. leucarpum*. The lengthy and arcane debates about the correct nomenclature are summarized by Abbott & Thompson (2011), and references cited therein. *Phoradendron* is, of course, the mistletoe familiar (at least traditionally) in e. United States as a Christmas decoration. Kuijt (1982) comments that "the superficial likeness of *Phoradendron serotinum* to the European *Viscum album* has made the transfer of the latter's folklore to North America easy;" *Viscum album* was a sacred plant of Celtic and druidical pre-Christian European societies. The white berries of *P. serotinum* are extremely poisonous. Their sticky flesh promotes the dispersal of the seeds by birds from tree to tree. [= X; = *P. serotinum* (Rafinesque) M.C. Johnston ssp. *serotinum* – Y; < *P. leucarpum* (Rafinesque) Reveal & M.C. Johnston – K, Pa; < *P. serotinum* (Rafinesque) M.C. Johnston – RAB, C, W, Z; < *P. flavescens* (Pursh) Nuttall – F, G, S, WV]

#### ***Pyrrularia*** Michaux (Buffalo-nut)

A genus of 4 species, shrubs, of e. North America and e. Asia (the other 3 species are of e. Asia). *Pyrrularia* is placed in the segregate family Cervantesiaceae by Nickrent et al. (2010).

***Pyrrularia pubera*** Michaux, Buffalo-nut, Oil-nut. Moist forests. April-May; July-October. A Southern and Central Appalachian endemic, *P. pubera* ranges from sw. PA (Rhoads & Block 2007), 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, Pa, S, W, WV]



**284. TAMARICACEAE** Link 1821 (Tamarisk Family) [in CARYOPHYLLALES]

A family of about 4 genera and 78 species, shrubs and trees, of Eurasia and Africa (especially from the Mediterranean to c. Asia).  
References: Crins (1989b); Gaskin in Kubitzki & Bayer (2003); Gaskin et al. (2004).

***Tamarix*** Linnaeus 1753 (Tamarisk, Salt-cedar)

A genus of about 54 species, trees and shrubs, native of Eurasia and Africa. References: Baum (1978)=Z; Crins (1989b)=Y.

**Identification notes:** An important character is the staminal disk; three terms are used. In **hololophic** disks, the lobe between each stamen is obvious and separate from the stamens on either side, and each is usually 2-lobed. In **paralophic** disks, each lobe is deeply bipartite, and each half-lobe is fused to the base of the adjacent stamen, but is still somewhat distinct from it. In **synlophic** disks, the lobes are also deeply bipartite, but each half-lobe is fused confluent with the stamen base, giving the appearance that the filament has swollen base.

- 1 Flowers 4-merous; [section *Oligadenia*].
  - 2 Petals 1.5-2.5 mm long; bracts subtending the pedicels diaphanous; young growth completely glabrous; [section *Oligadenia*; series *Arbusculae*].....*T. parviflora*
  - 2 Petals 3.5-5 mm long; bracts subtending the pedicels herbaceous; young growth (especially the bracts and the raceme axis) papillose; [section *Oligadenia*; series *Anisandrae*].....*T. tetragyna*
- 1 Flowers 5-merous.
  - 3 Racemes 5-10 mm wide; [section *Oligadenia*].
    - 4 Bracts of the raceme linear to linear oblong, about equaling the pedicel; disk hololophic; young growth glabrous; [section *Oligadenia*; series *Laxae*].....*T. chinensis*
    - 4 Bracts of the raceme lanceolate 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 antepetalous stamens and 0 antepetalous stamens .....*T. africana*
      - 5 Young growth papillose; disk hololophic to paralophic; flowers with 4-5 antepetalous stamens and 0-4 antepetalous stamens.....*T. tetragyna*
  - 3 Racemes 3-5 mm wide; [section *Tamarix*].
    - 6 Young growth papillose; disk synlophic; [section *Tamarix*; series *Canariensis*].....*T. canariensis*
    - 6 Young growth glabrous; disk synlophic or hololophic; [section *Tamarix*; section *Gallicae*].
      - 7 Petals caducous; disk synlophic.....*T. gallica*
      - 7 Petals persistent; disk hololophic.....*T. ramosissima*

- \* ***Tamarix africana*** Poiret, African Tamarisk. Cp (SC): brackish marshes, coastal sands; rare, native of sw. Mediterranean Europe, ne. Africa, and the Canary Islands. [= K, Y; > *T. africana* var. *africana* – Z]
- \* ***Tamarix aralensis*** Bunge, Russian Tamarisk. Reported for NC (Kartesz 1999), but the specimen on which the report is based is of a plant in cultivation as an ornamental. Not keyed. [= K, Y, Z]
- \* ***Tamarix canariensis*** Willdenow, Canary Island Tamarisk. Cp (FL, GA, NC, SC): brackish marshes, coastal hammocks, coastal sands; uncommon, native of sw. Europe, ne. Africa, and the Canary Islands. [= K, Y, Z; < *T. gallica* Linnaeus – RAB, S; > *T. parviflora* – WH]
- \* ***Tamarix chinensis*** Loureiro, Chinese Tamarisk. Cp (NC): coastal sands; rare, native of China, Korea, and Japan. [= C, K, Y, Z; = *T. pentandra* Pallas – G, an illegitimate name]
- \* ***Tamarix gallica*** Linnaeus, French Tamarisk. Cp (GA, NC, VA?): brackish marshes; rare, native of the w. Mediterranean region of Europe. April-July. Most reports of this taxon from the Southeast represent misidentifications or a very broad interpretation of the species. [= F, G, K, Y, Z; < *T. gallica* – RAB, S]
- \* ***Tamarix parviflora*** A.P. de Candolle, Small-flower Tamarisk. Cp (NC, VA): coastal sands; rare, native of ne. Europe (Italy, Greece, Cyprus, Turkey). [= C, G, K, Y, Z; < *T. gallica* Linnaeus – RAB, S]
- \* ***Tamarix ramosissima*** Ledebour, Salt-cedar. Cp (GA, NC, SC, VA): brackish marshes, coastal hammocks, dunes and coastal sands; common, native of w. to e. Asia. [= K, Y, Z; < *T. gallica* Linnaeus – RAB, S]
- \* ***Tamarix tetragyna*** C. Ehrenberg. Cp (GA): coastal sands; rare, native of the Middle East. Established on Cumberland Island, Camden County, GA (Crins 1989b). [= K, Y, Z]

VISCACEAE

285. PLUMBAGINACEAE A.L. de Jussieu 1789 (Leadwort Family) [in CARYOPHYLLALES]

A family of about 24-27 genera and 650-775 species, shrubs, vines, and herbs, of cosmopolitan distribution. Lledó et al. (1998) and other authors suggest that the portion of the Plumbaginaceae often recognized as tribe Staticeae or subfamily Staticoideae (which includes Limonium) would be better treated as a distinct family. References: Morin in FNA (2005); Lledó et al. (1998); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Limonium P. Miller 1754 (Sea-lavender)

A genus of about 350 species, dwarf shrubs, perennial, and annual herbs, of cosmopolitan distribution. References: Luteyn (1976)=Z; Smith in FNA (2005); Kubitzki in Kubitzki, Rohwer, & Bittrich (1993).

Limonium carolinianum (Walter) Britton, Carolina Sea-lavender. Cp (DE, FL, GA, NC, SC, VA): tidal marshes, especially in hypersaline flats; common. August-October. Along the coast from NL (Labrador) south to s. FL, west to TX and ne. Mexico. Various treatments recognize from 1 to 4 taxa in our area. The most recent monographer, Luteyn (1976), recognizes only a polymorphic L. carolinianum – a treatment followed by most flora authors since. Godfrey & Wooten (1981) follow Luteyn's treatment, but state "we are not at all confident that Luteyn's treatment is a reasonable one." [= C, FNA, GW, K, WH, Z; > L. carolinianum var. carolinianum – RAB, G; > L. carolinianum var. obtusilobum (Blake) H.E. Ahles – RAB; > L. nashii Small var. nashii – RAB, G; > L. nashii Small var. angustatum (A. Gray) H.E. Ahles – RAB; > L. carolinianum – F, S; > L. nashii Small – F, S; > L. carolinianum var. angustatum (A. Gray) Blake – G; > L. angustatum (A. Gray) Small – S; > L. obtusilobum Blake – S]



286. POLYGONACEAE A.L. de Jussieu 1789 (Smartweed Family) [in CARYOPHYLLALES]

A family of about 43-48 genera and 1100-1200 species, trees, shrubs, vines, and herbs, cosmopolitan, but especially north temperate. Recent changes in the circumscription of various genera (including Polygonum, Persicaria, Fallopia, etc.) have received strong support from molecular phylogenetic studies (Kim & Donoghue 2008; Lamb Frye & Kron 2003; Schuster, Reveal, & Kron 2011). References: Freeman & Reveal in FNA (2005); Horton (1972)=Z; Mitchell & Dean (1978)=Y; Ronse Decraene & Akeroyd (1988); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993); Lamb Frye & Kron (2003); Kim & Donoghue 2008).

- 1 Woody vine, climbing by tendrils; [subfamily Polygonoideae, tribe Coccolobae].
  - 2 Leaf base deeply cordate ..... *Antigonon*
  - 2 Leaf base truncate to broadly cuneate ..... *Brunnichia*
- 1 Herb (sometimes very robust and rather woody), herbaceous vine, or (*Fallopia baldschuanica*) a somewhat woody vine lacking tendrils.
  - 3 Stem leaves (in our species) whorled; flowers in involucrate heads; ocreae absent; stamens 9; leaves densely white-tomentose on the lower surface; [of xeric situations of shale barrens and sandhills]; [subfamily Eriogonoideae, tribe Eriogoneae]..... *Eriogonum*
  - 3 Stem leaves alternate; flowers in various inflorescences (not involucrate); ocreae present; stamens (3-) 5-8 (-9); leaves glabrous or variously pubescent, but not densely white-tomentose; [of various habitats, including xeric ones]; [subfamily Polygonoideae].
  - 4 Tepals 6, in 2 series of 3 each; plants with leaves basally disposed, the largest basal (these withering in some species later in the season); [tribe Rumiceae].
    - 5 Tepals (the outer series) spinose ..... *Emex*
    - 5 Tepals foliose.
      - 6 Fruit 3-winged; basal leaves very large, 20-40 cm wide; inner and outer tepals similar; [plant cultivated, rarely persistent or escaped] ..... *Rheum*
      - 6 Fruit 3-angled; basal leaves small to medium in size, 0.5-15 cm wide; inner tepals wider than the outer tepals; [plants common, mostly weedy] ..... *Rumex*
  - 4 Tepals mostly 5 in a single whorl; plants with leaves along the stem, lacking well-developed basal leaves.
    - 7 Flowers in small clusters or very reduced racemes of 1-5 flowers, borne in the axils of normally sized or reduced leaves; plants erect or sprawling herbs with stems < 1 m long, from taproots; leaves jointed at base; [tribe Polygoneae] ..... *Polygonum*
    - 7 Flowers in diffuse axillary panicles, or in terminal or long-peduncled axillary racemes, corymbs, or heads; plants various, either erect or sprawling herbs, or erect, robust, and suffrutescent herbs, or climbing herbaceous or suffrutescent vines, or suffrutescent bushy herbs; leaves not jointed at base (except *Polygonum*).
    - 8 Leaves cuneate at the base, either linear, spatular, or oblanceolate, mostly < 4 cm long and < 5 mm wide; leaves jointed at the base; pedicels jointed at the base; [tribe Polygoneae] ..... *Polygonum*
    - 8 Leaves cuneate, cordate, or hastate at the base, either lanceolate or ovate, mostly > 5 cm long and > 8 mm wide; leaves not jointed at the base; pedicels not jointed at the base.
      - 9 Inflorescence corymbiform, terminal; achenes strongly exserted at maturity; tepals almost free, horizontally spreading, white, 3-4 mm long; [erect annual, uncommonly cultivated and rarely persistent or escaped]; [tribe Persicarieae] ..... *Fagopyrum*
      - 9 Inflorescence paniculate, racemiform, or headlike, terminal and axillary; achenes enclosed in the perianth at maturity; tepals fused for much of their length, ascending, pink, green, or white.

- 10 Outer tepals neither keeled nor winged at maturity; inflorescence of spikelike racemes, heads, or sparse, interrupted racemes; [tribe *Persicarieae*] ..... *Persicaria*
- 10 Outer tepals keeled or winged at maturity; inflorescence a compound panicle of racemes; [tribe *Polygoneae*].
- 11 Plants climbing or sprawling, herbaceous to somewhat woody, the stems slender; perianth usually not enlarging in fruit; stigma capitate or peltate ..... *Fallopia*
- 11 Plants erect, robust (1-4 m tall), woody, the stems generally over 1 cm in diameter, hollow; perianth enlarging in fruit; stigma fimbriate ..... *Reynoutria*

***Antigonon*** Endlicher 1837 (Love-chain, Coralvine, Corallita)

A genus of about 6 species, vines, of tropical America. References: Freeman in FNA (2005).

\* ***Antigonon leptopus*** Hooker & Arnott, Love-chain, Queen's-jewels, Confederate-vine, Corallita. Cultivated and persisting; commonly cultivated, rarely persisting or escaping, native of tropical America. [= FNA, K, WH; = *Corculum leptopus* (Hooker & Arnott) Stuntz]

***Brunnichia*** Banks ex Gaertner 1788 (Buckwheat-vine)

A genus of 3-4 species, vines, of e. North America and w. Africa. References: Holmes in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

***Brunnichia ovata*** (Walter) Shinnars, Buckwheat-vine, Eardrop-vine, Ladies'-eardrops, Redvine. Floodplain forests, swamp forests. June-July; August-September. Ne. SC south to n. FL, west to e. TX, and north in the interior to w. TN, w. KY, s. IL, and se. MO. Introduced in se. VA. [= FNA, GW, K, WH; = *B. cirrhosa* Gaertner – RAB, C, F, G, S]

***Emex*** Campderá (Emex, Devil's-thorn, Cape Spinach)

A genus of 2 species, herbs, of Mediterranean Europe and s. Africa.

\* ***Emex spinosa*** (Linnaeus) Campderá. Disturbed areas; not recently collected and perhaps only a waif, native of Mediterranean Europe. [= K, S, WH]

***Eriogonum*** Michaux 1803 (Wild-buckwheat)

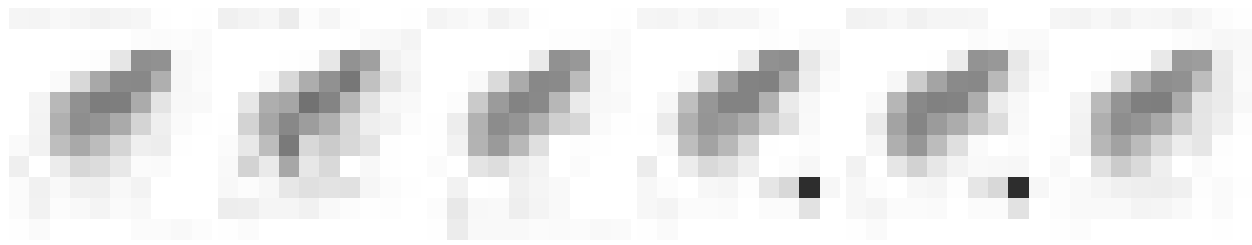
A genus of about 250 species, herbs and shrubs, of w. North America (a few in se. North America). Like *Astragalus*, it is represented in e. North America by a few species restricted to unusually dry habitats. References: Reveal in FNA (2005); Reveal (1989, 2004)=Y; Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Basal leaves absent; cauline leaves alternate; [of limestone glades and barrens of KY, TN, and n. AL]; [subgenus *Eriogonum*] ..... [***E. harperi***]
- 1 Basal leaves well-developed; cauline leaves whorled; [of other habitats and areas (see below)].
- 2 Tepals bright yellow; plants 3-5 dm tall; achenes pilose at the beak; [of shale barrens of VA and WV]; [subgenus *Oligogonum*]... ***E. allenii***
- 2 Tepals white to pink; plants 4-12 dm tall; achenes glabrous; [of sandhills of s. NC (at least formerly), SC, and southward]; [subgenus *Eriogonum*] ..... ***E. tomentosum***

***Eriogonum allenii*** S. Watson, Shale-barren Wild-buckwheat. Open and sunny situations in shale barrens (and rarely sandstone). July-August. Endemic to shale barrens of w. VA and e. WV. [= C, FNA, K, W, Y, Z; = *E. allenii* – F, G, WV, orthographic variant]

***Eriogonum harperi*** Goodman, Harper's Wild-buckwheat. Limestone glades and barrens. Endemic of sc. KY, nc. TN, and n. AL. [= *E. longifolium* Nuttall var. *harperi* (Goodman) Reveal – C, FNA, K, Y, Z]

***Eriogonum tomentosum*** Michaux, Sandhill Wild-buckwheat, Southern Wild-buckwheat, Dog-tongue. Sandhills, usually in white sand, primarily in the fall-line Sandhills and on riverine dunes in the middle and upper Coastal Plain. Late July-September; September-November. S. NC (at least formerly) south to c. peninsular FL, west to s. AL. There seems no reason to doubt the label data of an 1890's Biltmore Herbarium collection from Bladen County, NC (Pittillo, Horton, & Herman 1972), as *E. tomentosum* is fairly common not far away in SC; the species has apparently not been seen in NC since. [= RAB, FNA, K, S, WH, Y, Z]



***Fagopyrum*** P. Miller 1754 (Buckwheat)

A genus of about 8-16 species, perennial and annual herbs, of e. Asia and Africa. The latin and common name refer to the similarity of the seeds to beechnuts. References: Hinds & Freeman in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Flowers white, 3-4 mm long; achene smooth and shiny, mostly 5-7 mm long; inflorescences often flat-topped, borne near the stem tips ..... *F. esculentum*  
 1 Flowers greenish, 2-3 mm long; achene rough and dull, mostly 4-5.5 mm long; inflorescences elongate, mostly in leaf axils ..... *F. tataricum*

\* ***Fagopyrum esculentum*** Moench, Buckwheat. Mt (GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): fields, disturbed areas, railroad rights-of-way, escaped from cultivation; rare, native of Eurasia. June-November. [= RAB, C, FNA, G, K, Pa, W, WH, WV; = *F. sagittatum* Gilibert - F]

\* ***Fagopyrum tataricum*** (Linnaeus) Gaertner, Tartarian Buckwheat, India-wheat. Mt (WV): disturbed areas; rare, native of Asia. [= C, F, FNA, G, K, Pa, WV]

***Fallopia*** Adanson 1763 (Climbing Buckwheat)

A genus of about 9-10 species, woody and herbaceous vines, of temperate regions of the Northern Hemisphere. If accepted (as here) as a genus distinct from *Polygonum*, this group takes the name *Fallopia* Adanson (1763), which has priority over *Tiniaria* (1832) and *Bilderdykia* (1827). *Reynoutria* is sometimes included. References: Ronse Decraene & Akeroyd (1988)=X; Brandbyge in Kubitzki, Rohwer, & Bittrich (1993). [also see *Reynoutria*]

- 1 Plant woody; inflorescences freely branched, strongly paniculate; [sometimes cultivated, apparently naturalizing]..... *F. baldschuanica*  
 1 Plant herbaceous; inflorescences less-branched, usually a reduced panicle with only a few racemose branches; [collectively common and in various natural and disturbed habitats].  
 2 Ocreae reflexed bristly at the base; perianth white; achene glossy black; [of high elevation openings and woodlands]..... *F. cilinodis*  
 2 Ocreae smooth; perianth greenish to yellowish; achene glossy or dull black; [mostly of lower elevations].  
 3 Achene dull black; outer sepals keeled, not expanding into obvious wings in fruit, the fruit therefore 3.5-4.5 mm long (measured from the pedicel joint to the tip); [weedy annual] ..... *F. convolvulus* var. *convolvulus*  
 3 Achene glossy black; outer sepals expanding into obvious wings in fruit, the fruit therefore 7-15 mm long (measured from the pedicel joint to the tip); [native perennial or weedy annual].  
 4 Fruiting perianth wings usually truncate to attenuate-decurrent on stipelike base, flat, or (less often) undulate or crinkled, margins entire (rarely undulate-crenate)..... *F. dumetorum*  
 4 Fruiting perianth wings decurrent on stipelike base, undulate or crinkled, rarely flat, margins wavy-crenulate to incised or lacerate (rarely entire).  
 5 Perianth 7-10 mm long at maturity (measured from the pedicel joint to the tip); achenes 2-3.5 mm long..... *F. cristata*  
 5 Perianth 10-15 mm long at maturity (measured from the pedicel joint to the tip); achenes 3.5-6 mm long..... *F. scandens*

\* ***Fallopia baldschuanica*** (Regel) Holub, Silver-lace-vine, China Fleece-vine. Disturbed areas, roadsides; rare, native of Asia. [= FNA, Pa; > *Fallopia aubertii* (Henry) Holub - X; > *Polygonum aubertii* Henry - C, F, K]

***Fallopia cilinodis*** (Michaux) Holub, Fringed Climbing Buckwheat, Fringed Black Bindweed. Around rock outcrops, in openings, glades, and open woodlands at high elevations. June-September. NL (Newfoundland) west to SK, south to PA, w. NC, n. GA, e. TN, IN, IL, and MN. [= FNA, Pa; = *Polygonum cilinode* Michaux - RAB, C, K, W, Y, Z; > *Polygonum cilinode* var. *cilinode* - F, WV; > *Polygonum cilinode* var. *laevigatum* Fernald - F, WV; = *Bilderdykia cilinodis* (Michaux) Greene - S; = *Tiniaria cilinodis* (Michaux) Small]

\* ***Fallopia convolvulus*** (Linnaeus) Á. Löve, Bindweed, Climbing Buckwheat, Black Bindweed, Nimble-will. Disturbed areas; common (uncommon in DE, rare in FL), native of Eurasia. May-September. [= FNA, Pa, X; = *Polygonum convolvulus* - RAB, GW, W, WH, WV, Y, Z; > *Polygonum convolvulus* Linnaeus var. *convolvulus* - C, F, K; > *Polygonum convolvulus* var. *subulatum* Lejeune & Courtois - K; = *Bilderdykia convolvulus* (Linnaeus) Dumortier - S; = *Tiniaria convolvulus* (Linnaeus) Webb & Moquin-Tandon]

***Fallopia cristata*** (Engelmann & A. Gray) Holub, Crested Climbing Buckwheat. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (FL, NC, SC, VA) {DE?, GA}: moist to wet open habitats; common (rare in NC). July-October. MA, NY, IN, IL, MN, south to c. peninsular FL and TX. [= *Polygonum scandens* Linnaeus var. *cristatum* (Engelmann & A. Gray) Gleason - C, GW, K, WH, Y; < *Polygonum scandens* Linnaeus var. *cristatum* (Engelmann & A. Gray) Gleason - RAB; = *Polygonum cristatum* Engelmann & A. Gray - F, WV; = *Bilderdykia cristata* (Engelmann & A. Gray) Greene - S; < *Fallopia scandens* - X; < *Polygonum scandens* - Z; ? *Tiniaria cristata* (Engelmann & A. Gray) Small; = *Fallopia cristata* (Engelmann & A. Gray) Holub]

\* ***Fallopia dumetorum*** (Linnaeus) Holub. Mt (WV), Pd (DE, Cp (DE): disturbed areas, thickets; uncommon (rare in DE). Introduced at least as far south as scattered locations in c. and se. PA (Rhoads & Klein 1993; Rhoads & Block 2007), WV, KY, TN, and AL. NS and MI south to FL and TX (FNA). [= FNA; < *Polygonum scandens* Linnaeus var. *crispatum* (Engelmann & A. Gray) Gleason – RAB; = *Polygonum scandens* Linnaeus var. *dumetorum* (Linnaeus) Gleason – C, G, K; < *Polygonum scandens* – F, W, WV; = *Bylderdykia dumetorum* (Linnaeus) Dumortier – S; = *F. dumentorum* – Pa, orthographic error] {add to synonymy}

***Fallopia scandens*** (Linnaeus) Holub, Common Climbing Buckwheat. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (FL, NC, SC, VA), {DE?, GA}: moist to wet open habitats; uncommon. July-October. NS, ON and MB, south to Panhandle FL and TX. [= FNA, Pa; = *Polygonum scandens* Linnaeus var. *scandens* – RAB, C, GW, K, WH, Y; < *Polygonum scandens* – F, W, WV; = *Bilderdykia scandens* (Linnaeus) Greene – S; < *Fallopia scandens* – X; < *Polygonum scandens* – Z; = *Tiniaria scandens* (Linnaeus) Small]

***Persicaria*** P. Miller 1754 (Smartweed, Tearthumb, Jumpseed)

A genus of about 150 species, herbs, nearly cosmopolitan (primarily temperate Northern Hemisphere). References: Hinds & Freeman in FNA (2005); Park (1988)=X; Kim & Donoghue (2008); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993). Key based in part on FNA.

- 1 Stem, petioles, and lower surface of major leaf veins with abundant recurved prickles; [section *Echinocaulon*].
  - 2 Ocreae foliaceous, green, orbicular, perfoliate; tepals becoming fleshy and blue in fruit.....*P. perfoliata*
  - 2 Ocreae scarious, not as above; tepals not becoming fleshy or blue in fruit.
  - 3 Leaf blades triangular in outline, the larger 6-11 cm wide; perianth 4-parted.....*P. arifolia*
  - 3 Leaf blades lanceolate to narrowly elliptic, the larger 0.8-3 cm wide; perianth 5-parted.
    - 4 Inflorescence branches glandular-pubescent; stamens 5, in 1 whorl; leaves sessile (rarely shortly petiolate), usually cuneate or rounded at the base (rarely slightly cordate).....*P. meisneriana* var. *beyrichiana*
    - 4 Inflorescence branches glabrous; stamens 8, an outer whorl of 5 and an inner whorl of 3; leaves petiolate, sagittate at the base.....*P. sagittata*
- 1 Stem, petioles, and lower surface of major leaf veins unarmed.
  - 5 Styles exerted, persistent on achenes; inflorescences spikelike, interrupted; [section *Tovara*] .....*P. virginiana*
  - 5 Styles included, rarely exerted, deciduous; inflorescences capitate, paniclelike, or spikelike, uninterrupted or interrupted.
  - 6 Inflorescences capitate; [section *Cephalophilon*].....*P. chinensis*
  - 6 Inflorescences panicle-like or spikelike.
    - 7 Inflorescence panicle-like; [section *Rubrivena*].....*P. wallichii* var. *wallichii*
    - 7 Inflorescence spike-like; [section *Persicaria*].
      - 8 Ocreae with a green, herbaceous flange; leaves 3-17 cm wide.....*P. orientalis*
      - 8 Ocreae hyaline, tan, brown, or reddish throughout; leaves < 6 (-8) cm wide.
        - 9 Ocreae lacking cilia or with cilia 0-1 mm long.
          - 10 Plants perennial, with rhizomes or stolons; leaves lacking a triangular reddish blotch in the middle of the upper surface.
            - 11 Achenes biconvex; styles 2; leaf base cuneate; ocreae 12-23 mm long.....*P. glabra*
            - 11 Achenes triangular in x-section; styles 3; leaf base rounded to cordate; ocreae 6-12 mm long.....*P. hirsuta*
          - 10 Plants annual, lacking rhizomes or stolons; leaves often with a triangular reddish blotch in the middle of the upper surface (except for in *P. minor*).
            - 12 Peduncles glabrous; leaves lacking a triangular reddish blotch in the middle of the upper surface.....*P. minor*
            - 12 Peduncles usually stipitate-glandular; leaves often with a triangular reddish blotch in the middle of the upper surface.
              - 13 Outer tepals with 3 strong veins, each forked in an anchor shape; tepals 4 (-5); inflorescences usually arching-drooping.....*P. lapathifolia*
              - 13 Outer tepals with inconspicuous and irregularly-forking veins; tepals 5; inflorescences erect .....*P. pennsylvanica*
    - 9 Ocreae with cilia 1-12 mm long.
      - 14 Perianth with glandular punctae.
        - 15 Achenes minutely textured, dull; axillary inflorescences sometimes included within ocreae .....*P. hydropiper*
        - 15 Achenes smooth, shiny; axillary inflorescences never included within ocreae.
          - 16 Glandular punctae not uniformly distributed on the tepals, mainly on the lower portions of the outer tepals and on the inner tepals .....*P. hydropiperoides*
          - 16 Glandular punctae uniformly distributed on the tepals, not noticeably absent on the upper portion of the outer tepals.
            - 17 Inflorescences interrupted; ocreolae mostly not overlapping (especially the lower), the margins mostly ciliate with hairs < 2 mm long; leaves 0.6-2.4 cm wide.....*P. punctata*
            - 17 Inflorescences not interrupted; ocreolae usually overlapping, the margins usually eciliate or with cilia < 1 mm long; leaves 2-4.5 cm wide.....*P. robustior*
      - 14 Perianth lacking glandular punctae.
        - 18 Plants annual, lacking rhizomes or stolons
          - 19 Peduncles stipitate-glandular.....*P. careyi*

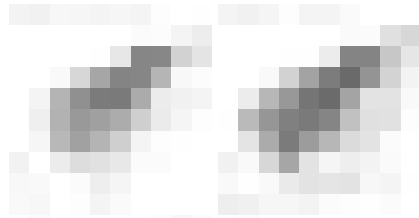
- 19 Peduncles not spiculate-glandular.
- 20 Bristles of ocreae (0.5-) 1-4 (-6) mm long; leaves lacking a triangular reddish blotch in the middle of the upper surface; achenes triangular in  $\times$ -section; styles 3 ..... *P. longiseta*
- 20 Bristles of ocreae 0.2-1.3 (-2) mm long; leaves often with a triangular reddish blotch in the middle of the upper surface; achenes biconvex or triangular in  $\times$ -section; styles 2-3 ..... *P. maculosa*
- 18 Plants perennial, with rhizomes or stolons; leaves lacking a triangular reddish blotch in the middle of the upper surface.
- 21 Achenes biconvex; styles 2 ..... *P. amphibia*
- 21 Achenes triangular in  $\times$ -section; styles 3.
- 22 Ocreae glabrous, or strigose toward the base (the hairs stiff and appressed) ..... *P. hydropperoides*
- 22 Ocreae strigose and hirsute, at least some of the hairs loosely ascending to spreading.
- 23 Leaf blades rounded to cordate at the base; stem internodes brownish-hirsute ..... *P. hirsuta*
- 23 Leaf blades cuneate to truncate at the base; stem internodes glabrous or loosely spreading-hirsute near the nodes only ..... *P. setacea*

*Persicaria amphibia* (Linnaeus) S.F. Gray, Water Smartweed. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (DE), {GA}: marshes, wet disturbed areas; common (uncommon in SC, VA, and WV, rare in GA and NC). June-August. Widespread in the Northern Hemisphere, in North America from NL (Newfoundland), NU, and AK south to SC, TN, TX, and CA, and southward into the New World tropics. [= FNA, Pa; > *Polygonum coccineum* Muhlenberg ex Willdenow – RAB, G, Z; > *Polygonum amphibium* Linnaeus var. *emersum* Michaux – C, GW, K, Y; > *Polygonum amphibium* Linnaeus – W; > *Polygonum coccineum* var. *coccineum* – F; > *Polygonum natans* (Michaux) Eaton – G; > *Persicaria muhlenbergii* (S. Watson) Small – S; > *Persicaria amphibia* (Linnaeus) S.F. Gray var. *emersa* (Michaux) Hickman; > *Persicaria amphibia* (Linnaeus) S.F. Gray var. *stipulacea* (Coleman) Hara; > *Polygonum amphibium* Linnaeus var. *stipulaceum* Coleman – C, F, K, Y]

*Persicaria arifolia* (Linnaeus) Haraldson, Halberd-leaf Tearthumb. Cp (DE, GA, NC, SC, VA), Pd (DE, NC, VA), Mt (VA, WV): marshes, wet thickets; common (uncommon in WV, rare in GA). July-November; August-December. NS west to MN. south to se. GA w. NC, and w. TN. [= FNA, Pa; = *Polygonum arifolium* Linnaeus – RAB, C, GW, K, W, WV, X, Y, Z; > *Polygonum arifolium* var. *arifolium* – F, G; > *Polygonum arifolium* var. *pubescens* (R. Keller) Fernald – F, G; = *Tracaulon arifolium* (Linnaeus) Rafinesque – S; = *Truellum arifolium* (Linnaeus) Soják]

*Persicaria careyi* (Olney) Greene. Cp (DE, FL\*), Mt (WV), {VA}: moist soils, disturbed areas; rare. NB west to ON and MN, south to VA, KY, IL, seemingly widely scattered. Reported for sc. PA (Rhoads & Klein 1993; Rhoads & Block 2007), DE, NJ, and MD (Kartesz 1999). [= FNA, Pa; = *Polygonum careyi* Olney – C, F, G, K, WH] {synonymy incomplete}

\* *Persicaria chinensis* (Linnaeus) H. Gross, Chinese Knotweed. Disturbed areas; native of Asia. Introduced in MD and NJ. [= FNA; = *Polygonum chinense* Linnaeus – K]



\* *Persicaria extremiorientalis* (Voroschilov) Tzvelev, East Asian Smartweed. Disturbed areas; roadsides, roadsides; native of Japan, China, Korea, and Sakhalin. August-November. See Atha, Nee, & Naczi (2010) for additional information. [] {not yet keyed}

*Persicaria glabra* (Willdenow) M. Gómez, Dense-flower Smartweed. Cp (DE, FL, GA, NC, SC, VA): swamp forests; uncommon (rare in VA). June-October. Nearly Pan-tropical, in North America north to s. NJ, VA, KY, MO, and TX. [= FNA, Pa; > *Polygonum densiflorum* Meisner – RAB, C, F, G, GW, K, WH, Z; > *Persicaria portoricensis* (Bertero ex Small) Small – S; > *Persicaria densiflora* (Meisner) Moldenke]

*Persicaria hirsuta* (Walter) Small, Hairy Smartweed. Cp (FL, GA, NC, SC): pondcypress savannas, depression ponds in pinelands; uncommon (rare in NC). June-December. Se. NC south to c. peninsular FL, west to s. MS. [= FNA, S; = *Polygonum hirsutum* Walter – RAB, GW, K, WH, Z]

\* *Persicaria hydropiper* (Linnaeus) Opiz, Common Smartweed, Waterpepper, Marshpepper Smartweed. Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, VA), Mt (NC, VA, WV): wet pastures, barnyards, ditches; common, native of Europe. July-November. [= FNA, Pa, S; = *Polygonum hydropiper* Linnaeus – RAB, C, F, GW, K, W, Z; > *Polygonum hydropiper* var. *hydropiper* – WV; > *Polygonum hydropiper* var. *projecta* Stanford – WV]

*Persicaria hydropperoides* (Michaux) Small, Waterpepper. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, VA, WV): swamp forests, streams, ditches; common (uncommon in VA and WV Mountains). May-November. NS, ON, and AK, south to FL, TX, and CA, and into the New World tropics. [= FNA, pa; > *Polygonum hydropperoides* var. *hydropperoides* – RAB, C, F; > *Polygonum hydropperoides* Michaux – GW, WH, Y; = *Polygonum hydropperoides* – K, W, WV, Z; > *Polygonum hydropperoides* var. *breviciliatum* Fernald – F; > *Polygonum hydropperoides* var. *euronotorum* Fernald – F; > *Persicaria hydropperoides* (Michaux) Small – S; > *Persicaria hydropperoides* (Michaux) Small var. *opelousana* (Riddell ex Small) J.S. Wilson; > *Polygonum hydropperoides* var. *opelousanum* (Riddell ex Small) Riddell ex W. Stone – RAB, C; > *Polygonum opelousanum* Riddell – GW, Y; > *Polygonum opelousanum* Riddell var. *opelousanum* – F; > *Persicaria opelousana* (Riddell ex Small) Small – S]

*Persicaria lapathifolia* (Linnaeus) S.F. Gray, Willow-weed, Dockleaf Smartweed, Pale Smartweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): bottomlands, bottomland fields, disturbed areas; common



(uncommon in FL, GA, NC, SC, VA, and WV). July-November. [= FNA, Pa, S; = *Polygonum lapathifolium* Linnaeus – RAB, C, GW, K, W, WH, WV, Y, Z; > *Polygonum lapathifolium* var. *lapathifolium* – G; > *Polygonum lapathifolium* var. *nodosum* (Rafinesque) Weinm. – G]

\* ***Persicaria longiseta*** (de Bruijn) Kitagawa, Longbristle Smartweed, Bristly Lady's-thumb. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas, ditches; common (rare in FL), native of Asia. May-October. [= FNA, Pa; = *Polygonum caespitosum* Blume var. *longisetum* (de Bruijn) A.N. Steward – RAB, C, F, G, GW, K, W, WV, Y, Z; = *Polygonum caespitosum* Blume var. *longisetum* (de Bruijn) A.N. Steward – WH; = *Polygonum longisetum* de Bruijn]

\* ***Persicaria maculosa*** S.F. Gray, Lady's-thumb, Heart's-ease. Cp (DE, FL, GA, VA), Pd (DE, GA, VA), Mt (GA, VA, WV), {NC, SC}: disturbed areas; common (uncommon in DE, rare in FL), native of Eurasia. June-December. [= FNA, Pa; = *Polygonum persicaria* Linnaeus – RAB, C, G, GW, K, W, WH, WV, Y, Z; > *Polygonum persicaria* var. *persicaria* – F; > *Polygonum persicaria* var. *angustifolium* Beckh. – F; > *Polygonum persicaria* var. *ruderales* (Salisbury) Meisner – F; > *Polygonum dubium* Stein – F; = *Persicaria persicaria* (Linnaeus) Small – S]

***Persicaria meisneriana*** (Chamisso & Schlechtendal) M. Gómez var. ***beyrichiana*** (Chamisso & Schlechtendal) C.C. Freeman, Mexican Tearthumb. Cp (FL, GA, SC): wet savannas, blackwater river floodplains, ditches; rare (GA Special Concern), sometimes considered only introduced in southeastern North America, but probably native. E. SC south to FL, west to LA; Mexico and Central America south to n. South America; Brazil; se. Africa. See Mitchell (1970) and Freeman (2004). [= FNA; = *Polygonum meisnerianum* Chamisso & Schlechtendal var. *beyrichianum* (Chamisso & Schlechtendal) Meisner – GW, K, WH; < *Polygonum meisnerianum* – Z; < *Truellum meisnerianum* (Chamisso & Schlechtendal) Soják]

\* ***Persicaria minor*** (Hudson) Opiz, Small Water-pepper. {VA}: disturbed moist areas; rare, native of Europe. [= FNA; = *Polygonum minus* Hudson]

\* ***Persicaria orientalis*** (Linnaeus) Spach, Kiss-me-over-the-garden-gate, Prince's-feather, Prince's-plume. Cp (DE, NC, SC, VA), Pd (GA, NC, VA), Mt (GA, NC, VA, WV): barnyards, disturbed areas, garden edges; rare, native of Eurasia. July-November. [= FNA, Pa, S; = *Polygonum orientale* Linnaeus – RAB, C, F, K, W, WH, WV, Y, Z]

***Persicaria pensylvanica*** (Linnaeus) M. Gómez, Pinkweed, Common Smartweed, Pennsylvania Smartweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed areas, bottomlands; common. July-December. NL (Newfoundland), ON, MT, and CA, south to FL, TX, AZ; disjunct (perhaps only introduced (?)) in AK, Ecuador, Europe. [= FNA, Pa, S; = *Polygonum pensylvanicum* Linnaeus – RAB, C, GW, K, W, WV, WH, Z; > *Polygonum pensylvanicum* var. *pensylvanicum* – F; > *Polygonum pensylvanicum* var. *durum* Stanford – F; > *Polygonum pensylvanicum* var. *laevigatum* Fernald – F; > *Polygonum pensylvanicum* var. *rosaeiflorum* J.B.S. Norton – F]

\* ***Persicaria perfoliata*** (Linnaeus) H. Gross, Mile-a-minute-vine, Asiatic Tearthumb, Devil's-tail Tearthumb. Pd (DE, VA), Cp (DE), Mt (NC, WV): roadsides, banks, powerline rights-of-way; common, native of e. Asia. Introduced and spreading rapidly in n. VA, MD, PA, DC, and WV. Adler (1999) reports it as occurring in PA, MD, VA, WV, DE, OH, NJ, and DC. Poindexter (2010a) reports its discovery at three separate locations in Alleghany County, NC. [= FNA, Pa; = *Polygonum perfoliatum* Linnaeus – C, F, K, X; = *Ampelgynon perfoliatum* (Linnaeus) Roberty & Vautier]

***Persicaria punctata*** (Elliott) Small, Dotted Smartweed. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): swamp forests, bottomlands, marshes; common. July-November. NS, ON, and BC south to FL, TX, and CA, south into the New World tropics. [= FNA, Pa; > *Persicaria punctata* (Elliott) Small var. *punctata* – S; = *Polygonum punctatum* – RAB, GW, W, WH, WV; > *Polygonum punctatum* Elliott var. *punctatum* – C, F, G, K, Y; > *Persicaria punctata* (Elliott) Small var. *leptostachya* (Meisner) Small – S; > *Polygonum punctatum* Elliott var. *leptostachyum* (Meisner) Small – F; > *Polygonum punctatum* var. *parvum* Marie-Victorin & Rousseau – F; > *Polygonum punctatum* Elliott var. *confertiflorum* (Meisner) Fassett – C, G, K, Y; < *Polygonum punctatum* – Z (also see *Persicaria robustior*)]

***Persicaria robustior*** (Small) E.P. Bicknell, Water Smartweed. {VA}: peaty shores or semi-aquatic in water; rare? NS, QC, MI, MO, south irregularly to FL s. and TX, and south into tropical America. Probably under-represented as to states of occurrence because of frequent synonymization. [= FNA, Pa; = *Polygonum robustius* (Small) Fernald – C, F, G, K, Y; < *Polygonum punctatum* – Z]

***Persicaria sagittata*** (Linnaeus) Gross ex Nakai, Arrowleaf Tearthumb, Arrowvine, Scratch-grass. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): marshes, bogs, beaver impoundments, wet thickets; common (rare in FL). May-December. NL (Newfoundland) west to MB, south to Panhandle FL and e. TX; China, Manchuria, India, Siberia, Korea, and Japan. [= FNA, Pa; = *Polygonum sagittatum* Linnaeus – RAB, C, G, GW, K, W, WH, WV, Y, Z; > *Polygonum sagittatum* var. *gracilentum* Fernald – F; > *Polygonum sagittatum* var. *sagittatum* – F; = *Tracaulon sagittatum* (Linnaeus) Small – S; = *Truellum sagittatum* (Linnaeus) Soják]

***Persicaria setacea*** (Baldwin) Small, Swamp Smartweed. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): swamp forests, bottomland forests; common (rare in Piedmont, rare in WV). July-November. MA, MI, MO, and OK south to s. FL and TX. [= FNA, Pa, S; = *Polygonum setaceum* Baldwin – RAB, GW, W, WH, Y, Z; > *Polygonum setaceum* var. *interjectum* Fernald – F, K; > *Polygonum setaceum* var. *tonsum* Fernald – F, K; > *Polygonum setaceum* var. *setaceum* – F, K; = *Polygonum hydropteroides* Michaux var. *setaceum* (Baldwin) Gleason – C, G]

*Persicaria virginiana* (Linnaeus) Gaertner, Jumpseed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): floodplains, moist forests; common (uncommon in DE Coastal Plain). NH, QC, MN, and NE, south to FL and TX; disjunct in c. Mexico. Section *Tovara* consists of 3-5 species of e. North America and e. Asia (Mun & Park 1995); if the section is recognized as a genus (as it often has been), the correct name for this species is *Antenoron virginianum*. Variation in North America, previously sometimes recognized as varieties, as by F and G, is under study by M. Pyne. [= FNA, Pa; = *Tovara virginiana* (Linnaeus) Rafinesque – RAB, S, WV; > *Tovara virginiana* var. *glaberrima* Fernald – F; > *Tovara virginiana* var. *virginiana* – F; = *Polygonum virginianum* Linnaeus – C, GW, K, W, Y; > *Polygonum virginianum* var. *virginianum* – G; > *Polygonum virginianum* var. *glaberrimum* (Fernald) Steyermark – G; = *Antenoron virginianum* (Linnaeus) Roberty & Vautier – Z]

\* *Persicaria wallichii* Greuter & Burdet var. *wallichii*, Himalayan Knotweed, Kashmir Plume. Mt (NC): persistent and spreading from plantings; rare, native of Himalayan Asia. [= FNA; < *Polygonum polystachyum* Wallich ex Meisner – C, F, G (a later homonym); < *Aconogonon polystachyum* (Wallich ex Meisner) M. Král; < *Rubrivena polystachya* (Wallich ex Meisner) M. Král; < *Reynoutria polystachya* (Wallich ex Meisner) Moldenke]

### *Polygonum* Linnaeus 1753 (Knotweed)

A genus of about 75 species, herbs, of temperate regions of the Northern Hemisphere. Based on morphology, Ronse Decraene, Hong, & Smets (2004) suggested that *Polygonella* should be merged into *Polygonum*, as section *Duravia*; this was confirmed using molecular evidence by Schuster, Reveal, & Kron (2011). References: Costea, Tardif, & Hinds in FNA (2005); Freeman in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993); Costea & Tardif (2003a)=X; Schuster, Reveal, & Kron (2011)=U; Nesom & Bates (1984)=Q; Wunderlin (1981)=V; Horton (1961)=T; Ronse Decraene, Hong, & Smets (2004); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993). [also see *Fallopia*, *Persicaria*, *Reynoutria*]. Key adapted from FNA and other sources.

- 1 Flowers in terminal or long-peduncled axillary racemes; branches adnate to stems, appearing to arise internodally; plants suffrutescent bushy herbs; [section *Duravia*].
  - 2 Ocreae ciliate; inner perianth segments fimbriate.
    - 3 Leaves not hyaline-bordered; stem (below the inflorescence) minutely but densely scabrous; [of e. GA south to Panhandle FL] ..... *P. fimbriatum*
    - 3 Leaves hyaline-bordered; stem (below the inflorescence) glabrous or slightly scabrous on the angles; [of e. FL Panhandle south into peninsular FL] ..... *P. nesomii*
  - 2 Ocreae not ciliate; inner perianth segments not fimbriate.
    - 4 Leaves (3-) 9-30 mm wide; [of sand pine scrub and coastal dunes in Panhandle FL and s. AL] ..... *P. smallianum*
    - 4 Leaves 0.3-6 mm wide; [collectively more widespread].
      - 5 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. americanum*
    - 5 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.
      - 6 Annual, simple to much-branched from above the base; leaves lacking hyaline margins, mostly deciduous before fruiting (or even flowering); ocreae obtuse; achenes 1.0-1.4 mm wide.
        - 7 Leaves (0.4-) 0.6-1.0 (-1.2) mm wide; flowers exerted 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. articulatum*
        - 7 Leaves (0.8-) 1.0-5.0 (-8.0) mm wide; flowers barely exerted from the ocreolae on pedicels ca. 0.1 mm long at anthesis; [of the outer Coastal Plain of se. SC southward] ..... *P. pinicola*
      - 6 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.
        - 8 Vernal leaves (larger leaves toward the base of the plant) 4-13 mm long, 0.5-1.2 (-2.1) mm wide, linear to linear-spatulate; leaf ocreae tips 1-1.5 mm long, acuminate to attenuate; floral ocreolae orange-reddish to orange-brownish throughout or pale distally, the pale portion no more than 1/5 the length of the ocreolae; longitudinal grooves evident in ocreolae ..... *P. polygamum* var. *croonii*
        - 8 Vernal leaves 7-30 mm long, 1.0-6 mm wide (leaves remaining at flowering often only 1-2 mm wide), spatulate to linear-spatulate; leaf ocreae tips 0.3-0.7 mm long, acute to long-acute; floral ocreolae olivaceous proximally, pale orange to beige distally, the pale portion 1/3-1/2 the length of the ocreolae; longitudinal grooves absent or faint in ocreolae ..... *P. polygamum* var. *polygamum*
- 1 Flowers in small clusters or very reduced racemes of 1-5 flowers, borne in the axils of normally sized or reduced leaves; branches not adnate to the stem, and thus not appearing to arise internodally; plants erect or sprawling herbs.
  - 9 Stems with 4 obscure ribs, or lacking apparent ribs; leaf venation parallel, with inconspicuous secondary veins; anthers pink-purple; [section *Duravia*].
    - 10 Pedicels deflexed; leaves not plicate, revolute at the margin; [reported for VA] ..... [*P. douglasii*]
    - 10 Pedicels erect-ascending; leaves plicate with one fold on either side of the midrib, planar at the margin; [widespread in our area] ..... *P. tenue*
  - 9 Stems with 8-16 distinct ribs; leaf venation pinnate, the secondary veins apparent; anthers whitish yellow; [section *Polygonum*].
    - 11 Perianth bottle-shaped, constricted above the achene.
      - 12 Fruiting perianth divided about 1/3 of its length; stem leaves (1-) avg. 1.6 (-3)× as long as branch leaves ..... [*P. achoreum*]
      - 12 Fruiting perianth divided about 3/4 of its length; stem leaves (1.5-) avg. 2.5 (-4)× as long as branch leaves ..... *P. erectum*
    - 11 Perianth more open, not constricted above the achene.
      - 13 Inflorescences spikelike, the cymules borne in the axils of bracts shorter than the cymules ..... *P. argyrocoleon*
      - 13 Inflorescences axillary, the cymules borne in the axils of leaves longer than the cymules (though often shorter than primary leaves of the stem).

- 14 Ocreae pruinose; mature tepals notably white or pink, loosely spreading; achenes smooth, glossy; [of maritime situations].....  
.....*P. glaucum*
- 14 Ocreae not pruinose; mature tepals yellow-green, white, pink, or reddish, appressed to the achene; achenes **either** smooth and glossy **or** textured and dull; [mainly of inland and disturbed situations]; [*P. aviculare* complex].
- 15 Outer 3 tepals cucullate, in fruiting condition distinctly surpassing the inner 2 sepals and concealing them.
- 16 Plants prostrate; leaves 2.5-5.6 (-10)× as long as wide.....*P. buxiforme*
- 16 Plants ascending to erect; leaves 4-12× as long as wide.
- 17 Plants bluish green when fresh, turning dark brown to black when dried; leaves rounded or obtuse at the apex; pedicels 1-2 mm long; stem leaves 1-2.5 (-3.5)× as long as the branch leaves.....*P. prolificum*
- 17 Plants yellowish green when fresh, not darkening when dried; leaves acute to acuminate at the apex; pedicels 2.5-6 mm long; stem leaves 2.1-3.5 (-4.2)× as long as the branch leaves.....*P. ramosissimum*
- 15 Outer 3 tepals flat, equaling or shorter than the inner 2 sepals.
- 18 Perianth tubes 40-57% of the perianth length.
- 19 Tepals green, margins pink or red (rarely white), with branched veins; plants prostrate to ascending, with 3-15 stems; leaf blades 2.8-5.7 (-6.5)× as long as wide.....*P. aviculare* ssp. *depressum*
- 19 Tepals green or reddish brown, margins white, with unbranched veins; plants usually ascending, with 1-7 stems; leaf blades (3.40) 4.2-9.2× as long as wide.....*P. aviculare* ssp. *neglectum*
- 18 Perianth tubes 15-40% of the perianth length.
- 20 Leaf blades 2-4.5× as long as wide; perianth (2.3-) 2.8-4.7 (-5) mm long; achenes (of the early season) (2.1-) 2.7-3.7 mm long.....*P. aviculare* ssp. *aviculare*
- 20 Leaf blades (3.4-) 4.2-9.2× as long as wide; perianth 1.9-3.4 mm long; achenes (of the early season) 1.2-1.8 mm long.....*P. aviculare* ssp. *neglectum*

*Polygonum achoreum* Blake. Mt (WV): disturbed areas; rare. NS and NT south to CT, WV, MO, KS, CO, UT, NV, OR. [= C, F, FNA, G, K, Pa]

*Polygonum americanum* (Fischer & C.A. Meyer) T.M. Schuster & Reveal, Southern Jointweed. Sandhills, other dry habitats. June-September; August-November. Sc. NC south to s. GA west to TX and NM, north in the interior to ec. TN (Chester, Wofford, & Kral 1997), se. MO, and AR, perhaps adventive toward the northern part of the range. [= U; = *Polygonella americana* (Fischer & C.A. Meyer) Small – RAB, F, FNA, G, K, S, T]

\* *Polygonum argyrocoleon* Steudel ex Kunze. Cp (NC): disturbed areas; rare, native of western North America. May-August? Reported for NC by Burk (1961). [= RAB, K, WH, Z]

*Polygonum articulatum* Linnaeus, Northern Wireweed. Sandhills, dunes, and other dry, sandy habitats. September-October; October-November. ME and s. QC west to MN, south on the Coastal Plain to VA and ne. NC, otherwise south to se. PA, NY, s. ON, MI, n. IN, n. IL, and e. IA; the record cited for GA in Jones & Coile (1988) is a misidentification. [= U; = *Polygonella articulata* (Linnaeus) Meisner – RAB, C, F, FNA, G, K, Pa, T; = *Delopyrum articulatum* (Linnaeus) Small – S]

\* *Polygonum aviculare* Linnaeus ssp. *aviculare*, Knotweed. Mt (NC, SC, VA, WV), Pd (NC, SC, VA), Cp (NC, SC, VA), {FL?, GA}; disturbed areas; common. March-November. [= FNA, X; = *P. aviculare* – RAB, C, K, S, W, Y; > *Polygonum aviculare* var. *aviculare* – F, WV; > *P. aviculare* var. *vegetum* Ledebour – F, WV; > *P. monevilleense* Persoon; < *P. aviculare* – G, Pa, Z]

\* *Polygonum aviculare* Linnaeus ssp. *depressum* (Meisner) Arcangeli, Dooryard Knotweed. Mt (WV), {DE, FL?, GA, NC, SC, VA}. [= FNA, X; = *Polygonum arenastrum* Boreau – C, K; < *P. aviculare* – G, Pa]

\* *Polygonum aviculare* Linnaeus ssp. *neglectum* (Besser) Arcangeli, Needle-leaf Knotweed. Cp (VA): fields, disturbed areas; rare, introduced. Also documented from scattered locations in s. PA (Rhoads & Klein 1993); DE, NJ, and MD (Kartesz 1999); and WV (as *P. aviculare* ssp. *rurivagum*) (Costea & Tardif 2003). [= FNA; ? *P. bellardii* Allioni – K; < *Polygonum aviculare* var. *aviculare* – F; < *P. aviculare* – G, Pa; *Polygonum aviculare* Linnaeus var. *rurivagum* (Jord. ex Boreau) Berher; ? *Polygonum aviculare* Linnaeus var. *angustissimum* Meisner]

*Polygonum buxiforme* Small, Small's Knotweed. Mt (WV), {NC, SC, VA}: disturbed areas, marsh edges; rare in WV {uncommon?}. NL (Newfoundland), NL (Labrador), NU, and NT, south to SC, AL, MS, LA, TX, and CA. [= C, K, S, Y; = *Polygonum aviculare* Linnaeus ssp. *buxiforme* (Small) Costea & Tardif – FNA, X; =? *P. aviculare* Linnaeus var. *littorale* (Link) Mertens – F; < *P. aviculare* – G; ? *P. littorale* Link]

\* *Polygonum douglasii* Greene. Mt (WV), {VA}: {habitat not known}; rare, native of western North America. Reported for VA in FNA. [= C, F, FNA; ? *P. douglasii* ssp. *douglasii* – K]

*Polygonum erectum* Linnaeus, Erect Knotweed. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (VA), {GA}: disturbed areas, open places; common (rare in GA, NC, SC, and VA). June-October; July-October. ME, ON, and AB south to GA, LA, and NM. [= RAB, C, F, FNA, K, Pa, S, W, WV, Y, Z]

*Polygonum fimbriatum* Elliott, Sandhill Jointweed. Sandhills. E. GA (not far from SC) and se. AL south to Panhandle FL. It differs from all our other species in having the inner sepals fimbriate. [= U; = *Polygonella fimbriata* (Elliott) Horton – FNA, K, Q, WH; = *Thysanella fimbriata* (Elliott) A. Gray – S; = *Polygonella fimbriata* var. *fimbriata* – T]

*Polygonum glaucum* Nuttall, Seabeach Knotweed. Cp (DE, FL, GA, NC, SC, VA): ocean beaches, sound-side sandy shores, dune bases; rare. May-October; June-November. CT south to ne. FL, along the coast. [= RAB, C, F, FNA, K, S, WH, Y, Z]

*Polygonum nesomii* T.M. Schuster & Reveal. Sandhills, scrub. E. FL Panhandle south to c. peninsular FL. [= U; = *Polygonella robusta* (Small) G.L. Nesom & Bates – FNA, K, Q, WH; = *Polygonella fimbriata* (Elliott) Horton var. *robusta* (Small) Horton – T; = *Thysanella robusta* Small – S]

*Polygonum pinicola* T.M. Schuster & Reveal, Wireweed. Sandhills. Late August-October; October-November. Sc. NC south to s. FL, west to s. MS, perhaps adventive toward the northern part of the range. [= U; = *Polygonella gracilis* (Nuttall) Meisner – RAB, FNA, K, T, WH; = *Delopyrum gracile* (Meisner) Small – S, *nom. illeg.*]

*Polygonum polygamum* Ventenat var. *croomii* (Chapman) T.M. Schuster & Reveal, Carolina October-flower. Sandhills, primarily in the fall-line Sandhills and middle Coastal Plain. August-October; October-November. Var. *croomii* ranges from se.

and sc. NC south to SC and GA. Var. *croonii* occurs mainly in the fall-line Sandhills, scattered as well in the middle Coastal Plain (Robeson and Bladen counties, NC, Dillon, Darlington, and Lee counties, SC) and rarely the outer Coastal Plain (New Hanover County, NC). In addition to our 2 varieties, var. *brachystachya* (Meisner) T.M. Schuster & Reveal is endemic to c. and s. peninsular FL; it resembles var. *croonii* in its narrow leaves, but has the ocrea and ocreola tips short and acute (more like var. *polygamum*). I agree with Nesom & Bates (1984) that "intermediates occur ... that will have to be arbitrarily identified, but without recognition of the varieties an interesting pattern of variation is obscured." It may well prove that the taxa are valid biological species, and that confusion is only caused by herbarium identifications. [= U; = *Polygonella polygama* (Ventenat) Engelmann & A. Gray var. *croonii* (Chapman) Fernald – FNA, Q, V; < *P. polygama* – RAB, K, T; = *Polygonella croonii* Chapman – S]

***Polygonum polygamum*** Ventenat var. ***polygamum***. Common October-flower. Sandhills, primarily in the outer Coastal Plain north of SC. August-October; October-November. Var. *polygamum* ranges from se. VA south to s. FL, west to se. TX (perhaps absent in GA). In our area, var. *polygamum* 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). [= U; = *Polygonella polygama* (Ventenat) Engelmann & A. Gray var. *polygama* – FNA, Q, V, WH; < *P. polygama* – RAB, C, F, G, K, T; = *Polygonella polygama* – S]

***Polygonum prolificum*** (Small) B.L. Robinson, Longfruit Knotweed, Bushy Knotweed, Prolific Knotweed. Cp (NC?, VA), Mt (WV): brackish marshes, disturbed areas; rare (VA Watch List). PE, QC, MB, and BC, south to GA, LA, TX. Also reported for NC (Kartesz 1999). [= C, G; = *Polygonum ramosissimum* Michaux var. *prolificum* Small – K, Y; = *P. prolificum* (Small) B.L. Robinson – C, G; > *P. prolificum* – F; > *P. exsertum* Small – F; < *P. ramosissimum* – Z; = *P. ramosissimum* ssp. *prolificum* (Small) Costea & Tardif – FNA, Pa, X]

***Polygonum ramosissimum*** Michaux. {GA, NC, SC, VA}: disturbed areas; brackish marshes and shores; {uncommon?}. NS west to NU and BC, south to GA, LA, TX, CA. Reported for SC (Kartesz 1999); {investigate distribution} [= C, F, G; = *Polygonum ramosissimum* Michaux var. *ramosissimum* – K, Y; = *P. ramosissimum* Michaux ssp. *ramosissimum* – FNA, Pa, X; = *P. ramosissimum* – C, F, G] {synonymy incomplete}

***Polygonum smallianum*** T.M. Schuster & Reveal, Largeleaf Wireweed. Sand pine scrub, coastal dunes. S. AL and Panhandle FL. [= U; = *Polygonella macrophylla* Small – FNA, K, S, WH, T]

***Polygonum tenue*** Michaux, Glade Knotweed, Slender Knotweed. Pd (DE, GA, NC, SC, VA), Mt (GA, NC, VA, WV), Cp (DE, VA): glades, barrens, and thin, rocky soils, over various rock types (including granite, diabase, amphibolite, greenstone, metagabbro, and shale); uncommon (rare in DE and NC). July-September; August-October. ME, ON, MN, SD, WY, south to GA, AL, MS, LA, TX. [= RAB, C, FNA, Pa, S, W, WV, Y, Z; > *Polygonum tenue* var. *protrusum* Fernald – F, K; > *Polygonum tenue* var. *tenue* – F, K]



Reynoutria Houttuyn 1777

A genus of about 15 species, perennial herbs, of temperate e. Asia. Ronse Decraene & Akeroyd (1988) and most other recent workers in Polygonaceae treat this group as *Fallopia* section *Reynoutria* (Houttuyn) Ronse Decraene, but molecular evidence supports its recognition at genus rank, as a monophyletic genus basal to *Fallopia* and *Muehlenbeckia* (Schuster, Reveal, & Kron 2011). References: Freeman & Hinds in FNA (2005); Ronse Decraene & Akeroyd (1988)=X; Schuster, Reveal, & Kron (2011); Brandyge 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. xbohemica***
  - 2 Veins of leaf underside minutely scabrous with scattered bumps; mid-branch leaves truncate (to very broadly V-shaped); well-developed stem leaves <18 cm long .....***R. japonica***

\* *Reynoutria ×bohemica* J. Chrtek & A. Chrtková [*Reynoutria japonica* × *sachalinensis*], Bohemian Knotweed, Hybrid Japanese Knotweed. Mt (NC), Pd (VA): disturbed areas, sandbars; rare, native of e. Asia. [= *Polygonum ×bohemica* (J. Chrtek & A. Chrtková) P.F. Zika & A.L. Jacobson – Z; = *Fallopia ×bohemica* (J. Chrtek & A. Chrtková) J.P. Bailey – FNA]

\* *Reynoutria japonica* Houttuyn, Japanese Knotweed, Japanese Bamboo, Japanese Buckwheat. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA); roadsides, disturbed areas, river banks and sandbars, often forming dense thickets; common (uncommon in GA, NC, SC, and VA), native of e. Asia. May-September; August-October. [= *Polygonum cuspidatum* Siebold & Zuccarini – RAB, C, F, K, W, WV, Y, Z; = *Fallopia japonica* (Houttuyn) Ronse Decraene var. *japonica* – FNA, Pa; = *Pleuropterus zucarinii* Small – S; = *Fallopia japonica* (Houttuyn) Ronse Decraene – X]

\* *Reynoutria sachalinensis* (F. Schmidt ex Maximowicz) Nakai, Giant Knotweed, Sachaline. Pd (DE, VA), Cp (VA), Mt (NC, WV): disturbed areas, roadsides; rare, native of e. Asia. July-August; August-October. [= *Polygonum sachalinense* F. Schmidt ex Maximowicz – RAB, C, F, K, W, WV, Y, Z; = *Fallopia sachalinensis* (F. Schmidt ex Maximowicz) Ronse Decraene – FNA, Pa, X]

#### *Rheum* Linnaeus 1753 (Rhubarb)

A genus of about 30-60 species, perennial herbs, of temperate and subtropical Asia and Europe. References: Freeman in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993).

\* *Rheum rhabarbarum* Linnaeus, Rhubarb, Pie-plant. Mt (NC, VA, WV): uncommonly cultivated (primarily in gardens in the cooler portions of our area), rarely persistent or escaped; rare, native of Europe (though originally native of Asia). June-September. [= K, Pa; = *R. rhabarbaricum* – C, misspelled; = *R. rhaponticum* – G, misapplied]

#### *Rumex* Linnaeus 1753 (Dock)

A genus of about 200 species, perennial and annual herbs (and a few shrubs), of cosmopolitan distribution. References: Mosyakin in FNA (2005); Brandbyge in Kubitzki, Rohwer, & Bittrich (1993). Key based on FNA and other sources.

- 1 Leaf blades hastate or sagittate on at least well-developed leaves; plants dioecious (rarely polygamo-monoecious), the flowers mostly unisexual; fresh foliage pleasantly acid to taste.
  - 2 Inner tepals (at fruiting) about as wide as the achene, with a minute or absent free wing; pedicel jointed just below the tepals; [subgenus *Acetosella*].....*R. acetosella*
  - 2 Inner tepals (at fruiting) enlarged, longer and wider than the achene; pedicel jointed near its middle or base, well below the tepals; [subgenus *Acetosa*].
  - 3 Leaves sagittate, the lobes pointing downward toward the petiole [subgenus *Acetosa*; section *Acetosa*].....[*R. acetosa*]
  - 3 Leaves hastate, the lobes spreading, pointing out away from the leaf; [subgenus *Acetosa*; section *Americanae*].....*R. hastatulus*
- 1 Leaf blades not hastate or sagittate; plants synoecious (rarely with some dioecious or polygamo-monoecious individuals), the flowers normally bisexual (sometimes bisexual and unisexual flowers in the same inflorescence); fresh foliage "green" or bitter to taste; [subgenus *Rumex*].
  - 4 Leaves primarily cauline; inner tepal margins entire; [subgenus *Rumex*; section *Axillares*].
    - 5 Pedicels 2.5-5× as long as the inner tepals; pedicel joint below the midpoint of the pedicel.
      - 6 Leaf blades ca. 2× as long as wide; lateral veins of leaves forming angle of ca. 80° to midvein .....*R. fascicularis*
      - 6 Leaf blades 3-7 (-10)× as long as wide; lateral veins of leaves forming angle of 40-60° to midvein.
        - 7 Leaf blades 3-5 (-6)× as long as wide; coriaceous and usually somewhat fleshy; inflorescences dense (interrupted only at base); pedicels 2.5-3× as long as the inner tepals; inner tepals as wide as or wider than long .....*R. floridanus*
        - 7 Leaf blades 5-7 (-10)× as long as wide; thin; inflorescences interrupted in at least the lower half; pedicels 3-5× as long as the inner tepals; inner tepals longer than wide (rarely as long as wide) .....*R. verticillatus*
    - 5 Pedicels usually < 2.5× as long as the inner tepals; pedicel joint **either** the midpoint of the pedicel, **or** below it.
      - 8 Leaf blades widest toward the apex; leaf apex rounded or obtuse .....*R. cuneifolius*
      - 8 Leaf blades widest at the middle or toward the base; leaf apex acute (rarely nearly obtuse).
        - 9 Leaf blades widest toward the base; inner sepals 4.5-6 mm long, 3-4.5 (-6) mm wide .....*R. altissimus*
        - 9 Leaf blades widest near the middle; inner sepals (2-) 2.5-4.5 (-5) mm long, (2-) 2.5-4 (-4.5) mm wide.
          - 10 Inflorescence lax, distinctly interrupted; leaf blades thick and coriaceous, deep green, with veins prominent on the lower surface; leaf apex nearly obtuse; inner sepals 3.5-4.5 (-5) mm long, 3-4 (-4.5) mm wide.....*R. chrysocarpus*
          - 10 Inflorescence dense, interrupted only toward its base; leaf blades light or yellowish green, the veins on the lower surface not noticeably prominent; leaf apex acute; inner sepals (2-) 2.5-3.5 (-3.8) mm long, (2-) 2.5-3 (-3.5) mm wide..... *R. triangulivalvis*
    - 4 Leaves basally disposed, the largest and best developed in a basal rosette (these sometimes withering at maturity, especially in annual species); inner tepal margins entire or variously dentate; [subgenus *Rumex*; section *Rumex*].
      - 11 Inner tepal margins entire, indistinctly erose, or (rarely) minutely denticulate (the teeth then < 0.2 mm long).
        - 12 Inner tepals ca. 2× as long as wide, margins entire, largest tubercle almost as wide as the inner tepal.
          - 13 Tubercles 3, equal or nearly so in size; inflorescence leafy through at least 2/3 of its length; pedicels 1.4 (-5) mm long .....*R. conglomeratus*
          - 13 Tubercles 1 (or if 3, then one much larger than the other 2); inflorescence leafy only in basal 1/3 or less of its length; pedicels (2-) 4-6 (-8) mm long.....[*R. sanguineus*]
        - 12 Inner tepals ca. 1-1.5× as long as wide, margins entire or denticulate, largest tubercle much narrower than the inner tepal.
          - 14 Tubercles 3, equal or nearly so in size; leaf blade >8× as long as wide, 20-55 (-70) cm long, 2-7 cm wide ..... [*R. britanica*]
          - 14 Tubercles 1 or 2-3 (if 2-3, then one much larger than the other 1-2); leaf blade <6× as long as wide, 15-45 (-50) cm long, **either** 2-6 cm **or** 10-15 cm wide.

- 15 Leaf blade 15-30 (-35) cm long, 2-6 cm wide, the margins strongly undulate; inner tepals 3.5-6 mm long; tubercles normally 3 (rarely 1-2)..... *R. crispus* ssp. *crispus*
- 15 Leaf blade 30-45 (-50) cm long, 10-15 cm wide; the margins plane or weakly undulate; inner tepals (5-) 5.5-8 (-10) mm long; tubercles normally 1 (rarely 2-3) ..... *R. patientia*
- 11 Inner tepal margins prominently dentate, at least some of the teeth > 0.3 mm long.
- 16 Inner tepals (not including the teeth) orbiculate-ovate to deltate, as wide as long ..... *R. stenophyllus*
- 16 Inner tepals (not including the teeth) ovate-triangular or triangular, evidently longer than wide.
- 17 Inner tepals with 3-5 strongly hooked teeth on each side ..... *R. brownii*
- 17 Inner tepals with straight teeth.
- 18 Leaf blade > 4× as long as wide; inner tepals (not including the teeth) ca. 2× as long as wide..... *R. fueginus*
- 18 Leaf blade 2-3× as long as wide; inner tepals (not including the teeth ca. 1.5× as long as wide (sometimes to 2× as long as wide in *R. obtusifolius*).
- 19 Plants perennial; base of leaf blade usually distinctly cordate.
- 20 Stems 6-12 (-15) dm tall; leaf blades 20-40 cm long; inflorescence branches normally ascending, making an angle of 30-45° with inflorescence axis; tubercles of the inner sepals smooth..... *R. obtusifolius*
- 20 Stems 2-6 (-7) dm tall; leaf blades 4-10 (-15) cm long; inflorescence branches spreading, making an angle of 60-90° with inflorescence axis; tubercles of the inner sepals usually verrucose ..... *R. pulcher*
- 19 Plants annual or biennial; base of leaf blade cuneate (rarely rounded).
- 21 Inner tepals 4-5 (-5.5) mm long; tubercles of the inner sepals verrucose ..... *R. obovatus*
- 21 Inner tepals 3-4 mm long; tubercles of the inner sepals smooth or minutely punctate ..... *R. paraguayensis*

\* *Rumex acetosa* Linnaeus, Garden Sorrel, Green Sorrel. Introduced and weakly naturalized as a weed at least far south as se. PA (Rhoads & Block 2007) and s. NJ (Kartesz 2010). [= C, F, FNA, G, Pa; = *R. acetosa* ssp. *acetosa* - K; = *Acetosa pratensis* Miller]

\* *Rumex acetosella* Linnaeus, Red Dock, Sheep Sorrel, Sourgrass. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA). pastures, fields, roadsides, rock outcrops, grassy balds, gardens; common (rare in FL), native of Eurasia. March-June (sometimes later); May-July (sometimes later). Variation in *R. acetosella* has been studied in considerable detail in Eurasia, and a number of infrataxa named; the application of these to North American material is unclear at this time. *R. acetosella* ssp. *pyrenaicus* (Pouret ex Lapeyrouse) Akeroyd, a hexaploid subspecies from western Europe, is apparently the predominant naturalized subspecies in North America. See Mosyakin in FNA (2005) and the references cited therein for further information. [= RAB, C, FNA, G, GW, K, Pa, W, WV; > *R. acetosella* var. *acetosella* - F; > *R. acetosella* var. *pyrenaicus* (Pouret) Timbal-Lagrave - F; = *Acetosella acetosella* (Linnaeus) Small - S; > *Acetosella vulgaris* (Koch) Fourreau ssp. *pyrenaica* (Pouret ex Lapeyrouse) Á. Löve]

*Rumex altissimus* A. Wood, Pale Dock, Tall Dock, Peachleaf Dock. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (NC, VA): roadsides, disturbed areas, bottomlands; uncommon (rare in DE). March-June (sometimes later); May-July (sometimes later). ME and MN south to FL, TX, AZ, and n. Mexico. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV]

*Rumex britannica* Linnaeus, Great Water Dock. Native species south to PA, NJ, KY (FNA). The specimen reported for VA as *R. orbiculatus* Gray (*R. britannica* of FNA) in Castanea 42:261 (1977) has subsequently been annotated to *R. obtusifolius*. No valid collections of *R. britannica* are known for VA. [= FNA, Pa; > *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, native of Australia. [= FNA; = *R. brownei* - K, orthographic variant]

*Rumex chrysocarpus* Moris, Amamastla Dock. Cp (FL\*, LA): swamps, disturbed wet areas; rare. Se. LA west to TX and Tamaulipas. [= FNA, WH]

\* *Rumex conglomeratus* Murray, Clustered Green Dock. Cp (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, VA, WV): disturbed areas, bottomland forests, pastures; common (uncommon in Piedmont and Mountains, rare in WV). May-June; May-July. [= RAB, C, F, FNA, G, GW, K, S, WV]

\* *Rumex crispus* Linnaeus ssp. *crispus*, Curly Dock. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): disturbed areas, pastures, fields; common (uncommon in FL). March-May; May-July. [= FNA, K; < *R. crispus* - RAB, C, F, G, GW, Pa, S, W, WV]

\* *Rumex cuneifolius* Campderá. Cp (FL): disturbed areas; rare, not recently collected and perhaps only a waif, native of South America. A rare introduction from South America in AL, FL. [= FNA, S; ? *R. frutescens* Thouars - K, misapplied]

*Rumex fascicularis* Small. Cp (FL, NC?): swamps and marshes; rare (if present). Peninsular FL, and perhaps north to se. NC. [= FNA, S; < *R. verticillatus* Linnaeus - F, G, WH; = *R. verticillatus* ssp. *fascicularis* (Small) Á. Löve]

*Rumex floridanus* Meisner, Florida Dock. Cp (FL, GA, NC, SC): swamps and marshes; uncommon. NJ south to FL, west to LA. Reported for Orangeburg County, SC (S.W. Leonard, pers. comm.). [= FNA, G, S; < *R. verticillatus* - RAB, C, F, GW, WH; = *R. verticillatus* Linnaeus ssp. *floridanus* (Meisner) Á. Löve; > *R. chrysocarpus* Moris - GW, K, misapplied]

\*? *Rumex fueginus* Philippi, American Golden Dock. Mt\* (WV\*), Cp? (NC?), {MD, DE}: saline marshes, disturbed areas inland. [= FNA, Pa; < *R. maritimus* Linnaeus - G, K; = *R. maritimus* var. *fueginus* (Philippi) Dusen - F; < *R. maritimus* var. *persicarioides* (Linnaeus) R.S. Mitchell - C; < *R. persicarioides* Linnaeus - S, WV; = *R. persicarioides* var. *fueginus* (Philippi) A. Haines]

*Rumex hastatulus* Baldwin, Wild Dock, Heartwing Dock. Cp (FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, SC): fields (especially sandy fields in the Coastal Plain), roadsides, disturbed areas; common (rare in VA). March-May; April-June. NY, IN, IL, MO, and KS, south to c. peninsular FL, TX, and NM. [= RAB, C, F, FNA, G, GW, K, Pa, S, W; = *Acetosa hastatula* (Baldwin) Á. Löve]

\* *Rumex obovatus* Danser, Tropical Dock. Cp (FL, LA): maritime shores, riverbanks, pond margins; rare, native of South America. [= FNA, K]

\* *Rumex obtusifolius* Linnaeus, Bitter Dock. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): pastures, barnyards, disturbed areas; common (rare in FL), native of Europe. May-June; June-August. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV]

- \* ***Rumex paraguayensis*** D. Parodi, Paraguayan Dock. Cp (FL, LA): moist maritime shores; rare, native of South America. See Brown & Marcus (1998). [= FNA, GW, K]
- \* ***Rumex patientia*** Linnaeus, Patience Dock, Monk's-rhubarb. Mt (NC, WV), Pd (DE, NC), Cp (VA): disturbed areas; rare, native of Mediterranean Europe. April-May; May-June. [= RAB, C, F, FNA, G, K, Pa]
- \* ***Rumex pulcher*** Linnaeus, Fiddle Dock. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (SC, VA, WV\*): disturbed areas, bottomland fields, bottomland forests; common (uncommon in GA, NC, SC, and VA, rare in Mountains, rare in FL), native of Eurasia. May-June; June-July. [= RAB, C, F, FNA, G, GW, K, Pa, S, W]
- \* ***Rumex sanguineus*** Linnaeus, Bloody Dock, Red-veined Dock. Introduced at least as far south as se. PA (Rhoads & Klein 1993), MD, NJ, and AL (Kartesz 1999), perhaps only as a waif. Reported for AL, MS, LA, and VA by Small (1933). [= C, FNA, G, K, S]
- \* ***Rumex stenophyllus*** Ledebour, Narrowleaf Dock. Cp (SC), native of Eurasia. [= FNA, K]
- Rumex triangulivalvis*** (Danser) Rechinger f. Mt (WV), Pd (DE): disturbed areas; rare. Throughout North America, south to WV, DE, PA, KY. [= FNA; < *Rumex salicifolius* Weinmann var. *mexicanus* (Meisner) C.L. Hitchcock – K; = *R. salicifolius* var. *triangulivalvis* (Danser) C.L. Hitchcock – C; < *R. mexicanus* Meisner – F, G; > *R. triangulivalvis* var. *mexicanus* (Meisner) C.L. Hitchcock – Pa]
- Rumex verticillatus*** Linnaeus, Swamp Dock. Cp (DE, FL, GA, NC, SC, VA), Pd (NC, VA), Mt (VA, WV\*): tidal freshwater marshes and swamps, inland sometimes adventive in disturbed areas; common (rare in Piedmont and Mountains). April-May (sometimes later); May-July (sometimes later). QC, ON, MN, and SD, south to s. FL and TX. [= FNA, S; < *R. verticillatus* – RAB, C, F, G, GW, K, Pa, W, WH]

### 287. DROSERACEAE Salisbury 1808 (Sundew Family) [in CARYOPHYLLALES]

A family of 3 genera (*Drosera*, *Dionaea*, *Aldrovanda*) and about 100 species, nearly cosmopolitan. References: Schnell (2002b); Kubitzki in Kubitzki & Bayer (2003). [including *DIONAEACEAE*]

- 1 Leaves catching insects via "snap-trap" leaves, with stiff marginal hairs; stamens 10-20; inflorescence cymose; [endemic to the Coastal Plain of se. NC and ne. SC] ..... *Dionaea*
- 1 Leaves catching insects via "flypaper" leaves, with gland-tipped hairs; stamens 5; inflorescence racemose; [collectively widespread in our area] ..... *Drosera*

#### *Dionaea* Ellis 1768 (Venus Flytrap, Meadow Clam)

This monotypic genus is endemic to the Coastal Plain of NC and SC; it has been introduced in various places, including Panhandle FL, Yancey County in the mountains of NC, and s. NJ, where it persists and spreads to varying degrees (Evert 1957). References: Roberts & Oosting (1958); Wood (1960); Schnell (2002b)=Z.

***Dionaea muscipula*** Ellis, Venus Flytrap, Meadow Clam, Tippitiwitchee. Cp (FL\*, NC, SC): wet savannas, sandhill seepages; rare. The shiny black seeds are exposed at the maturity and dehiscence of the capsule. Perhaps the most remarkable species in our flora, *Dionaea* has become increasingly rare and now receives some protection as a NC Special Concern species and a Convention on International Trade in Endangered Species "Appendix 2" species. Although collection and trade as a novelty item have contributed to the decline of *Dionaea*, its more fundamental problem is that faced by the great majority of Coastal Plain species in our area – destruction of habitat and fire suppression. In the fall-line Sandhills, *Dionaea* is now restricted to a very few sites on Fort Bragg; in the central Coastal Plain, it is also nearly extirpated. Substantial populations remain only in the Outer Coastal Plain, primarily in Brunswick, Pender, and Onslow counties. Ellis's Latin phrase describing the plant to Linnaeus (quoted in Croom 1837) is worth repeating for its succinctness: "Miraculum naturae! – folia biloba, radicalia, ciliata, sensibilia, conduplicanda, insecta incarcerantia." The colonial governor of North Carolina, Arthur Dobbs, wrote in 1759, "we have a kind of Catch Fly Sensitive which closes upon anything that touches it." Gibson (1991) shows that trap size and prey size are correlated; trap leaves of *Dionaea* primarily capture insects about 5 mm smaller than the length of the trap. Deliberately introduced and at least somewhat naturalized at other places in the Coastal Plain, notably Apalachicola National Forest, FL. [= RAB, GW, K, S, WH, Z]



#### *Drosera* Linnaeus 1753 (Sundew)

A genus of about 100 species, herbs, nearly cosmopolitan. References: Wood (1960)=Z; Shinnars (1962)=Y; Wynne (1944)=X; Schnell (2002b)=Q; Schnell (1976, 1995).

- 1 Leaves filiform, the expanded leaf bases forming a corm-like base.
- 2 Petals 7-10 (12) mm long; leaves 8-25 (-30) cm long, < 1 mm wide; glandular hairs on the leaves red to purple, drying dark brown; scape 6-26 cm long ..... *D. filiformis*
- 2 Petals 12-17 (-20) mm long; leaves 30-50 cm long, > 1 mm wide; glandular hairs on the leaves pale green, drying pale greenish brown; scape 25-60 cm long ..... *D. tracyi*
- 1 Leaves spatulate or suborbicular, the leaf bases not expanded.
- 3 Inflorescence stipitate-glandular; basal rosettes 0.8-3.5 cm in diameter; stipules absent or obsolete (consisting of a few hair-like segments); seeds black, crateriform ..... *D. brevifolia*
- 3 Inflorescence glabrous; basal rosettes (2-) 3-12 cm in diameter; stipules present, fimbriate; seeds light brown and longitudinally striate, or reddish brown to black and densely papillose, or brown and coarsely corrugated into 14-16 longitudinal ridges.
- 4 Leaf blades wider than long, suborbicular or reniform; seeds about 6× as long as wide; [primarily of the Mountains, rarely disjunct eastward] ..... *D. rotundifolia* var. *rotundifolia*
- 4 Leaf blades about as wide as long, spatulate to obovate; seeds 1-2× as long as broad; [primarily of the Coastal Plain, rarely disjunct westward].
- 5 Petioles with few to many long trichomes; petals pink (sometimes fading to white); plants scapose; inflorescence straight at base; seeds coarsely corrugated into 14-16 longitudinal ridges ..... *D. capillaris*
- 5 Petioles glabrous; petals white; plants usually with a leafy stem 1-10 cm long; inflorescence arching at base; seeds reddish brown to black and densely papillose ..... *D. intermedia*

*Drosera brevifolia* Pursh, Dwarf Sundew. Cp (FL, GA, NC, SC, VA), Pd (GA, NC), Mt (GA, SC): pine savannas, other wet sandy sites, rarely in seepage over rock outcrops; common (rare in lower Piedmont only and Mountains, rare in VA). April-May. The species ranges from se. VA south to s. FL and west to AR, OK, and TX; disjunct in sc. TN. *D. leucantha* may be the correct name for this taxon; see Shinnars (1962) and Wood (1966) for a contentious discussion of nomenclatural issues. [= C, F, GW, G, K, Q, S, WH, X, Z; = *D. leucantha* Shinnars – RAB, Y]

*Drosera capillaris* Poiret, Pink Sundew. Cp (DE, FL, GA, NC, SC, VA), Pd (NC, SC, VA): pine savannas, other wet sandy or peaty sites; common (rare in Piedmont, rare in DE and VA). May-August. Se. VA south to s. FL and west to TX, rarely inland, as in TN; also extending into tropical America, in the West Indies, Mexico, and n. South America. [= RAB, C, F, G, GW, K, Q, S, W, WH, X, Y, Z]

*Drosera filiformis* Rafinesque, Threadleaf Sundew. Cp (DE, FL, NC): margins of natural pools in pinelands, especially clay-based Carolina bays; rare. June; August. E. MA south to se. NC; disjunct in the FL Panhandle (Bay and Washington counties) and in sw. NS (Sorrie 1998a). Sorrie (1998a) has clarified the taxonomy and phytogeography of *D. filiformis* and *D. tracyi*. See comments about *D. tracyi* below. Reported as adventive in a single county in WV (Harmon, Ford-Werntz, & Grafton 2006). [= GW, K, WH, Y; < *D. filiformis* – RAB, C, G (also see *D. tracyi*); = *D. filiformis* var. *filiformis* – F, Q, X, Z; < *D. tracyi* Macfarlane in L.H. Bailey – S (also see *D. filiformis*)]

*Drosera intermedia* Hayne, Water Sundew, Spoonleaf Sundew. Cp (DE, FL, GA, NC, SC, VA), Pd (NC, SC): savannas, ditches, pocosins, margins of pools or streams, often in standing water; common (rare in Piedmont, rare in VA). July-September. *D. intermedia* is circumboreal, in North America ranging from NL (Newfoundland) and MN south to c. peninsular FL and TX, and into tropical America. Reported as adventive in a single county in WV (Harmon, Ford-Werntz, & Grafton 2006). [= RAB, C, F, G, GW, K, S, Pa, Q, W, WH, X, Y, Z]

*Drosera rotundifolia* Linnaeus var. *rotundifolia*, Roundleaf Sundew. Mt (GA, NC, SC, VA, WV), Cp (DE, NC, VA), Pd (DE, VA): mountain bogs and fens, seepage slopes, vertical seepage on rock (in the mountains) or clay (as along the Little River in the Sandhills of NC); uncommon (rare in DE and GA). A circumboreal species ranging south in North America to SC, ne. GA, e. and nc. TN, IL, and CA. Var. *comosa* Fernald is restricted to e. Canada, New England, and n. NY. [= F, K; < *D. rotundifolia* – RAB, C, G, GW, S, Pa, Q, W, WV, X, Y, Z]

*Drosera tracyi* (Diels) MacFarlane, Tracy's Sundew. Cp (FL, GA): savannas; common (rare in GA). Sc. GA and Panhandle FL, west to e. LA; it has been reported for SC by various authors, including Wynne (1944), but the basis for these reports is unknown. The notion that this species is not distinguishable from *D. filiformis* (or is only varietally distinct) is erroneous (Sorrie 1998a); see Schnell (1995) for a contrary view. [= GW, K, WH, Y; = *D. filiformis* Rafinesque var. *tracyi* Diels – Q]



## 296. CARYOPHYLLACEAE A.L. de Jussieu 1789 (Pink Family) [in CARYOPHYLLALES]

A family of about 86 genera and 2200-3000 species, herbs, shrubs, and trees, nearly cosmopolitan, but mostly Northern Hemisphere. References: Rabeler & Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Stipules present and readily apparent, scarious or hyaline.



- 2 Fruit a utricle; seed 1 per fruit; petals absent; [subfamily *Paronychioideae*]..... **Key A**
- 2 Fruit a capsule; seeds 3-many per fruit; petals present; [subfamily *Polycarpoideae*] ..... **Key B**
- 1 Stipules absent.
  - 3 Sepals fused into a toothed or lobed tube; [subfamily *Caryophylloideae*]..... **Key C**
  - 3 Sepals distinct, or slightly fused at their bases; [subfamily *Alsinoideae*]..... **Key D**

**Key A – Paronychioideae**

- 1 Leaves alternate; staminodes petaloid, ovate to oblong .....[*Corrigiola*]
- 1 Leaves opposite (or the uppermost alternate in *Herniaria*); staminodes not petaloid, subulate.
  - 2 Stipules inconspicuous; sepals green-margined, obtuse, lacking awns ..... [*Herniaria*]
  - 2 Stipules usually conspicuous; sepals white-scarious-margined, hooded or awned ..... *Paronychia*

**Key B – Polycarpoideae**

- 1 Stem leaves subulate, 1-2 mm long, pectinate-fringed at the base; basal rosette leaves spatulate (usually withering quickly after overwintering; stems wiry, stiff, subdichotomously branched; [of xeric sands on the Coastal Plain from se. VA southward] .....*Stipulicida*
- 1 Stem leaves larger, mostly both longer and broader, not pectinate-fringed at the base; basal rosette present or absent; stems either thicker, more flexuous, or not subdichotomously branched; [collectively more widespread].
  - 2 Leaves appearing verticillate, 10-16 per node, filiform to linear .....*Spergula*
  - 2 Leaves opposite or in whorls of 4, linear to ovate or spatulate.
    - 3 Leaves mostly in whorls of 4, obovate-spatulate, 2-8 mm long .....*Polycarpon*
    - 3 Leaves opposite, linear or orbicular, 5-40 mm long.
      - 4 Leaves orbicular-ovate; styles partly united .....*Drymaria*
      - 4 Leaves linear; styles separate .....*Spergularia*

**Key C – Caryophylloideae**

- 1 Calyx immediately subtended by 1-3 pairs of bracts.
  - 2 Calyx 20-40-nerved..... *Dianthus*
  - 2 Calyx 15-nerved..... *Petrorrhagia*
- 1 Calyx lacking subtending bracts.
  - 3 Sepals 25-62 mm long; calyx lobes longer than the calyx tube, the lobes as long as or longer than the corolla lobes .....*Agrostemma*
  - 3 Sepals (1-) 10-28 (-40) mm long; calyx lobes shorter than the calyx tube, the lobes much shorter than the corolla lobes (except *Gypsophila*).
    - 4 Styles 3-5 (or 0 in staminate plants); fruit valves 3, 4, 5, 6, 8, or 10; petals generally appendaged..... *Silene*
    - 4 Styles 2; fruit valves 4; petals appendaged or not.
      - 5 Sepals 1-5 mm long, the commissures between the sepals scarious ..... *Gypsophila*
      - 5 Sepals 7-25 mm long, lacking commissures.
        - 6 Calyx tubular, 20-nerved; petals appendaged; perennial ..... *Saponaria*
        - 6 Calyx ovoid, 5-nerved; petals not appendaged; annual ..... *Vaccaria*

**Key D – Alsinoideae**

- 1 Petals absent; fruit a 1-seeded, indehiscent utricle; styles 2.....*Scleranthus*
- 1 Petals present (rarely obsolete or essentially absent); fruit a few-many seeded capsule; styles 3-5.
  - 2 Leaves fleshy; seeds > 3 mm long; [of seabeaches and dunes]..... *Honckenya*
  - 2 Leaves membranaceous or stiff; seeds < 2 mm long; [of various habitats].
    - 3 Styles 4-5.
      - 4 Leaves linear-subulate, < 2 mm wide; styles 4-5.
        - 5 Valves or teeth of the capsule twice as many as the styles ..... *Moenchia*
        - 5 Valves or teeth of the capsule as many as the styles..... *Sagina*
      - 4 Leaves ovate, obovate, > 4 mm wide; styles 5.
        - 6 Capsule cylindric, dehiscent by 10 apical teeth..... *Cerastium*
        - 6 Capsule ovoid, dehiscent by 5 valves, each apically 2-cleft ..... *Myosoton*
    - 3 Styles 3.
      - 7 Inflorescence umbelliform; petals irregularly denticulate at apex..... *Holosteum*
      - 7 Inflorescence cymose or racemiform; petals entire, notched, or deeply cleft.
        - 8 Petals shallowly to deeply 2-cleft, notched at least 1/4 of the length, often divided nearly to the base and then appearing almost as 10 petals.
          - 9 Capsule cylindric, twice as long as the sepals; petals 2-cleft 1/5 - 1/2 length; styles (3-) 5 (-6), 0.5-2 mm long ..... *Cerastium*
          - 9 Capsule spherical or ellipsoid, as long as or slightly longer than the sepals; petals 2-cleft 2/3-3/4 length (1/2 length to lacinate in *S. holostea*); styles (2-) 3 (-5), 0.2-7 mm long ..... *Stellaria*
      - 8 Petals entire, or emarginate.
        - 10 Valves or teeth of the capsule as many as the styles ..... *Minuartia*

- 10 Valves or teeth of the capsule twice as many as the styles.
  - 11 Seeds with an aril ..... *Moehringia*
  - 11 Seeds lacking an aril.
    - 12 Capsule straight; petals entire or barely emarginated..... *Arenaria*
    - 12 Capsule cylindrical, and often somewhat curved; petals emarginate to bifid ..... *Cerastium*

*Agrostemma* Linnaeus 1753 (Corncockle)

A genus of 2 species, herbs, of temperate Eurasia. References: Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

\* *Agrostemma githago* Linnaeus var. *githago*, Corncockle, Purple Cockle, Corn-campion. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, disturbed areas; common (rare in DE and FL), native of Europe. May-July. [= FNA; < *A. githago* – RAB, C, F, G, K, Pa, S, W, WH]

*Arenaria* Linnaeus 1753 (Sandwort)

A genus of about 150-210 species, herbs, of temperate and subarctic regions of the Northern Hemisphere, extending southward to the montane tropics of South America and Africa. References: Hartman, Rabeler, & Utech in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993). [also see *Minuartia*]

- 1 Leaves lanceolate to oblanceolate, (7-) 15-32 mm long, 2-8 (-14) mm wide; perennial, stems to 8 dm long..... *A. lanuginosa* var. *lanuginosa*
- 1 Leaves ovate, 3-8 mm long, 1-4 mm wide; annual, stems to 3 dm long.
  - 2 Seeds 0.4-0.5 mm long; fruiting calyx 2-3 mm long ..... *A. leptoclados*
  - 2 Seeds ca. 0.6 mm long; fruiting calyx 3-4 mm long ..... *A. serpyllifolia*

*Arenaria lanuginosa* (Michaux) Rohrbach var. *lanuginosa*, Spreading Sandwort. Cp (FL, GA, NC, SC, VA): dunes, maritime forests, coquina limestone outcrops; common (uncommon in GA and SC, rare in NC and VA). May-July. Se. VA south to c. peninsular FL, west to TX, AR, and Mexico, and north in the interior to sc. TN (Chester, Wofford, & Kral 1997). [= C, FNA; < *A. lanuginosa* – RAB, F, S, WH; = *A. lanuginosa* ssp. *lanuginosa* – G; > *A. lanuginosa* ssp. *lanuginosa* var. *lanuginosa* – K; > *A. lanuginosa* ssp. *lanuginosa* var. *longepedunculata* Duncan – K; *Spergularium lanuginosum* Michaux ssp. *lanuginosum*]

\* *Arenaria leptoclados* (Reichenbach) Gussone, Small Thyme-leaved Sandwort, Slender Sandwort. Cp (FL), {GA, NC, SC, VA, WV}; rare in FL, native of Eurasia. The relative ranges, habitats, and abundance of the *A. leptoclados* and *A. serpyllifolia* are poorly known {additional herbarium work}. March-June. [= S; < *A. serpyllifolia* – RAB, K, W; = *A. serpyllifolia* Linnaeus var. *tenuior* Mertens & W.D. J. Koch – C, F, FNA, G, Pa; = *A. serpyllifolia* Linnaeus ssp. *leptoclados* (Reichenbach) Nyman – WH]

\* *Arenaria serpyllifolia* Linnaeus, Large Thyme-leaved Sandwort. Cp (DE, FL), Pd (DE), {GA, NC, SC, VA, WV}; uncommon in DE and FL. The relative ranges, habitats, and abundance of this and *A. leptoclados* are poorly known. March-June. [= S; < *A. serpyllifolia* – RAB, K, W; = *A. serpyllifolia* var. *serpyllifolia* – C, F, FNA, G, Pa; = *A. serpyllifolia* ssp. *serpyllifolia* – WH]

*Cerastium* Linnaeus 1753 (Mouse-ear Chickweed, Mouse-ear)

A genus of about 100 species, herbs, especially north temperate but nearly cosmopolitan. References: Morton in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993); Rabeler & Thieret (1988); Scheen et al. (2004). Key based in part on FNA.

- 1 Petals 10-18 mm long, 2-3× as long as the sepals; leaves 2-7 cm long; plants perennial, typically with some shoots not flowering.
  - 2 Leaf blades narrowly to broadly linear, acute or short-acuminate at tip, tapered to base; stems erect nearly whole length
    - 3 Plants strongly rhizomatous with long-creeping shoots, lacking taproot; flowering stems usually 25-30 cm long; stem pubescence eglandular (glandular hairs present in the inflorescence only); sepals 5-7 mm long; anthers 1.0-1.1 mm long; petals often turning brown when dry; [alien]..... [*C. arvense* ssp. *arvense*]
    - 3 Plants clumped, with taproots or shortly rhizomatous; flowering stems usually 5-20 cm long; stem pubescence glandular; sepals 3.5-6 (-7) mm long; anthers 0.8-0.9 mm long; petals usually remaining white when dried; [native]..... *C. arvense* ssp. *strictum*
  - 2 Leaf blades narrowly lanceolate to narrowly ovate, obtuse to acute at tip, more-or-less rounded at base; stems spreading or decumbent basally, ascending-erect distally.
    - 4 Leaf blades narrowly lanceolate, obtuse to acute, well-spaced on stem, moderately to densely pubescent with dull hairs but may be glabrate in age; plants forming small clumps..... *C. velutinum* var. *velutinum*
    - 4 Leaf blades narrowly ovate, obtuse and blunt at tip, tightly spaced on stem, very densely pubescent with silvery or translucent-white permanent hairs; plants form clumps to several dm wide; [endemic to serpentine in PA and MD] ..... *C. velutinum* var. *villosissimum*
- 1 Petals 3-8 mm long, shorter than, equaling, or up to 1.5× as long as the sepals; leaves 0.5-3.0 cm long (to 8 cm long in *C. nutans* and *C. brachypodium*); plants annual, with all shoots producing flowers (except *C. fontanum* ssp. *vulgare*).
  - 5 Perennial, matted at the base and rooting at the nodes..... *C. fontanum* ssp. *vulgare*
  - 5 Annual, taprooted.
    - 6 Sepals with long, appressed, eglandular hairs extending beyond the tip of the sepal.
      - 7 Inflorescence an open cyme, most of the pedicels longer than the sepals..... *C. brachypetalum*
      - 7 Inflorescence a compact, cymose cluster, most of the pedicels shorter than the sepals ..... *C. glomeratum*
    - 6 Sepals lacking long, appressed, eglandular hairs.
      - 8 Styles, sepals, and petals 3-4 (-5); capsule teeth 6-8 (-10).

- 9 Styles, sepals, and petals 4 (-5); capsule teeth 8 (-10); capsules ca. 1.5 × as long as the sepals; cauline leaves 2-3 × as long as wide ..... [*C. diffusum*]
- 9 Styles, sepals, and petals 3 (-4); capsule teeth 6 (-8); capsules ca. 2 × as long as the sepals; cauline leaves 8-10 × as long as wide... ..... *C. dubium*
- 8 Styles, sepals, and petals 5; capsule teeth 10.
- 10 Bracts of the inflorescence with distinctly scarious margins; leaves mostly 0.5-1.0- (-1.5) cm long.
- 11 Petals equaling or surpassing the sepals; cleft in petal apex 1.0-1.5 mm deep ..... *C. pumilum*
- 11 Petals shorter than the sepals; cleft in petal apex 0.2-0.5 (-0.9) mm deep ..... *C. semidecandrum*
- 10 Bracts of the inflorescence with green margins; leaves mostly (1.0-) 1.5-8 cm long.
- 12 Pedicels 3-10 (-15) mm long; leaves to 3.5 cm long ..... *C. brachypodum*
- 12 Pedicels (10-) 15-40 (-55) mm long; leaves to 8 cm long ..... *C. nutans*
- \* ***Cerastium arvense*** Linnaeus *ssp. arvense*. Introduced at scattered locations in ne. North America, including MD and NJ (FNA). [= FNA, K, Pa; < *C. arvense* – C, G; < *C. arvense* var. *arvense* – F]
- Cerastium arvense*** Linnaeus *ssp. strictum* (Linnaeus) Ugborogho. Mt (WV): sandy and gravelly areas; rare. {overall distribution}. Reported for GA, TN, KY, WV, MD, DE, and NJ, among other states (Kartesz 1999), the GA record not validated in FNA. [= FNA, K, Pa; < *C. arvense* – C, G; < *C. arvense* var. *arvense* – F]
- \* ***Cerastium brachypetalum*** Desportes, Gray Mouse-ear. Mt (NC, SC, WV), Pd (NC, SC, VA), Cp (NC, VA): roadsides, disturbed areas; common (rare in SC and WV), native of Europe. April-June. The reports of *C. tetrandrum* for e. VA in F and G are actually this species. [= RAB, C, F, FNA, G, W; > *C. brachypetalum* *ssp. brachypetalum* – K; >> *C. tetrandrum* W. Curtis – F, G, misidentified]
- Cerastium brachypodum*** (Engelmann ex A. Gray) B.L. Robinson. Mt (NC, VA), Pd (SC, VA), Cp (VA): disturbed areas, roadsides; rare. April-May. IL west to AB and OR, south to NC, nc. GA (Jones & Coile 1988), and AZ. This taxon is perhaps only introduced in our area from farther west. [= F, FNA, K, S; = *C. nutans* Rafinesque var. *brachypodum* Engelmann ex A. Gray – RAB, G, W; < *C. nutans* – C]
- 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 dubium*** (Bastard) Guépin. Cp (VA): disturbed areas; rare, native of s. Europe and Asia. Introduced in scattered states in the United States, including VA, KY, TN, MS (FNA). First reported for VA by Belden et al. (2004). [= C, FNA, K]
- \* ***Cerastium fontanum*** Baumgartner *ssp. vulgare* (Hartman) Greuter & Burdet, Common Mouse-ear. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (FL, NC, SC, VA): fields, disturbed areas; common (uncommon in DE, rare in FL), native of Europe. March-June. [= FNA, K, Pa, WH; = *C. holosteoides* Fries var. *vulgare* (Hartman) Hylander – RAB; = *C. vulgatum* Linnaeus – C, S; > *C. vulgatum* var. *vulgatum* – F, G; > *C. vulgatum* var. *holosteoides* (Fries) Wahlenberg – F, G; > *C. vulgatum* var. *hirsutum* Fries – G; ? *C. fontanum* *ssp. triviale* (Link) Jalas – W]
- \* ***Cerastium glomeratum*** Thuillier, Sticky Mouse-ear. Cp (DE, FL, NC, SC, VA), Pd (DE, NC, SC, VA), Mt (NC, SC, VA, WV): fields, disturbed areas; common (uncommon in DE), native of Europe. March-May. [= RAB, FNA, K, Pa, W, WH; = *C. viscosum* Linnaeus – C, F, G, S, an ambiguous name, of uncertain application]
- Cerastium nutans*** Rafinesque. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, VA): alluvial forests, bottomlands, moist forests; common (uncommon in NC, rare in DE). April-May. NS west to NT, south to SC, GA, AZ, Mexico, and OR. [= F; = *C. nutans* var. *nutans* – RAB, G, K, W; < *C. nutans* – C, Pa; > *C. nutans* var. *nutans* – FNA; > *C. longepedunculatum* Willdenow ex Britton – S]
- \* ***Cerastium pumilum*** W. Curtis, Dwarf Mouse-ear. Cp (NC, VA), Pd (NC, SC, VA), Mt (NC, WV): disturbed areas; rare, native of Europe. April-May. See Rabeler & Thieret (1988) for discussions and reports. [= C, F, FNA, G, K, Pa; > *C. glutinosum* Fries]
- \* ***Cerastium semidecandrum*** Linnaeus, Little Mouse-ear. Cp (DE, FL, NC, SC, VA), Mt (NC, VA, WV), Pd (NC, VA): disturbed areas; uncommon (rare in DE, FL, NC, and WV), native of Europe. April-June. Reported for SC by Nelson & Kelly (1997). Inconspicuous and easily overlooked. [= RAB, C, F, FNA, G, K, Pa, S, W, WH]
- \* ***Cerastium tomentosum*** Linnaeus, Snow-in-summer. Mt (NC, VA, WV): disturbed areas; rare, native of Eurasia. April-July. This species is "cultivated and sometimes escaped" in scattered locations in PA (Rhoads & Klein 1993; Rhoads & Block 2007). First reported for NC by Pittillo & Brown (1988). [= C, F, FNA, G, K, Pa]
- Cerastium velutinum*** Rafinesque var. *velutinum*, Field Mouse-ear, Starry Grasswort. Pd (DE, VA), Mt (VA): rocky river-scour areas, other open situations; rare. April-August. [= FNA, Pa; < *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 velutinum*** Rafinesque var. *villosissimum* (Pennell) J.K. Morton, Octararo Creek Chickweed. Serpentine barrens. May-August. 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, Pa; = *C. arvense* var. *villosissimum* Pennell – F; < *C. arvense* – C, G; < *C. arvense* Linnaeus *ssp. velutinum* (Rafinesque) Ugborogho var. *villosum* (Muhlenberg ex Darlington) Hollick & Britton – K]

### *Corrigiola* Linnaeus (Strapwort)

A genus of ca. 10 species, of Eurasia, Africa, and South America. References: Thieret & Rabeler in FNA (2005).

- \* ***Corrigiola littoralis*** Linnaeus *ssp. littoralis*, Strapwort. Introduced south to MD and PA. [= FNA; < *C. littoralis* – C, F, G, orthographic variant; < *C. littoralis* – K]

*Dianthus* Linnaeus 1753 (Pink, Carnation)

A genus of about 300-320 species, herbs, of Eurasia and Africa. Species other than those treated here are grown in gardens and may escape or persist. References: Rabeler & Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Flowers clustered in crowded cymes, short-pedicelled; [subgenus *Carthusianastrum*].
  - 2 Leaves 2-5 (-8) mm wide; annual or biennial; inflorescence pubescent ..... *D. armeria*
  - 2 Leaves mostly (8-) 10-20 mm wide; perennial; inflorescence glabrous..... *D. barbatus*
- 1 Flowers solitary, or few, long-pedicelled; [subgenus *Dianthus*].
  - 3 Petal blade 5-9 (-10) mm long, toothed..... *D. deltoides*
  - 3 Petal blade (8-) 12-18 mm long, fringed..... *D. plumarius*

\* *Dianthus armeria* Linnaeus ssp. *armeria*, Deptford Pink. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, NC, SC, VA): fields, roadsides, pastures; common (rare in FL), native of Europe. May-September. [= FNA; < *D. armeria* – RAB, C, F, G, K, Pa, S, W, WH, WV]

\* *Dianthus barbatus* Linnaeus ssp. *barbatus*, Sweet William. Pd (DE, NC, SC), Mt (VA, WV), Cp (DE), {GA}: cultivated as an ornamental, rarely escaped to disturbed areas; rare, native of Europe. June-August. [= FNA; < *D. barbatus* – RAB, C, F, G, K, Pa, WV]

\* *Dianthus deltoides* Linnaeus ssp. *deltoides*, Maiden Pink, Meadow Pink. Pd (NC, VA), Mt (NC, WV): cultivated as an ornamental, rarely escaped to adjacent areas; rare, native of Europe. May-July. See Rabeler & Thieret (1988) for additional information. [= FNA; < *D. deltoides* – C, F, G, K, Pa]

\* *Dianthus plumarius* Linnaeus ssp. *plumarius*, Garden Pink, Grass Pink. Cp (NC), Pd (NC, SC), Mt (VA): cultivated as an ornamental, rarely escaped to disturbed areas; rare, native of e. Europe. June-August. [= FNA; < *D. plumarius* – RAB, C, F, G, K]

*Drymaria* Willdenow ex J.A. Schultes 1819 (Drymary)

A genus of about 48 species, herbs, mostly New World (tropical to temperate), but 1 species pantropical. References: Duke (1961)=Z; Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

*Drymaria cordata* (Linnaeus) Willdenow ex Schultes var. *cordata*, Drymary, West Indian Chickweed. Cp (FL, GA): moist hammocks, moist disturbed areas; uncommon (rare in GA). Sc. GA south to s. FL south into the New World tropics; also old World tropics. Var. *diandra* Blume is restricted to the Old World. [= FNA; = *D. cordata* ssp. *cordata* – K, Z; < *D. cordata* – S, WH]

*Gypsophila* Linnaeus 1754 (Baby's-breath)

A genus of about 150 species, annual and perennial herbs, of temperate Eurasia, Africa, and Australia. References: Pringle in FNA (2005).

- 1 Leaves 0.2-2 (-3) mm wide; stems diffusely and repeatedly branched near the base and upward..... *G. muralis*
- 1 Leaves (1-) 3-16 mm wide; stems simple, few-branched toward the top, or much-branched
  - 2 Annual; plants strict or few branched upward; petals 6-15 mm long..... *G. elegans*
  - 2 Perennial; plants much-branched 1-4 (-8) mm long ..... *G. paniculata*

\* *Gypsophila elegans* Bieberstein, Annual Baby's-breath. Cp (NC), Pd (NC), Mt (WV): disturbed areas, persistent from cultivation, doubtfully established; rare, native of Eurasia. See Rabeler & Thieret (1988) for additional information. [= C, FNA, K]

\* *Gypsophila muralis* Linnaeus, Cushion Baby's-breath. Pd (NC): disturbed areas, roadsides, yards, cemeteries; rare, native of Europe. Found in Alamance County, NC (McCormick, pers. comm., 2009). Reported for various eastern states, including KY, TN, PA, NJ (FNA). [= C, FNA, K]

\* *Gypsophila paniculata* Linnaeus, Tall Baby's-breath. Cp (FL): disturbed areas; rare, native of Eurasia. [= FNA, K, WH] {add to synonymy}

*Herniaria* Linnaeus (Rupture-wort)

A genus of about 45 species, herbs, of Eurasia, Africa, and South America. References: Thieret, Hartman, & Rabeler in FNA (2005).

\* *Herniaria glabra* Linnaeus, Smooth Rupture-wort, introduced south to MD, NJ, and PA (Kartesz 1999). [= FNA, C, F, G, K]

*Holosteum* Linnaeus 1753 (Jagged Chickweed)

A genus of 3-4 species, herbs, of temperate Eurasia. References: Rabeler & Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

\* ***Holosteum umbellatum*** Linnaeus ssp. ***umbellatum***. Jagged Chickweed. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, VA): fields, roadsides, lawns, disturbed shale barrens, other disturbed areas; common (uncommon in DE), native of Europe. March-June. Four additional subspecies are not known to be present in North America. [= FNA; < *H. umbellatum* – RAB, C, F, G, K, Pa, S, W, WV]

***Honckenya*** Ehrhart 1788 (Seabeach-chickweed, Sea-sandwort)

A monotypic genus, an herb, with circumboreal distribution. References: Wagner in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

***Honckenya peploides*** (Linnaeus) Ehrhart ssp. ***robusta*** (Fernald) Hultén, Southern Seabeach-chickweed, Southern Sea-sandwort. Cp (DE, VA): seabeaches and dunes; rare. June-July. The species is circumboreal, in North America ranging south to e. VA. Ssp. *robusta* ranges from NL (Newfoundland) south to e. VA; 3 other subspecies do not occur south of NL (Newfoundland). [= FNA, K; = *Honckenya peploides* var. *robusta* (Fernald) House – C; = *Arenaria peploides* Linnaeus var. *robusta* Fernald – F; = *Honckenya peploides* ssp. *robusta* – G (apparently misspelled)]

***Minuartia*** Linnaeus 1753 (Sandwort)

A genus of about 120-175 species, herbs, of the northern hemisphere (and rarely South America). References: Rabeler, Hartman, & Utech in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Sepals acute, with prominent nerves; [of calcareous or mafic barrens of VA, and westward or northward].
  - 2 Primary leaves with axillary fascicles of secondary leaves ..... ***M. michauxii*** var. ***michauxii***
  - 2 Primary leaves lacking axillary fascicles of secondary leaves.
    - 3 Sepals 3-nerved; seeds 0.7-0.9 mm long..... [***M. muscorum***]
    - 3 Sepals 5-nerved; seeds 0.5-0.7 mm long..... ***M. patula***
- 1 Sepals obtuse (rarely sub-acute), nerveless or with very obscure nerves; [of various habitats].
  - 4 Lower stem leaves closely imbricated; [of xeric sands of the Coastal Plain of NC and SC]..... ***M. caroliniana***
  - 4 Lower stem leaves not imbricated; [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 but 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. Deep white sands of barren sandhills. April-June. NY (and formerly RI) to Panhandle FL, on the Coastal Plain. [= FNA, K, WH; = *Arenaria caroliniana* Walter – RAB, C, F, G; = *Sabulina caroliniana* (Walter) Small – S; = *Alsinosopsis caroliniana* (Walter) Small; = *Minuopsis caroliniana* (Walter) W.A. Weber]

***Minuartia cumberlandensis*** (B.E. Wofford & Kral) McNeill, Cumberland Sandwort. Vertical sandstone outcrops in the Cumberland Plateau. May-July (-November). Endemic to the Cumberland Plateau of ne. TN (Fentress, Morgan, Pickett, and Scott counties) and se. KY (McCreary County). See Winder (2004) for detailed information about this species. [= FNA, K; = *Arenaria cumberlandensis* B.E. Wofford & Kral – C]

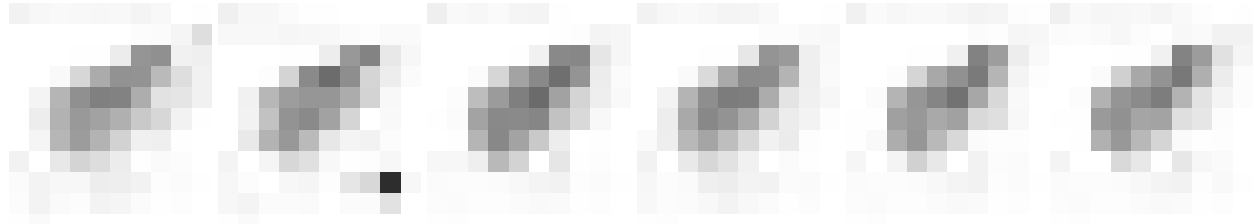
***Minuartia glabra*** (Michaux) Mattfeld, Appalachian Sandwort. Granitic flatrocks, other outcrops of granite, granitic gneiss, or other felsic gneisses and schists, in the mountains restricted to low or medium elevations. April-May. ME and NH south to w. GA (Jones & Coile 1988) and AL, primarily on the Piedmont and also in the Cumberlands (Chester, Wofford, & Kral 1997). [= FNA, K, Pa; = *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. Tidal freshwater marshes, other wetlands. April-June. Peculiarly and irregularly distributed, with isolated and scattered locations in the Coastal Plain and Mountains: wc. VA, ne. TN, e. NC, ne. SC, e. Panhandle FL, n. peninsular FL, wc. AL, and se. AR. [= FNA, K, WH; = *Arenaria godfreyi* Shinners – RAB, GW, W; = *Sabulina uniflora* – S, misapplied; = *Stellaria paludicola* Fernald & Schubert]

***Minuartia groenlandica*** (Retzius) Ostenfeld, Mountain Sandwort, Greenland Sandwort. 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). May-October. Greenland, NS, and QC south to the

higher mountains of New England and NY; disjunct in the Southern Appalachians of VA, w. NC, and e. TN. [= FNA, K; = *Arenaria groenlandica* (Retzius) Sprengel var. *groenlandica* – RAB, C, F, G; = *Sabulina groenlandica* (Retzius) Small – S; = *A. groenlandica* (Retzius) Sprengel – W; = *Porsildia groenlandica* (Retzius) Á. Löve & D. Löve ssp. *groenlandica*]

***Minuartia michauxii*** (Fenzl) Farwell var. ***michauxii***, Rock Sandwort. Limestone, dolostone, calcareous sandstone, serpentine, and calcareous shale outcrops and barrens. May–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, Pa; = *A. stricta* Michaux ssp. *stricta* – G; < *Sabulina stricta* (Michaux) Small – S; < *A. stricta* Michaux – W, WV]



***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]

***Minuartia patula*** (Michaux) Mattfeld, Lime-barren Sandwort. Rocky barrens of calcareous or mafic rocks. April–June. Ec. PA and w. VA west to IN and MN, south to AL and TX. [= FNA, K, Pa; = *Arenaria patula* Michaux var. *patula* – C, G; < *A. patula* Michaux – F; < *Sabulina patula* (Michaux) Small – S]

***Minuartia uniflora*** (Walter) Mattfeld. Granitic flatrocks, outcrops of Altamaha grit. 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]

#### ***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. Rocky, disturbed areas (powerline) over mafic rocks (diabase). May–July. Circumboreal, ranging south in North America to n. VA (Fairfax County), n. WV (Morton et al. 2004), MO, and CA. [= FNA, K, Pa; = *Arenaria lateriflora* Linnaeus – C, F, G]

#### ***Moenchia*** Ehrhart 1788

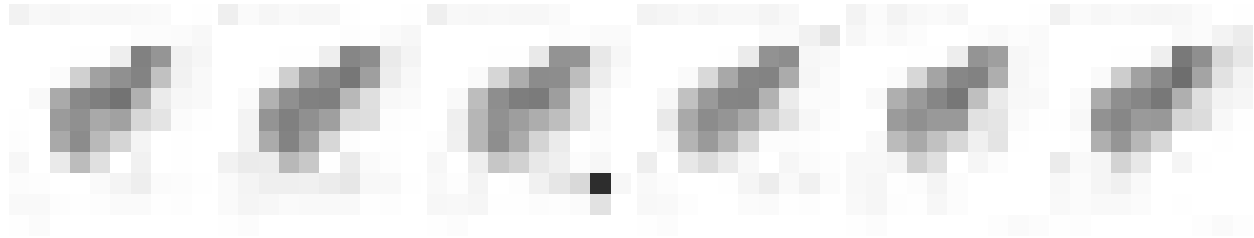
A genus of 3 species, herbs, native of Europe. References: Rabeler & Hartman in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

\* ***Moenchia erecta*** (Linnaeus) P.G. Gaertner, B. Meyer, & Scherbius ssp. ***erecta***, Upright Chickweed. Disturbed areas; native of { }. 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. Marshes, streambeds, wet meadows; native of Europe. May–October. [= F, FNA, K, Pa, WV; = *Stellaria aquatica* (Linnaeus) Scopoli – RAB, C, G, GW, W; = *Alsine aquatica* (Linnaeus) Britton – S]



*Paronychia* P. Miller 1754 (Whitlow-wort, Nailwort)

A genus of about 110 species, herbs and shrubs, nearly cosmopolitan in distribution. This genus consists mostly of plants of dry rocky or sandy habitats. References: Hartman, Thieret, & Rabeler in FNA (2005); Chaudhri (1968)=Z, Ward (1977a, 1977b)=Y; Shinnors (1962h)=X; Bittrich in Kubitzki, Rohwer, & Bittrich (1993). Key adapted from Y and Z.

**Identification notes:** Magnification of at least 10× is necessary for the identification of many of the taxa.

- 1 Leaf surfaces with silky, appressed pubescence (usually densely so, but sometimes sparse), giving the plant a silvery appearance; flowers 3.5-6 mm long, largely concealed by scarious bracts; [subgenus *Paronychia*] ..... *P. argyrocoma*
- 1 Leaf surfaces glabrous or with very short pubescence (neither appressed nor silky), the plant green; flowers 1-4 mm long, not concealed by scarious bracts.
  - 2 Sepals petaloid, the tip, margins, or entire sepal whitish; perigynous zone very well developed (mostly equaling or somewhat longer than the sepals); [of the Coastal Plain, from SC southward and westward]; [subgenus *Siphonychia*].
    - 3 Sepals glabrous to the base; plant a caespitose perennial with ascending annual stems.
      - 4 Stems minutely gray-puberulent ..... *P. erecta* var. *corymbosa*
      - 4 Stems glabrous and often also glaucous ..... *P. erecta* var. *erecta*
    - 3 Sepals densely pubescent on the basal portion (glabrous above); plant a sprawling, ascending or erect annual.
      - 5 Pubescent portion of the sepal nearly ½ its length; sepals broadly rounded and hooded; stem glabrous or one side with curly hairs.....  
..... *P. americana*
      - 5 Pubescent portion of the sepal <1/3 its length; sepals narrowed toward the apex, with a short tooth or awn; stem uniformly pubescent with retrorse hairs.
        - 6 Stem spreading or ascending, the branching unevenly dichotomously, the flowers therefore in diffuse cymes; glabrous portion of the sepal 0.8 mm long ..... *P. patula*
        - 6 Stem erect, the branching symmetrical and dichotomous, the flowers therefore in weirdly geometric, tight square cymes; glabrous portion of the sepal > 1.1 mm long ..... *P. rugelii*
  - 2 Sepals not petaloid, green, sometimes scarious-margined; perigynous zone somewhat shorter than the sepals; [of various provinces, collectively widespread in our area]; [subgenus *Paronychia*].
    - 7 Sepals tipped with a distinct awn, 0.35-0.75 mm long; flowers 2-4 mm long.
      - 8 Suffrutescent perennial, at least the flowering stems ascending or erect; leaves linear-subulate, 15-25 (-30) mm long, 0.5-1 mm wide, acute; [of Mountain and Piedmont rocky areas] ..... *P. virginica* var. *virginica*
      - 8 Prostrate annual; leaves oblong-elliptic or spatulate, 3-12 (-16) mm long, 1.5-3.5 (-5) mm wide, obtuse; [of Coastal Plain sands from sc. NC southward] ..... *P. herniarioides*
    - 7 Sepals tipped with a short cusp or mucro; flowers 1-1.6 mm long.
      - 9 Leaves with a distinctly ciliate margin; plants prostrate, the branching below the inflorescence not pseudo-dichotomous.
        - 10 Plant an annual (-biennial); stems 1-4 dm long, uniformly and minutely recurved-puberulent; flowers 1.25-1.4 mm long, shortly ciliate to nearly glabrous; sepals ca. 1 mm long, oval-oblong, the margin ciliolate; style 0.4-0.5 mm long, bifid; fruit rounded at the top ..... *P. baldwinii* ssp. *baldwinii*
        - 10 Plant a perennial; stems 2-12 dm long, glabrous or minutely puberulent in longitudinal bands; flowers 1.45-1.55 mm long, more or less glabrous; sepals 1-1.2 mm long, oblong, with a brownish margin; style 0.35-0.4 mm long, the 2 lobes divergent-recurved at maturity; fruit narrowed to the top ..... *P. baldwinii* ssp. *riparia*
      - 9 Leaves entirely glabrous or with a slightly ciliate-serrulate margin; plants erect, suberect, or somewhat prostrate, pseudo-dichotomously branched.
        - 11 Style elongate, 0.6-0.75 mm long; anthers 0.25-0.3 mm in diameter; stipular bracts subtending the flowers narrowly lanceolate, ca. 0.5× as long as the flowers ..... *P. montana*
        - 11 Style short, 0.3-0.35 mm long; anthers ca. 0.15 mm in diameter; stipular bracts subtending the flowers lanceolate, from much shorter than to exceeding the flowers.
          - 12 Stems glabrous; leaves oval-elliptic, 5-25 mm long, 2-8 (-10) mm wide, obtuse (rarely sub-obtuse or acute), very thin in texture, deep-green; calyx 0.9-1.3 mm long; sepals 0.5-1 mm long, herbaceous ..... *P. canadensis*
          - 12 Stems retrorsely puberulent (sometimes sparsely so); leaves oblanceolate, 5-15 mm long, 2-5 mm wide, acute (rarely sub-obtuse to obtuse), firm in texture, dull brownish-green; calyx 1.1-1.6 mm long; sepals 1-1.2 mm long, leathery.
            - 13 Stipular bracts subtending the flowers exceeding the flowers (calyx) ..... *P. fastigiata* var. *paleacea*
            - 13 Stipular bracts subtending the flowers somewhat shorter than the flowers (calyx).
              - 14 Sepals with a minute cusp or mucro ..... *P. fastigiata* var. *fastigiata*
              - 14 Sepals with a distinct white awn to 0.2 mm long ..... *P. fastigiata* var. *nuttallii*

*Paronychia americana* (Nuttall) Fenzl ex Walpers, American Whitlow-wort. Sandhills. June-September. S. SC south to GA and s. FL. Two taxa have been questionably distinguished. Ssp. *americana*, with the cymes many-flowered and forming spheroidal glomerules, has the range of the species; ssp. *pauciflora* (Small) Chaudhri, differing in its laxer, more open cymes, is restricted to s. GA and n. FL. [= FNA, WH, X, Y; > *Paronychia americana* (Nuttall) Fenzl ex Walpers ssp. *americana* – K, Z; > *Paronychia*

*americana* (Nuttall) Fenzl ex Walpers ssp. *pauciflora* (Small) Chaudhri – K, Z; > *P. americana* – RAB; > *Siphonychia americana* (Nuttall) Torrey & Gray – S; > *Siphonychia pauciflora* Small – S]

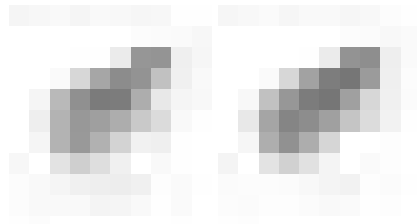
***Paronychia argyrocoma*** (Michaux) Nuttall, Silverling, Silver Whitlow-wort. Thin soils of rock outcrops, especially on mountain summits at medium to high elevations, disjunct to a few Piedmont monadnocks. July-September. A characteristic component of the summit flora of Southern Appalachian peaks, *P. argyrocoma* occurs in the mountains of New England (ME, NH, VT, and MA), and in the Southern Appalachians of WV, VA, NC, TN, and n. GA (Jones & Coile 1988). [= RAB, C, FNA, K, S, W, WV; > *P. argyrocoma* var. *argyrocoma* – F, G; > *P. argyrocoma* var. *albimontana* Fernald – F, G, Z]

***Paronychia baldwinii*** (Torrey & A. Gray) Fenzl ex Walpers ssp. ***baldwinii***, Annual Dune Whitlow-wort. Cp (FL, GA, NC, SC): dry sandy sites, woodlands or dunes; uncommon. June-October. E. NC south to c. peninsular FL and west to AL (and LA?), on the Coastal Plain. [= K, Y, Z; < *P. baldwinii* – FNA, WH; < *P. riparia* – RAB; = *Anychiastrum baldwinii* (Torrey & Gray) Small – S]

***Paronychia baldwinii*** (Torrey & A. Gray) Fenzl ex Walpers ssp. ***riparia*** (Chapman) Chaudhri, Perennial Dune Whitlow-wort. Cp (FL, GA, NC, SC, VA): dry sandy sites, woodlands or dunes; uncommon (VA Watch List). June-October. Se. VA south to n. FL (and AL?), on the Coastal Plain. Though Chaudhri (1968) and Ward (1977a and 1977b) independently reached the conclusion to reduce *P. riparia* to a subspecies of *P. baldwinii*, neither stated any reasons for their choice of subspecific status. I here follow the independent conclusions of Chaudhri and Ward, but the appropriate taxonomic rank remains unclear. [= K, Y; < *P. riparia* – RAB, F; < *P. baldwinii* – FNA, WH; = *P. riparia* Chapman – C, F; = *Anychiastrum riparium* (Chapman) Small – S; > *P. baldwinii* ssp. *riparia* var. *riparia* – Z; > *P. baldwinii* ssp. *riparia* var. *ciliata* Chaudhri – Z]

***Paronychia canadensis*** (Linnaeus) Wood, Canada Whitlow-wort, Forked Chickweed. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (DE, NC, SC, VA): dry rocky woods, shale barrens; uncommon (common in WV, rare in the NC, SC, and VA Coastal Plain). June-October. NH and s. ON west to MN, south to n. GA (Jones & Coile 1988), AL, MO, and KS. This species is somewhat taller on average than *P. fastigiata* or *P. montana*. [= RAB, C, F, FNA, G, K, Pa, W, WV, Z; = *Anychia canadensis* (Linnaeus) Britton, Sterns, & Poggenburg – S]

***Paronychia chartacea*** Fernald var. ***minima*** (L.C. Anderson) R.L. Hartman, Paper Nailwort. Cp (FL): scrub; rare. (May-) July-October. Endemic to Panhandle FL. [= FNA; < *P. chartacea* – WH; < *Nyachia pulvinata* Small; = *P. chartacea* Fernald ssp. *minima* L.C. Anderson – K] {add to synonymy; add to key}



***Paronychia erecta*** (Chapman) Shinnars var. ***corymbosa*** (Small) Chaudhri, Hairy Squareflower. Cp (FL): coastal dunes; uncommon. Panhandle FL west to se. LA. March-November. [= K, Y, Z; = *Odontonychia corymbosa* Small – S; < *Paronychia erecta* – FNA, WH, X]

***Paronychia erecta*** (Chapman) Shinnars var. ***erecta***, Smooth Squareflower. Cp (FL): coastal dunes; uncommon. Panhandle FL west to s. MS. March-November. [= K, Y, Z; = *Odontonychia erecta* (Chapman) Small – S; < *Paronychia erecta* – FNA, WH, X]

***Paronychia fastigiata*** (Rafinesque) Fernald var. ***fastigiata***, Common Forked Whitlow-wort. Mt (NC, SC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, SC, VA): dry, usually rocky, woodlands, often on thin soil around outcrop edges; uncommon (rare in DE). June-October. MA west to MN south to FL and TX. The three varieties of *P. fastigiata* (though accepted by Chaudhri and many recent floras) need additional investigation to confirm their taxonomic status, habitats, and geographic ranges. [= C, F, G, K, Pa, WV, Z; < *P. fastigiata* – RAB, W; < *P. fastigiata* var. *fastigiata* – FNA; < *Anychia polygonoides* Rafinesque – S]

***Paronychia fastigiata*** (Rafinesque) Fernald var. ***nuttallii*** (Small) Fernald, Pennsylvania Forked Whitlow-wort. Mt (NC, VA, WV): dry woods; rare. June-October. NY, sc. PA, n. VA, WV, e. TN, and w. NC. [= C, F, FNA, G, K, Pa, WV, Z; < *P. fastigiata* – RAB, W; < *Anychia polygonoides* Rafinesque – S]

***Paronychia fastigiata*** (Rafinesque) Fernald var. ***paleacea*** Fernald, Green Forked Whitlow-wort. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (NC, VA): dry, mostly rocky woodlands; uncommon (rare in WV). June-October. NJ, DE, and PA west to IL, south to VA, NC, KY, TN, MO, and TX. [= C, F, G, K, WV, Z; < *P. fastigiata* – RAB, W; < *P. fastigiata* var. *fastigiata* – FNA; < *Anychia polygonoides* Rafinesque – S]

***Paronychia herniarioides*** (Michaux) Nuttall, Michaux's Whitlow-wort. Cp (FL, GA, NC, SC): sandhills; rare. April-July. Sc. NC south to c. peninsular FL and e. Panhandle FL. The NC distribution ascribed by Small, Chaudhri, and FNA is based on the type specimen of André Michaux ("in arenosis aridis Carolinae septentrionalis"); the species has been relocated in NC (Scotland County) by Harry E. LeGrand, Jr, over two centuries later. [= RAB, FNA, K, WH, Y, Z; = *Gastronychia herniarioides* (Michaux) Small – S]

***Paronychia montana*** (Small) Pax & K. Hoffmann, Shale-barren Whitlow-wort. Mt (NC, VA): dry rock outcrops and talus barrens, especially on shale barrens; uncommon. June-October. C. PA (and OH?) south through w. VA and e. WV to a few localities in NC, TN, GA, and AL. [= K, Z; < *P. fastigiata* – RAB, W; = *P. fastigiata* var. *pumila* (A. Wood) Fernald – C, F, FNA, G, Pa; = *Anychiastrum montanum* Small – S]

***Paronychia patula*** Shinnars, Pineland Nailwort. Cp (FL, GA): sandhills; uncommon (rare in GA). July-September. Sw. GA west to s. AL, south to c. peninsular FL. [= FNA, K, WH, X, Y, Z; = *Siphonychia diffusa* Chapman – S]



***Paronychia rugelii*** (Chapman) Shuttleworth ex Chapman, Sand-squares, Rugel's Nailwort. Cp (FL, GA): sandhills; uncommon (rare in GA). July-October. S. GA south to c. peninsular FL. [= FNA, WH, X, Y; > *Paronychia rugelii* (Chapman) Shuttleworth ex Chapman var. *interior* (Small) Chaudhri – K, Z; > *Paronychia rugelii* (Chapman) Shuttleworth ex Chapman var. *rugelii* – K, Z; > *Odontonychia interior* Small – S; > *Gibbesia rugelii* (Chapman) Small – S]

***Paronychia virginica*** Sprengel var. ***virginica***, Virginia Whitlow-wort. Mt (VA, WV), Pd (GA, VA): shale barrens, rocky riversides, calcareous rock outcrops and talus, serpentine outcrops; rare. June-August. The ranges of the two varieties are variously stated; the distinguishing characteristics and distributions are not clear. Var. *virginica* occurs in w. MD, w. VA, WV, GA, and AL (or allegedly also in NC, AR, OK, and TX). Var. *parksii* (Cory) Chaudhri occurs in TX (or also in OK) and Coahuila (Mexico). [= C, Z; < *P. virginica* – F, FNA, K, W, WV; = *P. virginica* ssp. *virginica* – G; = *P. dichotoma* (Linnaeus) Nuttall – S]

### ***Petrorhagia*** (Seringe) Link 1831 (Pink)

A genus of about 28-33 species, herbs, of Eurasia. References: Rabeler & Hartman in FNA (2005); Rabeler (1985)=Z; Bittrich in Kubitzki, Rohwer, & Bittrich (1993). Key based on Z.

- 1 Flowers in capitate inflorescences (solitary in impoverished or very young plants); bracts subtending the calyx broad and long, usually completely enclosing the calyx; [section *Kohlrauschia*].....***P. prolifera***  
 1 Flowers solitary (or in fascicles of 2-3); bracts subtending the calyx narrow and short, enclosing about ½ of the calyx; [section *Petrorhagia*]..  
 .....***P. saxifraga***

\* ***Petrorhagia prolifera*** (Linnaeus) P.W. Ball & Heywood, Childing Pink, Proliferous Pink. Cp (DE, SC, VA), Mt (NC, VA, WV), Pd (GA, NC, VA): roadsides, disturbed areas; uncommon (rare in WV), native of Europe. May-September. Reported for GA by Duncan (1985). [= C, FNA, K, Pa, Z; = *Dianthus prolifera* Linnaeus – F, WV; = *Tunica prolifera* (Linnaeus) Scopoli – G; = *P. prolifera* – W, orthographic variant]

\* ***Petrorhagia saxifraga*** (Linnaeus) Link var. ***saxifraga***, Saxifrage Pink. Disturbed areas. June. "Cultivated and occasionally escaped" south to se. PA (Rhoads & Block 2007), 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, Pa, Z; < *Tunica saxifraga* (Linnaeus) Scopoli]

### ***Polycarpon*** Linnaeus 1759 (Allseed)

A genus of about 18 species, herbs, primarily of Europe, with several species in South America, and 1 cosmopolitan. References: Thieret & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

\* ***Polycarpon tetraphyllum*** (Linnaeus) Linnaeus ssp. ***tetraphyllum***, Four-leaved Allseed. Cp (AL, FL, GA, SC, VA): disturbed areas, lawns, parking lots, ballast; rare, native of Europe. April-October. Reported for AL (Diamond & Woods 2009). Reported for VA (Wright, pers. comm. 2010). [= FNA, K; < *Polycarpon tetraphyllum* – RAB, S, WH]

### ***Sagina*** Linnaeus 1753 (Pearlwort)

A genus of about 25 species, herbs, mainly north temperate. References: Crow in FNA (2005); Crow (1978)=Z; Bittrich in Kubitzki, Rohwer, & Bittrich (1993). [also see *Moenchia*]

- 1 Leaf blades fleshy; seeds reniform or nearly spherical, lacking a groove on one side; flowers 5-merous.....***S. japonica***  
 1 Leaf blades thin; seeds obliquely triangular, with a groove on one side; flowers 4-merous or 5-merous.  
 2 Annual, usually without a persistent rosette of leaves; flowers (4-) 5-merous; seeds 0.3-1.4 mm long; sepals erect-appressed in fruit .....  
 .....***S. decumbens***  
 2 Perennial, usually with a persistent rosette; flowers 4 (-5)-merous; seeds (0.3-) 0.4 (0.5) mm long; sepals spreading in fruit .....  
 .....***S. procumbens***

***Sagina decumbens*** (Elliott) Torrey & A. Gray, Eastern Pearlwort. Cp (DE, FL, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed ground, fields, cracks in pavement or sidewalks; common (uncommon in Mountains of GA, NC, SC, and VA, rare in Mountains of WV). March-June. NB west to IL and MO, south to c. peninsular FL and TX, with adventive occurrences farther 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, Pa, S, W, WH; = *S. decumbens* ssp. *decumbens* – FNA, K, Z]

\* ***Sagina japonica*** (Swartz) Ohwi, Japanese Pearlwort. Cp (DE): disturbed areas; rare, native of e. Asia. June-July. Also naturalized in se. PA (Rhoads & Block 2007). [= FNA, K, Pa]

\* ***Sagina procumbens*** Linnaeus, Northern Pearlwort, Bird's-eye. Cp (DE), Pd (DE), Mt (NC, WV): disturbed soils; uncommon (rare in NC), native of Eurasia (or, at least, ne. North America). May-September. Crow (1978) questions whether *S. procumbens* is native at all in the Western Hemisphere. In North America, it is concentrated in 2 main regions, from NS and QC south to MD, and from sw. BC south to c. CA, with scattered occurrences elsewhere, such as around the Great Lakes, CO, AR, s. OH, and w. NC. Whether or not the species is native in the New World, the occurrence in NC (in a gravel parking lot on top of

Roan Mountain) is almost certainly adventive. [= C, FNA, G, K, Pa, WV, Z; > *S. procumbens* var. *procumbens* – F; > *S. procumbens* var. *compacta* Lange – F]

***Saponaria* Linnaeus 1753 (Soapwort)**

A genus of about 40 species, herbs, of temperate regions of Eurasia. References: Thieret & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993). [also see *Vaccaria*]

\* ***Saponaria officinalis* Linnaeus**, Soapwort, Bouncing Bet. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): disturbed areas, fields, roadsides; common (rare in DE Coastal Plain), native of Europe. May-October. [= RAB, C, F, FNA, G, K, Pa, S, W, WV]

***Scleranthus* Linnaeus 1753 (Knewel)**

A genus of 10 species, herbs, mainly of temperate regions of the Northern Hemisphere. References: Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

\* ***Scleranthus annuus* Linnaeus**, Knewel, Annual Knewel. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): fields, ditches, roadsides, other disturbed areas; common (uncommon in Mountains), native of Europe. March-October. [= RAB, C, F, G, K, Pa, W, WV]

***Silene* Linnaeus 1753 (Catchfly, Campion, Fire-pink, Wild-pink)**

A genus of about 700 species, of Eurasia and North America. References: Morton in FNA (2005); Clausen (1939)=Z; Wilbur (1970b)=Y; Bittrich in Kubitzki, Rohwer, & Bittrich (1993). [including *Lychnis*]

- 1 Styles mostly 5; capsule with 5 or 10 teeth; calyx tubular at anthesis, becoming strongly inflated later in *S. dioica* and *S. latifolia*.
  - 2 Petal limbs deeply divided into 4 linear segments ..... *S. flos-cuculi*
  - 2 Petal limbs unlobed, emarginate, or shallowly 2-lobed.
    - 3 Leaf blades with dense silky white hairiness; flowers bisexual ..... *S. coronaria*
    - 3 Leaf blades variously pubescent, but not with silky-appressed pubescence.
      - 4 Petals pink; capsule teeth revolute ..... [*S. dioica*]
      - 4 Petals white; capsule teeth spreading to slightly reflexed ..... *S. latifolia*
- 1 Styles mostly 3; capsule with 3 or 6 teeth; calyx tubular or campanulate at anthesis, not greatly inflated (except in *S. vulgaris*).
  - 5 Middle cauline leaves in whorls of 4; petals fimbriate ..... *S. stellata*
  - 5 Middle cauline leaves opposite; petals entire, bilobed, 2-cleft, or 8-cleft.
    - 6 Flowers bright red.
      - 7 Petals entire or slightly erose at the tip; cauline leaves 10-20 pairs ..... *S. regia*
      - 7 Petals deeply notched at the tip; cauline leaves 2-8 pairs.
        - 8 Cauline leaves 2.0-7.0 cm wide, elliptic, obovate, or orbicular, usually 1-2× as long as wide; entire plant sticky glandular-pubescent; [of sandstone cliffs and crevices, in our area only in sw. VA] ..... *S. rotundifolia*
        - 8 Cauline leaves 0.8-4.0 cm wide, mostly oblanceolate, usually at least 2.5× as long as wide; plant not covered with sticky glandular hairs; [of various, mostly rocky, habitats, widespread in our area].
          - 9 Cauline leaves (excluding bracteal leaves) in 2-4 pairs; basal leaves not conspicuously clustered; [mountains of e. WV, se. KY, and e. TN] ..... *S. virginica* var. *robusta*
          - 9 Cauline leaves (excluding bracteal leaves) in 1 (-2) pairs; basal leaves often numerous and clustered; [widespread in our area] ..... *S. virginica* var. *virginica*
    - 6 Flowers white or pink.
      - 10 Petals 8-cleft or more divided; plants perennial; [native].
        - 11 Plants 2-6 dm tall; petals pink, the >8 ultimate segments of each dichotomously forked at nearly right angles; calyx ca. 2.5 cm long; stem with long, villous pubescence ..... *S. catesbaei*
        - 11 Plants (5-) 7-15 dm tall; petals white, the 8 segments of each essentially parallel to one another; calyx ca. 1 cm long; stem with short rigid pubescence ..... *S. ovata*
  - 10 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].
    - 12 Plant < 2.5 dm tall; plant perennial, with a stout, carrot-like taproot; [native, of woodlands, rock outcrops, barrens, glades, and dry roadbanks].
      - 13 Calyx pubescence of long, straight, nonglandular hairs; [of OH, WV, ?VA, and MO south to AL] ..... *S. caroliniana* var. *wherryi*
      - 13 Calyx pubescence of glandular hairs; [of NC and ne. TN northward in and east of the Appalachians].
        - 14 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*
        - 14 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*
    - 12 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*).

- 15 Calyx with 20-30 parallel veins.
- 16 Calyx glabrous ..... *C. csereii*
- 16 Calyx pubescent and usually glandular.
- 17 Mature calyx 8-15 mm long; seeds 0.6-0.9 mm broad ..... *C. conica*
- 17 Mature calyx 20-30 mm long; seeds 1.3-1.8 mm broad ..... *C. conoidea*
- 15 Calyx with 10 or fewer veins (or the venation obscure).
- 18 Plants rhizomatous perennials (biennial in *S. csereii*); petals white.
- 19 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*
- 19 Fruiting calyx clavate or campanulate, not contracted at the mouth; stamens 1.0-1.5× as long as the calyx; filaments usually white.
- 20 Petal appendages 1.0-1.6 mm long; inflorescences leafy; [native] ..... *S. nivea*
- 20 Petal appendages absent or to 0.2 mm long; inflorescences with reduced leaves resembling bracts; [alien, mostly of disturbed habitats] ..... *S. vulgaris*
- 18 Plants annuals; petals white, pink, or lavender.
- 21 Stems glabrous or sparsely pubescent (if pubescent, puberulent).
- 22 Calyx 4-10 mm long; carpophore ca. 1 mm long ..... *S. antirrhina*
- 22 Calyx 13-17 mm long; carpophore 7-8 mm long ..... *S. armeria*
- 21 Stems densely pubescent (hirsute or glandular-hirsute).
- 23 Petals entire or emarginate; fruiting calyx 6-10 mm long ..... *S. gallica*
- 23 Petals deeply 2-lobed; calyx; fruiting calyx 10-30 mm long.
- 24 Fruiting calyx 10-15 mm long; petal appendages ca. 0.2 mm long ..... *S. dichotoma*
- 24 Fruiting calyx (15-) 25-30 mm long; petal appendages 0.5-1.5 mm long ..... *S. noctiflora*

*Silene antirrhina* Linnaeus, Sleepy Catchfly, Garter-pink. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): fields, disturbed areas; common. April-July. Nearly throughout North America, south to c. peninsular FL, and in Mexico and South America; introduced in Europe. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, WV]

\* *Silene armeria* Linnaeus, Sweet William Catchfly, None-so-pretty, Garden Catchfly. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, FL, NC, SC, VA): disturbed areas; uncommon (rare in FL, NC, SC, VA, and WV), native of Europe. June-October. [= RAB, C, F, FNA, G, K, Pa, W, WH, WV]

*Silene caroliniana* Walter var. *caroliniana*, South Carolina Wild-pink, Rock Catchfly. Pd (FL, GA, NC, SC), Cp (GA, NC, SC): in acidic, sandy, open woodlands, especially woodlands around granitic flatrocks and sandy Coastal Plain woodlands; uncommon (rare in GA and NC). April-July. Sc. NC south through the e. three-quarters of SC just into e. GA; disjunct in Panhandle FL. See Wilbur (1970b) and Clausen (1939) for additional discussion of these infraspecific taxa in *S. caroliniana*. [= C, F; < *S. caroliniana* – RAB, S, WH; = *S. caroliniana* ssp. *caroliniana* – FNA, G, K, Z; = *S. caroliniana* ssp. *caroliniana* var. *caroliniana* – Y]

*Silene caroliniana* Walter var. *pensylvanica* (Michaux) Fernald, Northern Wild-pink, Sticky Catchfly. Mt (NC, VA, WV), Pd (NC, VA), Cp (DE, NC, SC, VA): open woodlands, especially calcareous; common (rare in DE and NC). April-July. NH west to e. OH, south to VA, e., nc., and w. NC, and ne. TN (Chester, Wofford, & Kral 1997). [= F, W; < *S. caroliniana* – RAB, S; > *S. caroliniana* var. *pensylvanica* – C; = *S. caroliniana* ssp. *pensylvanica* (Michaux) Clausen – FNA, G, K, Pa, Z; = *S. pensylvanica* Michaux – WV; = *S. caroliniana* ssp. *caroliniana* var. *pensylvanica* – Y]

*Silene caroliniana* Walter var. *wherryi* (Small) Fernald. Mt (VA?, WV): dry, rocky places; rare. April-July. OH and WV (and VA according to FNA) south and west to AL, KY, MO, and KS. [= F; > *S. caroliniana* var. *pensylvanica* – C; = *S. caroliniana* ssp. *wherryi* (Small) Clausen – FNA, G, K, Y, Z; = *S. wherryi* Small]

*Silene catesbaei* Walter, Eastern Fringed Catchfly, Fringed Campion. Cp (FL, GA): mesic deciduous forests along streams or on lower- to mid-slopes; rare. Mid-March-early May. C. GA south to Panhandle FL, and possibly in AL based on a C.T. Mohr specimen (see FNA). Ward (2006) discusses the nomenclatural change. [= *Silene polypetalata* (Walter) Fernald & Schubert – FNA, K, WH; = *S. baldwinii* Nuttall – S]

\* *Silene conica* Linnaeus ssp. *conica*, Sand Catchfly. Cp (DE): disturbed areas; rare, native of Eurasia. May-July. [= FNA; < *S. conica* – C, F]

*Silene conoidea* Linnaeus, Large Sand Catchfly. Pd (DE): disturbed areas; uncommon, native of Eurasia. [= C, FNA]

\* *Silene coronaria* (Linnaeus) Clairville, Mullein-pink, Rose Campion. Mt (GA, NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (VA): disturbed areas; uncommon (rare in GA, NC, SC, and WV), native of Europe. May-July. [= FNA, Pa; = *Lychnis coronaria* (Linnaeus) Desrousseaux – RAB, C, F, G, K, WV]

\* *Silene csereii* Baumgarten, Balkan Bladder-campion. Mt (NC, WV): habitat not known; rare, native of Europe. May-August. Documented for w. NC (J.K. Morton, pers.comm.). Also reported in se. PA (Rhoads & Klein 1993) and e. WV. [= FNA, K, Pa; = *S. cserei* – C, F, G, orthographic variant]

\* *Silene dichotoma* Ehrhart ssp. *dichotoma*, Forked Catchfly. Mt (NC, VA, WV), Pd (VA), {GA}: fields, disturbed areas; common (uncommon in WV), native of Europe. May-August. [= FNA; < *S. dichotoma* – RAB, C, F, G, K, Pa, S, W, WV]

\* *Silene dioica* (Linnaeus) Clairville, Red Campion, Red Catchfly. Cp (DE): disturbed areas; rare, native of Europe. May. 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, Pa; = *Lychnis dioica* Linnaeus]

\* *Silene flos-cuculi* (Linnaeus) Clairville ssp. *flos-cuculi*, Ragged Robin. Mt (NC): rare; native of Europe. May-June. Introduced and established in Alleghany County, NC (Poindexter 2008) and elsewhere in ne. North America, as in MD and PA. [= FNA, Pa; < *Lychnis flos-cuculi* Linnaeus – C, F, G, K]

\* *Silene gallica* Linnaeus, Small-flowered Catchfly. Cp (FL, NC, SC, VA): sandy disturbed areas; rare, native of Europe. May-July. [= RAB, C, F, FNA, G, K, Pa, WH; > *S. anglica* Linnaeus – S, misapplied]

\* *Silene latifolia* Poiret, White Champion, White Cockle, Evening Lychnis. Mt (NC, SC, VA, WV), Pd (DE, NC, SC, VA), Cp (NC, SC, VA): fields, roadsides, disturbed areas; common (uncommon in DE, rare in SC), native of Europe. May-July. [= C, FNA, Pa; > *S. latifolia* Poiret ssp. *alba* (P. Miller) Greuter & Burdet – K; = *Lychnis alba* P. Miller – RAB, F, G, S, W, WV; ? *S. pratensis* (Rafinesque) Grenier & Godron; ? *Melandrium dioicum* (Linnaeus) Cosson & Germain]

*Silene nivea* (Nuttall) Muhlenberg ex DC., Snowy Champion. Mt (GA, VA, WV), Pd (VA): rocky or sandy flood-scoured riversides or creeksides; rare (VA Rare). June-July. NJ west to ND, south to n. VA, w. VA, WV, nw. GA (Jones & Coile 1988), TN, and MO. [= C, F, FNA, G, K, Pa, W, WV; = *Silene alba* Muhlenberg – S, misapplied]

\* *Silene noctiflora* Linnaeus, Sticky Cockle, Night-flowering Catchfly, Sticky Champion. Mt (NC, VA, WV), Pd (DE, NC, VA), Cp (DE, NC, VA): fields, disturbed areas; uncommon (rare in NC and VA), native of Europe. June-August. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, WV; = *Melandrium noctiflorum* (Linnaeus) Fries]

*Silene ovata* Pursh, Mountain Catchfly. Mt (GA, NC, SC, VA), Cp (GA): circumneutral soils of woodlands and forests, especially over mafic or calcareous rocks, mostly at medium elevations in the mountains; rare. August-September. Sw. VA and KY west to AR, south to nw. GA, n. AL, and AR; disjunct in sc. and sw. GA. [= RAB, C, F, FNA, G, K, S, W]

*Silene regia* Sims, Royal Catchfly. Cp (FL, GA): prairies and calcareous woodlands and forests; rare (GA Rare). OH and e. MO south to e. TN (Chester, Wofford, & Kral 1997), nw. and sw. GA (Jones & Coile 1988), FL Panhandle (Jackson County), and AL. [= C, F, FNA, G, K, S, WH]

*Silene rotundifolia* Nuttall, Roundleaf Fire-pink, Sandstone Fire-pink. Mt (GA, VA, WV): sandstones cliffs, ledges, and talus, and at bases of sandstone cliffs; rare. S. OH and WV south to nw. GA (Jones & Coile 1988) and n. AL, nearly restricted to the Cumberland Plateau. [= C, F, FNA, G, K, S, WV]

*Silene stellata* (Linnaeus) Aiton f., Starry Champion, Widow's-frill. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, NC, SC, VA): dry to mesic forests, rock outcrops; common (rare in NC, SC, and VA Coastal Plain). July-September. CT west to SD, south to c. GA and TX. [= RAB, F, FNA, K, Pa, S, W, WV; > *S. stellata* var. *stellata* – C, G; > *S. stellata* var. *scabrella* Palmer & Steyermark – C, G]

*Silene virginica* Linnaeus var. *robusta* Strausbaugh & Core, Large Fire-pink. Mesic forest margins. June-July. E. WV south through se. KY to e. TN. Var. *robusta* Strausbaugh & Core, named from locations in e. WV, extends as well to se. KY and e. TN. It differs in its greater size and numerous pairs of cauline leaves, the leaves larger (7-15 cm long, 2-4 cm wide, vs. 7.5-10 cm long, 0.5-2 cm wide) and smaller calyx (1.5-2 cm long, vs. ca. 2.2 cm long) (Strausbaugh & Core 1952, 1978); it flowers about a month later than nearby populations of *S. virginica* var. *virginica* (B.E. Wofford, pers. comm., 2012). [= K, WV; < *S. virginica* – C, F, FNA, G, S, W]

*Silene virginica* Linnaeus var. *virginica*, Fire-pink. Woodlands, rock outcrops, crevices in cliffs, roadbanks. April-July. NJ and NY west to s. ON and se. MI, south to Panhandle FL (Bay County), GA and OK. [= K, WV; < *S. virginica* – RAB, C, F, FNA, G, Pa, S, W, WH]

\* *Silene vulgaris* (Moench) Garcke, Bladder Champion, Maiden's-tears. Mt (NC, VA, WV), Pd (DE, GA, NC, VA), Cp (NC, SC, VA): disturbed areas; common (uncommon in GA, NC, SC, and WV, rare in DE, rare in VA Coastal Plain), native of Europe. May-August. [= C, FNA, K, Pa; = *S. cucubalus* Wibel – RAB, G, W, WV; > *S. cucubalus* var. *cucubalus* – F; > *S. cucubalus* var. *latifolia* (Reichenbach) G. Beck – F; > *S. latifolia* (P. Miller) Britten & Rendle – S]



*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.....*S. 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 .....[*S. morisonii*]
  - 2 Seed wings white to tan, 0.4-0.6 mm wide; stamens usually 5 .....*S. pentandra*

\* *Spergula arvensis* Linnaeus, Corn Spurrey. Cp (DE, FL, GA, NC, SC, VA), Pd (DE, NC, SC, VA), Mt (VA, WV): fields, roadsides, disturbed areas; uncommon (rare in FL and WV), native of Europe. April-June. Two varieties are sometimes recognized; var. *arvensis*, with seeds ornamented with white, clavate papillae, the plants sparsely glandular, and var. *sativa*, with seeds reticulate and lacking papillae, the plants sparsely to densely glandular. Additional information is needed on the distinctiveness, range in our area, etc. of the two putative varieties. [= RAB, C, FNA, K, Pa, S, WH, WV; > *S. arvensis* Linnaeus var. *arvensis* – F, G; > *S. arvensis* Linnaeus var. *sativa* (Boeninghausen) Mertens & W.D.J. Koch – F, G]

\* *Spergula morisonii* Boreau, Morison's Spurrey. Fallow fields, disturbed areas; native of Europe. May. Known from MD (Prince Georges County) (Steury 2004a), MA, and NJ (FNA). [= C, FNA, Pa]

\* *Spergula pentandra* Linnaeus, Wingstem Spurrey. Cp (NC, VA): sandy fields; rare, native of Europe. April-June. [= RAB, C, F, FNA, G, K]

*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 *S. media*).
- 2 Seeds 0.8-1.1 mm long, smooth, without sculpturing except for wings; leaf blades fleshy .....[*S. 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 .....*S. 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 ..... *S. echinosperma*
- 3 Seeds dull, not silvery; stipules longer than wide; styles 0.4-0.7 mm long ..... *S. salina*

\* *Spergularia echinosperma* Čelakovský. Cp (GA): disturbed soils; rare, native of Europe. Naturalized in GA and AL (FNA). [= FNA, K]

\* *Spergularia media* (Linnaeus) K. Presl var. *media*. Mt (WV): disturbed areas; rare, native of Europe. August-September. 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, Pa; ? *Spergularia maritima* (Linnaeus) Chiovenda – K] {synonymy incomplete}

\* *Spergularia rubra* (Linnaeus) J. & K. Presl, Purple Sand-spurrey, Roadside Sand-spurrey. Pd (VA), Cp (DE): disturbed areas; uncommon (rare in VA), native of Eurasia. May-September. [= C, F, FNA, G, K, Pa; = *Tissa rubra* (Linnaeus) Britton – S]

*Spergularia salina* J. & K. Presl, Saltmarsh Sand-spurrey. Cp (DE, FL, GA, NC, SC, VA): brackish and salt marsh flats; uncommon. June-October. Widespread on coasts of North America (from QC south to c. peninsular FL, from BC south to Baja California), inland along salted highways, in South America, and Eurasia. Considered by some (C, G) to be introduced only in North America, by others native (F, FNA, S). [= FNA, K, Pa; = *S. marina* (Linnaeus) Grisebach – RAB, C, F, G, GW, WH, misapplied; = *Tissa marina* (Linnaeus) Britton – S, misapplied]

*Stellaria* Linnaeus 1753 (Chickweed, Stitchwort, Starwort)

A genus of about 120-200 species, cosmopolitan (centered in Asia). References: Morton in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Leaves narrow, usually linear, lanceolate, oblanceolate, or narrowly elliptic, the blade 3-10× as long as wide, 0.8-10 mm wide; stems prominently 4-angled.
- 2 Sepals 2.0-3.5 mm long; petals 0-3.0 mm long, shorter than the sepals or absent; seeds 0.3-0.9 mm long.
- 3 Inflorescence a leafy terminal cyme of (1-) 5-50 flowers; seeds 0.7-0.9 mm long, smooth or slightly rugose ..... *S. borealis* var. *borealis*
- 3 Inflorescences axillary, soliray or in small cymes of 2-5 flowers; seeds 0.3-0.8 mm long, distinctly papillose.
- 4 Flowers in axillary inflorescences of 1-5 flowers; sepals 5; petals 5; seeds 0.3-0.4 mm long, with small, rounded tubercles; [widespread] ..... *S. alsine*
- 4 Flowers solitary in leaf axils; sepals 4 (-5); petals absent; seeds 0.6-0.8 mm long, with stalked, knoblike tubercles; [of c. KY and TN] ..... *S. fontinalis*
- 2 Sepals 3.5-9 mm long; petals 3.5-13 mm long, equaling or longer than the sepals; seeds 0.7-2.5 mm long.
- 5 Seeds 2-2.5 mm long; bracts of the inflorescence herbaceous; petals notched < halfway to the base ..... *S. holostea*
- 5 Seeds 0.7-1.2 mm long; bracts of the inflorescence scarious; petals notched > halfway to the base.
- 6 Sepals 4.5-5.5 mm long, strongly 3-nerved; seeds 0.8-1.2 mm long, coarsely tuberculate; inflorescence diffuse, many-flowered ..... *S. graminea*
- 6 Sepals 3.5-4.5 mm long, weakly 3-nerved; seeds 0.7-1.0 mm long, obscurely sculptured and appearing almost smooth; inflorescence more compact, fewer-flowered ..... *S. longifolia*
- 1 Leaves broad, usually ovate, obovate, or broadly elliptic, the blade 1-2.5× (or to 4×) as long as wide, 4-30 mm wide (if > 2.5× as long as wide, then definitely > 10 mm wide); stems terete or 4-angled.
- 7 Leaves long-petiolate, the petiole about as long as the blade, the blades cordate to truncate at the base; sepals 2.5-3.5 mm long, obtuse to broadly acute; seeds 0.6-0.8 mm long; stem glabrous or glandular-puberulent (the pubescence not in lines) ..... *S. prostrata*
- 7 Leaves sessile, short-petiolate, to long-petiolate (if long petiolate, the blades cuneate), the blades rounded to cuneate at the base; sepals 3.5-11 mm long, broadly acute to acuminate; seeds 0.4-2.0 mm long; stem puberulent to short-pilose (the pubescence in vertical lines or not).
- 8 Leaves (1.0-) 2.5-10 cm long (with strong dimorphism between sterile and fertile shoots, the leaves of sterile shoots much larger); seeds 1.7-2 mm long; sepals 4-11 mm long; stem pubescence in vertical lines or uniformly distributed; perennial, the stems strong and ascending to erect; [native].
- 9 Sepals 7-11 (-12) mm long, acuminate, ciliate, but more-or-less glabrous on the back; [of the mountains] ..... *S. corei*
- 9 Sepals 3.5-7 mm long, acute, ciliate and more-or-less pubescent on the back; [widespread in our area] ..... *S. pubera*
- 8 Leaves 0.5-4.0 cm long; seeds 0.6-1.7 mm long; sepals 3.0-6.5 mm long; stem pubescence always in vertical lines; annual, the stems weak and in part prostrate, the tips or vigorous growth ascending; [alien].
- 10 Sepals 5.0-6.5 mm long; stamens 8-10; seeds 1.1-1.7 mm long ..... *S. neglecta*
- 10 Sepals 3.0-5.2 (-6.0) mm long; stamens 1-5 (-8); seeds 0.4-1.3 mm long.
- 11 Stamens 3-5 (-8); sepals 4.5-5.2 (-6.0) mm long; seeds 0.9-1.4 mm long; petals usually present ..... *S. media*
- 11 Stamens 0-3 (-5); sepals 3.0-4.0 mm long; seeds 0.4-0.9 mm long; petals usually absent ..... *S. pallida*

*Stellaria alsine* Grimm, Bog Stitchwort, Longstalk Starwort, Bog Chickweed. Seepages. 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, Pa, W; ? *Stellaria uliginosa* Murray]

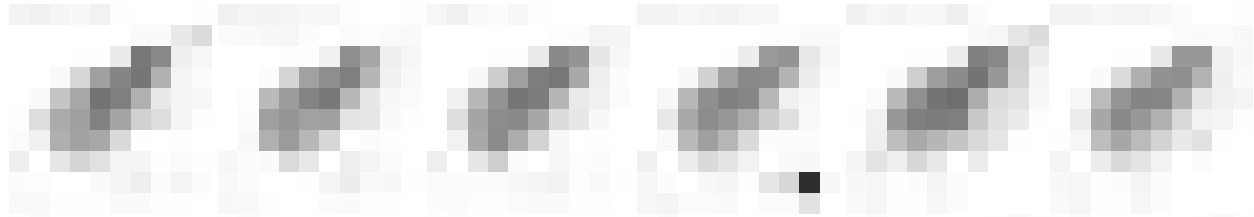
*Stellaria borealis* Bigelow var. *borealis*, Northern Stitchwort. Cold swamps. May-September. Greenland and NL (Labrador) west to AK, south to MD, n. WV (Canaan Valley, Tucker Co.), sc. PA, MI, WI, MN, CO, NV, and OR. Var. *sitchana* (Steudel) Fernald is restricted to nw. North America. [= C; = *S. borealis* ssp. *borealis* – FNA, K; > *S. calycantha* (Ledebour) Bongard var. *floribunda* Fernald – F, G; > *S. calycantha* var. *isophylla* Fernald – F, G, WV, misapplied; < *S. borealis* – Pa]

*Stellaria corei* Shinners, Tennessee Starwort. Cove forests and seepages at moderate to high elevations, rarely escaped from cultivation; rare. April-June. W. VA, WV, and sw. PA west to OH and IN, south to w. NC, e. and c. TN, and n. AL. Cronquist (1991) reports that *S. corei* has a chromosome number of  $2n = 60$ , as opposed to  $2n = 30$  for *S. pubera*. In mountain coves, *S. corei* and *S. pubera* sometimes grow intermixed; they are best regarded as species. Both species have an interesting seasonal growth form, producing short and relatively small-leaved flowering shoots in the spring (which wither following fruiting), followed by taller, more vigorous summer shoots with larger and tougher leaves and lacking flowers, which persist until autumn. Some of the description in various manuals of differences in petiole length and leaf size and shape between the two species is obscured or complicated by these seasonal differences; more careful observation is needed. [= RAB, FNA, K, Pa, W, WV; = *S. pubera* Michaux var. *silvatica* (Béguinot) Weatherby – C, F; = *S. silvatica* (Béguinot) Maguire – G, preoccupied; = *Alsine tennesseensis* (C. Mohr) Small – S, misapplied]

*Stellaria fontinalis* (Short & Peter) B.L. Robinson. Seepages and wet cliffs. C. TN (Chester, Wofford, & Kral 1997) and c. KY. 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]

\* *Stellaria graminea* Linnaeus, Common Stitchwort, Lesser Stitchwort. Fields, roadsides, pastures, disturbed areas; native of Europe. May-August. [= RAB, C, F, FNA, G, GW, K, Pa, W, WV; = *Alsine longifolia* (Muhlenberg ex Willdenow) Britton – S, misapplied]

\* *Stellaria holostea* Linnaeus, Easter-bell, Greater Stitchwort. Escaped or persistent from cultivation; native of Europe. April-June. [= C, F, FNA, G, K, Pa]



*Stellaria longifolia* Muhlenberg, Longleaf Stitchwort. Meadows, floodplain forests, freshwater tidal marshes, moist disturbed areas. May-September. Apparently circumboreal, in North America ranging south to e. SC, w. VA, e. TN, MO, KS, AZ, and CA. [= C, F, FNA, G, Pa, W, WV; > *S. longifolia* var. *longifolia* – K]

\* *Stellaria media* (Linnaeus) Villars, Common Chickweed. Disturbed areas, gardens, fields, bottomlands, moist forests, native of Europe. January-December. [= FNA, Pa; < *S. media* – RAB, C, G, W, WH, WV (also see *S. pallida*); < *S. media* var. *media* – F; = *S. media* ssp. *media* – K; < *Alsine media* Linnaeus – S]

\* *Stellaria neglecta* Weihe. Disturbed areas; native of Europe. Similar to *S. media* and *S. pallida*. It has been found at scattered localities in e. North America and will presumably eventually be found elsewhere in our area. [= FNA, G; < *S. media* (Linnaeus) Villars – RAB, C, W; < *S. media* var. *media* – F; = *S. media* ssp. *neglecta* (Weihe) Murbeck – K; = *Alsine neglecta* (Weihe) A. & D. Löve]

\* *Stellaria pallida* (Dumortier) Piré, Lesser Chickweed. Disturbed areas, gardens, fields; native of Europe. January-December. Cronquist (1991) reports that *S. pallida* has a chromosome number of  $2n = 22$ , as opposed to  $2n = 40-44$  for *S. media*. [= C, FNA, Pa; < *S. media* (Linnaeus) Villars – RAB, W, WH, WV; >> < *S. media* var. *glaberrima* G. Beck – F, possibly misapplied; = *S. prostrata* – G, misidentified; ? *S. apetala* Ucria ex Roemer – G, possibly misapplied; = *S. media* ssp. *pallida* (Dumortier) Ascherson & Graebner – K; < *Alsine media* – S; = *Alsine pallida* Dumortier]

*Stellaria prostrata* Baldwin. Moist soil along streams. March-April. Apparently ranging from SC south to c. peninsular FL, west to c. TX. This species has been reported repeatedly for SC and sometimes for VA as well; the VA reports are referable to *S. pallida*. More information is needed about its occurrence in our area. [= K, WH; = *S. cuspidata* Willdenow ex Schlechtendal ssp. *prostrata* (Baldwin) J.K. Morton – FNA; = *Alsine baldwinii* Small – S]

*Stellaria pubera* Michaux, Star Chickweed, Common Starwort, Giant Chickweed, Great Chickweed. Mt (GA, NC, SC, VA, WV), Pd (GA, NC, SC, VA), Cp (FL, NC, SC, VA): bottomland forests, moist slopes, coves, hammocks; common (uncommon in Coastal Plain, uncommon in DE Piedmont, rare in FL). April-June. NJ west to IL, south to Panhandle FL and AL. See *S. corei* for comments. [= RAB, FNA, G, K, Pa, W, WH, WV; = *S. pubera* var. *pubera* – C, F; = *Alsine pubera* (Michaux) Britton – S]



*Stipulicida* Michaux 1803 (Wire-plant)

A genus of a single species, herb, of se. North America. References: Judd (1983)=Z; Ward (2001)=Y; James (1957)=X; Swanson & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

**Identification notes:** *Stipulicida* is immediately recognizable by its very wiry, dichotomously branched stems, the stem leaves reduced to subulate scales 0.5-2 mm long. Often overlooked are the basal rosette of spatulate leaves, to 15 mm long and 4 mm wide.

- 1 Sepal margin lacerate; outer sepal tips mucronate; [of FL].....*S. setacea* var. *lacerata*
- 1 Sepal margin entire or nearly so; outer sepal tips acute to obtuse; [of se. VA south to s. FL, west to LA] ..... *S. setacea* var. *setacea*

*Stipulicida setacea* Michaux var. *lacerata* C.W. James. Cp (FL): xeric sands of sandhills, dry pine flatwoods, maritime forests; rare. May-August. Ne. FL south to s. FL; Cuba. [= FNA, K, WH, X, Y, Z; < *S. setacea* – S]

*Stipulicida setacea* Michaux var. *setacea*, Wire-plant. Cp (FL, GA, NC, SC, VA): xeric sands of sandhills, dry pine flatwoods, maritime forests; common, rare in VA. May-August. Se. VA south to s. FL, west to e. LA (Florida parishes). A third variety, var. *filiformis* (Nash) D.B. Ward, endemic to c. Peninsular FL, is often considered a mere form of var. *setacea* (see synonymy and references). [= Y; < *S. setacea* var. *setacea* – FNA, K, WH, X, Z (including var. *filiformis*, but not var. *lacerata*); < *S. setacea* – RAB, C, S; < *S. setacea* – S (including var. *lacerata* but not var. *filiformis*)]

*Vaccaria* von Wolf 1781 (Cow-cockle, Cow-herb)

A genus of 1-4 species, herbs, of c. and e. Europe, Mediterranean, and temperate Asia. References: Thieret & Rabeler in FNA (2005); Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

\* *Vaccaria hispanica* (P. Miller) Rauschert, Cow-cockle, Cow-herb. Pd (DE, SC, VA), Mt (WV): fields, disturbed areas; rare, native of Europe. May-July. The record from VA (Arlington County) probably represents a waif. [= C, FNA, K, Pa; =? *V. pyramidata* Medikus – RAB; = *Saponaria vaccaria* Linnaeus – F, WV; =? *Vaccaria segetalis* Garcke ex Ascherson – G; = *Vaccaria vaccaria* (Linnaeus) Britton – S]

298. AMARANTHACEAE A.L. de Jussieu 1789 (Amaranth Family) [in CARYOPHYLLALES]

A family of about 175 genera and 2250 species, mostly herbs, but including shrubs and trees, nearly cosmopolitan, but most diverse in subtropical and temperate regions (Judd & Ferguson 1999). References: Robertson & Clemants in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993); Welsh, Crompton, & Clemants in FNA (2003b); Judd & Ferguson (1999)=Z; Kühn in Kubitzki, Rohwer, & Bittrich (1993). [including CHENOPODIACEAE]

{Note: several of the genera below have been treated in very different ways by various authors. Complicating the situation is the pantemperate or pantropical distribution of some species, questions of application of names having priority, and the use of technical characters not readily observed on herbarium specimens. The treatments below of *Salicornia*, *Sarcocornia*, *Atriplex*, and *Suaeda* may require considerable change prior to publication}

Subfamily Amaranthoideae

Tribe Celosieae: *Celosia*.

Tribe Amarantheae, subtribe Amaranthinae: *Amaranthus*.

Tribe Amarantheae, subtribe Aervinae: *Achyranthes*.

Subfamily Gomphrenoideae

Tribe Gomphrenae, subtribe Froelichiinae: *Alternanthera*, *Froelichia*, *Guellimenea*.

Tribe Gomphrenae, subtribe Gomphreninae: *Gomphrena*, *Iresine*.

**Warning to users!:** This key is under construction. Several genera need to be added to it: *Achyranthes*, *Beta*, *Celosia*, *Gomphrena*, *Guilleminea*, *Spinacia*

- 1 Leaves opposite.
- 2 Leaves reduced to scales a few mm long, clasping and appressed against the succulent stem; flowers in groups of 3, sunken into the stem.
- 3 Annual from a taproot; central flower (of each group of 3) considerably longer than the 2 lateral flowers..... *Salicornia*
- 3 Perennial from a horizontal rhizome; central flower (of each group of 3) slightly or not at all longer than the 2 lateral flowers..... *Sarcocornia*

- 2 Leaves not reduced to scales; flowers not sunken into the stem.
  - 4 Flowers unisexual and plants dioecious ..... *Iresine*
  - 4 Flowers perfect.
    - 5 Sepals united into a tube; plants of dry soils ..... *Froelichia*
    - 5 Sepals distinct or nearly so; plants of disturbed areas (dry or moist) or aquatic ..... *Alternanthera*
- 1 Leaves mostly or entirely alternate (the lower sometimes opposite).
  - 6 Plants (at least some parts) with glandular or glandular-vesicular hairs ..... *Dysphania*
  - 6 Plants glabrous, farinose, or variously pubescent, but lacking glandular hairs.
    - 7 Fruit enclosed and concealed by paired accrescent bracteoles (these usually deltoid, diamond-shaped, or ovoid) ..... *Atriplex*
    - 7 Fruit enclosed by the persistent calyx.
      - 8 Tepals and bracts intermingled, scarious, acute ..... *Amaranthus*
      - 8 Tepals and bracts not intermingled, not scarious and acute.
        - 9 Leaves petiolate, lanceolate or wider, toothed or entire, not succulent or only slightly so.
          - 10 Fruiting calyx not winged, the lobes flat, keeled, or hooded ..... *Chenopodium*
          - 10 Fruiting calyx winged horizontally ..... *Cycloloma*
        - 9 Leaves sessile, linear, entire, succulent or not.
          - 11 Leaves spine-tipped ..... *Salsola*
          - 11 Leaves not spine tipped.
            - 12 Leaves pubescent to villous ..... *Bassia*
            - 12 Leaves glabrous ..... *Suaeda*

**Former Chenopodiaceae**

- 1 Leaves opposite, reduced to scales a few mm long, clasping and appressed against the succulent stem; flowers in groups of 3, sunken into the stem; [subfamily *Salicornioideae*, tribe *Salicornieae*].
  - 2 Annual from a taproot; central flower (of each group of 3) above the 2 lateral flowers ..... *Salicornia*
  - 2 Perennial from a horizontal rhizome; central flower (of each group of 3) inserted at the same level as the 2 lateral flowers ..... *Sarcocornia*
- 1 Leaves mostly or entirely alternate (the lower sometimes opposite), not reduced to appressed scales; flowers not usually grouped into groups of 3, not sunken into the stem.
  - 3 Fruit enclosed and concealed by paired accrescent bracteoles (these usually deltoid, diamond-shaped, or ovoid); [subfamily *Chenopodioideae*].
    - 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]; [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]; [tribe *Spinacieae*] ..... *Spinacia*
  - 3 Fruit enclosed by the persistent calyx.
    - 5 Leaves petiolate, lanceolate or wider, the larger leaves generally toothed, not succulent or only slightly so; [subfamily *Chenopodioideae*].
      - 6 Fruit dehiscent; ovary half-inferior; roots usually enlarged; [tribe *Beteae*] ..... *Beta*
      - 6 Fruit indehiscent; ovary superior; roots not enlarged.
        - 7 Fruiting calyx not winged, the lobes flat, keeled, or hooded; [tribe *Chenopodieae*] ..... *Chenopodium*
        - 7 Fruiting calyx winged horizontally; [tribe *Camphorosmeae*] ..... *Cycloloma*
    - 5 Leaves sessile, linear, entire, succulent or not.
      - 8 Leaves spine-tipped; [subfamily *Salsoloideae*; tribe *Salsoleae*] ..... *Salsola*
      - 8 Leaves not spine-tipped.
        - 9 Leaves pubescent to villous; [subfamily *Chenopodioideae*, tribe *Camphorosmeae*] ..... *Bassia*
        - 9 Leaves glabrous; [subfamily *Salsoloideae*, tribe *Suaedeae*] ..... *Suaeda*

***Achyranthes* Linnaeus 1753 (Chaff-flower)**

A genus of 6-8 species, of warm temperate and tropical regions of the Old World. References: Robertson in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993). Key based closely on FNA.

- 1 Pseudostaminode margins entire, denticulate, or slightly 2-lobed at the tip ..... *A. japonica* var. *hachijoensis*
- 1 Pseudostaminode margins fimbriate at the tip.
  - 2 Leaf blades 1-4 (-6) cm long, 1-4 (-6) cm wide, obtuse to rounded and apiculate at the tip; tepals 3-4 mm long; utricles 2-2.5 mm long ..... *A. aspera* var. *aspera*
  - 2 Leaf blades 4-20 cm long, 2-5 cm wide, acuminate at the tip; tepals 6-7 mm long; utricles 3-4 mm long ..... [*A. aspera* var. *pubescens*]

\* *Achyranthes aspera* Linnaeus var. *aspera*. Disturbed areas, waste areas around wool-combing mills; native of Asia, perhaps merely a waif. [= FNA, K1, K2, WH; = *Centrostachys indica* (Linnaeus) Standley – S]

\* *Achyranthes aspera* Linnaeus var. *pubescens* (Moquin-Tandon) C.C. Townsend, Devil's-horsewhip. Reported for MD and s. FL (FNA, Kartesz 1999), the MD report dropped in Kartesz (2010). Native of West Indies and perhaps s. FL. [= FNA, K1, K2; = *Centrostachys aspera* (Linnaeus) Standley – S] {rejected; keyed; not mapped}

\* *Achyranthes japonica* (Miquel) Nakai var. *hachijoensis* Honda, Japanese Chaff-flower. Bottomland forests, disturbed areas, native of e. Asia. Escaped in KY and WV (Mingo and Wayne counties) (Medley et al. 1985), n. AL (Limestone County) (D. Spaulding, pers. comm.), nc. GA, s. OH, s. IN, and s. IL, and now acting as a serious invasive species (Evans & Taylor 2011). [= FNA, K1, K2; < *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).

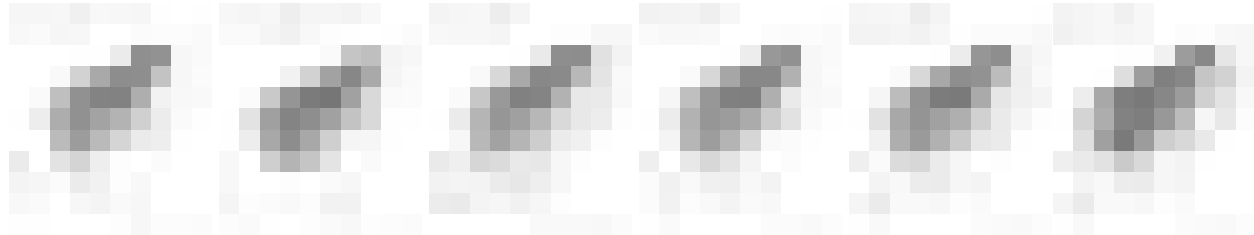
- 1 Inflorescences borne on peduncles 1-7 cm long, these from the leaf axils or terminal
  - 2 Bracts keeled; tepals pilose; leaves not succulent, acute to acuminate at the tip.....*A. flavescens*
  - 2 Bracts not keeled; tepals glabrous; leaves somewhat succulent, obtuse to rounded at the tip.....*A. philoxeroides*
- 1 Inflorescences sessile, in the leaf axils.
  - 3 Tepals dimorphic; tepal hairs barbed.
    - 4 Leaf blades longer than broad; tepals 3-5 mm long, densely villous.....*A. caracasana*
    - 4 Leaf blades as broad as long; tepals 5-7 mm long, sparsely villous.....*A. pungens*
  - 3 Tepals monomorphic; tepal hairs not barbed.
    - 5 Mature fruit included within the tepals; spikes globular; stems sericeous.....*A. paronychioides*
    - 5 Mature fruit exerted between the tepals; spikes narrow, short-cylindric; stems glabrous to pubescent in lines (the nodes also pubescent).....*A. sessilis*

\* *Alternanthera caracasana* Kunth. Disturbed areas; native of South America. Reported for Coastal Plain of SC, and in s. Coastal Plain of GA (Jones & Coile 1988) and for NC (FNA, K) and MD (K). [= FNA, K, WH; = *Achyranthes repens* Linnaeus – S, misapplied]

\* *Alternanthera flavescens* Kunth, Yellow Joyweed. Hammocks, sandbars. Widespread in the FL peninsula, north to ne. FL (Clay County) (Wunderlin & Hansen 2004); West Indies, Mexico, South America, the native distribution unclear. [= K; > *Achyranthes ramosissima* (Mart.) Stand. – S; > *Alternanthera floridana* (Chapman) Small] {add synonymy}

\* *Alternanthera paronychioides* St.-Hilaire. Disturbed areas; native of tropical America. July-October. [= FNA, WH; > *Alternanthera paronychioides* St.-Hilaire var. *paronychioides* – K; = *Alternanthera polygonoides* (Linnaeus) R. Brown ex Sweet – RAB, G, misapplied; = *Achyranthes polygonoides* (Linnaeus) Lamarck – S, misapplied]

\* *Alternanthera philoxeroides* (Martius) Grisebach, Alligator-weed. Floating in mats on the surface of the waters of blackwater rivers, sloughs, ditches, ponds, and in very moist soil of ditches and shores; native of tropical America. April-October. This plant is a serious weed of natural areas. [= RAB, C, FNA, K; = *Achyranthes philoxeroides* (Martius) Standley – S]



\* *Alternanthera pungens* Kunth. Field edges, parking lots, other disturbed areas. perhaps only a waif at least northward; native of tropical America. Known from scattered locations in AL, FL, LA, NY, and TX (Clemants in FNA 2003b); native of tropical America. Reported for Sumter and Tift counties, GA (Carter, Baker, & Morris 2009). [= FNA, K, WH; > *Achyranthes leiantha* (Seubert) Standley – S; > *Achyranthes repens* Linnaeus – S]

\* *Alternanthera sessilis* (Linnaeus) R. Brown ex A.P. de Candolle, Sessile Joyweed. Disturbed wet muck; native of the Tropics. First reported for SC by Nelson & Kelly (1997). Apparently now known in the Southeast from SC, FL, AL, MS, LA, TX (Brown & Marcus 1998) and GA (Jones & Coile 1988). [= FNA, GW, K]

*Amaranthus* Linnaeus 1753 (Amaranth, Pigweed)

A genus of about 60 species, all annual herbs, of tropical and temperate regions. References: Mosyakin & Robertson in FNA (2003b); Costea & Tardif (2003b)=Y; Henrickson (1999)=Z; Sauer (1955)=X; Costea, Sanders & Waines (2001a, 2001b); Townsend in Kubitzki, Rohwer, & Bittrich (1993). Key based closely on Mosyakin & Robertson in FNA (2003b) and Sauer (1955).

- 1 Plants dioecious; [subgenus *Acnida*].....**Key A**
- 1 Plants monoecious (the pistillate and staminate flowers intermingled, or in separate inflorescences on the same plant); [subgenera *Albersia* and *Amaranthus*] .....**Key B**

**Key A – *Amaranthus*, subgenus *Acnida***

- 1 Plants pistillate.
  - 2 Tepals present and well-developed (usually 5 present, at least the outer tepals >2 mm long and with a visible midvein).
    - 3 Tepals 1 or 2, lanceolate to linear; [subgenus *Acnida*, section *Acnida*] ..... *A. tuberculatus*
    - 3 Tepals 5, at least the inner spatulate; [subgenus *Acnida*, section *Saueranthus*].

- 4 Outermost tepal obtuse or notched (similar to the others), the midvein excurrent slightly or not at all ..... *A. arenicola*
- 4 Outermost tepal acute or acuminate (dissimilar to the inner obtuse tepals), the midvein excurrent into a rigid point ..... *A. palmeri*
- 2 Tepals lacking, or rudimentary (often only 1-2 present, these <1 (2) mm long and lacking a visible midvein); subgenus *Acnida*, section *Acnida*.
  - 5 Seeds 2-3 mm long; utricle 2.5-4 mm long ..... *A. cannabinus*
  - 5 Seeds 0.7-1.2 mm long; utricle 1-2.5 mm long.
    - 6 Utricle with conspicuous and regular longitudinal ridges; bract > 1.5 mm long, with a stout midrib not far excurrent beyond the bract blade ..... *A. australis*
    - 6 Utricle smooth or irregularly tuberculate; bract < 1.5 mm long, with a slender excurrent midrib
      - 7 Leaf blades narrow, all or nearly all < 1 cm wide ..... *A. floridanus*
      - 7 Leaf blades broader, well-developed leaves 1-3 cm wide ..... *A. tuberculatus*
- 1 Plants staminate (some identifications following this lead may not be reliable).
  - 8 Outer tepals with prominent midribs, usually longer than the inner tepals; bracts >2 mm long (or 1-2 mm long in *A. tuberculatus*), mostly with prominent midribs.
    - 9 Outer tepals with apex acute or obtuse; dark midribs not excurrent ..... *A. arenicola*
    - 9 Outer tepals with apex acuminate; midribs excurrent as rigid spines.
      - 10 Bracts ca. 4 mm long, equaling or exceeding the outer tepals ..... *A. palmeri*
      - 10 Bracts ca. 2 mm long, shorter than the outer tepals ..... *A. tuberculatus*
  - 8 Outer tepals without prominent midribs, not appreciably longer than the inner tepals; bracts <2 mm long, the midribs usually not prominent (except sometimes in *A. australis*).
    - 11 Bracts < 1 mm long; midribs scarcely excurrent ..... *A. cannabinus*
    - 11 Bracts > 1 mm long; midribs often conspicuously excurrent.
      - 12 Leaf blades narrow, all or nearly all < 1 cm wide ..... *A. floridanus*
      - 12 Leaf blades broader, well-developed leaves 1-3 cm wide
        - 13 Bracts with moderately prominent midribs; midribs of outer tepals excurrent ..... *A. australis*
        - 13 Bracts with slender midribs; midribs of outer tepals not excurrent ..... *A. tuberculatus*

**Key B – *Amaranthus*, subgenera *Albersia* and *Amaranthus***

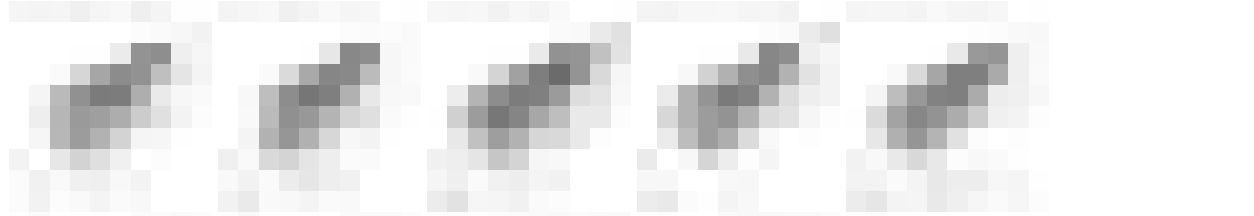
- 1 Inflorescences axillary clusters of glomerules (sometimes leafy terminal spikes also present); [subgenus *Albersia*].
  - 2 Pistillate flowers usually with 3 tepals; utricles usually regularly dehiscent (indehiscent in *A. blitum*).
    - 3 Utricles indehiscent; leaf blades usually deeply notched at the tip ..... *A. blitum*
    - 3 Utricles dehiscent; leaf blades obtuse, acuminate, or very shallowly notched at the tip.
      - 4 Tepals of pistillate flowers acute to short-acuminate at the tip, not reflexed; seeds 0.6-1.0 mm in diameter ..... *A. albus*
      - 4 Tepals of the pistillate flowers long-aristate at the tip, usually reflexed outward; seeds 1.0-1.4 mm in diameter ..... [*A. thunbergii*]
  - 2 Pistillate flowers usually with (4-) 5 tepals; utricles usually indehiscent or tardily dehiscent (regularly dehiscent in *A. blitoides*).
    - 5 Inflorescence axes thickened, becoming indurate at maturity ..... *A. crassipes* var. *crassipes*
    - 5 Inflorescence axes not thickened, not indurate at maturity.
      - 6 Utricles with regular, circumscissile dehiscence ..... *A. blitoides*
      - 6 Utricles indehiscent (or tardily and irregularly dehiscent).
        - 7 Leaves crisped-erose, conspicuously undulate (non planar) ..... *A. crispus*
        - 7 Leaves entire or erose, plane or slightly undulate.
          - 8 Leaves ovate, obovate-rhombic, to narrowly ovate or lanceolate; plants not fleshy; [alien of disturbed situations] ..... *A. polygonoides*
          - 8 Leaves orbicular or obovate; plants fleshy; [native of sea-beaches] ..... *A. pumilus*
  - 1 Inflorescences terminal spikes or panicles, leafless or nearly so at least in the distal portions (axillary spikes or clusters usually also present).
    - 9 Utricles indehiscent; tepals of pistillate flowers usually 2-3 (5 in *A. spinosus*); inflorescence bracts shorter than the tepals.
      - 10 Stems with paired nodal spines; tepals of pistillate flowers 5; [subgenus *Amaranthus*] ..... *A. spinosus*
      - 10 Stems lacking spines; tepals of pistillate flowers 2-3; [subgenus *Albersia*].
        - 11 Utricles distinctly rugose, equaling or slightly exceeding the tepals; terminal inflorescences usually thin and interrupted ..... *A. viridis*
        - 11 Utricles smooth to faintly rugose (occasionally wrinkled or rugose in dried material), distinctly exceeding the tepals; terminal inflorescences usually thick and dense (or thin and interrupted in some forms of *A. blitum*).
          - 12 Utricles subglobose to obovate, compressed; seeds filling the fruit almost completely; leaf blades usually deeply notched at the tip; annual ..... *A. blitum*
          - 12 Utricles ellipsoid, slightly to distinctly inflated; seeds filling only the proximal portions of the fruit; leaf blades shallowly notched at the tip; short-lived perennials, or annuals ..... *A. deflexus*
    - 9 Utricles dehiscent; tepals of pistillate flowers usually usually 5 (3-5 in *A. powellii*); inflorescence bracts exceeding the tepals (shorter than the tepals in some cultivated forms); [subgenus *Amaranthus*].
      - 13 Fully developed inflorescences large and robust, usually brightly colored (red, purple, occasionally white or yellow, rarely green); bracts usually not exceeding style branches at maturity (occasionally longer than the style branches in *A. hypochondriacus*); seeds white, ivory, red, brown, or black; [cultivated, only weakly naturalized].
        - 14 Inflorescences stiff, erect ..... *A. hypochondriacus*
        - 14 Inflorescences lax, erect to drooping.
          - 15 Tepals of pistillate flowers (at least the inner tepals of the pistillate flowers) obovate or spatulate, the tip obtuse to slightly notched; style branches spreading or reflexed ..... *A. caudatus*
          - 15 Tepals of pistillate flowers oblong to lanceolate, the tip acute; style branches erect or slightly reflexed ..... *A. cruentus*
  - 13 Fully developed inflorescences moderately large, usually green (rarely with some whitish or reddish coloration); bracts exceeding the style branches and tepals; seeds brown or black; [wild and weedy].
    - 16 Tepals of pistillate flowers obtuse, rounded, or slightly notched at the tip; plants rather densely pubescent ..... *A. retroflexus*

- 16 Tepals of pistillate flowers acute, acuminate, or aristate at the tip; plants slightly pubescent when young, becoming glabrous or nearly so.
- 17 Bracts 2-4 mm long; inflorescences usually soft and lax, with spreading branches ..... *A. hybridus*
- 17 Bracts 4-7 mm long; inflorescences usually stiff, with erect branches ..... *A. powellii*

\* *Amaranthus albus* Linnaeus, Tumbleweed Amaranth. Disturbed areas, agricultural fields; native of c. North America. July-October. [= C, FNA, G, K, Pa, W, WH, Y; < *Amaranthus graecizans* Linnaeus – RAB, misapplied; > *Amaranthus albus* var. *albus* – F]

\* *Amaranthus arenicola* I.M. Johnston, Sandhill Amaranth. Disturbed areas; native of w. North America. June-August. [= C, FNA, G, K, Pa, X; = *Amaranthus torreyi* A. Gray – F]

*Amaranthus australis* (A. Gray) J.D. Sauer, Southern Water-hemp, Careless. Tidal marshes, ditches, disturbed areas. E. NC, TN, AR, and TX south into West Indies, Mexico, and n. South America; perhaps adventive in most of our range, from an original distribution on the Gulf Coast, in FL, and southward into the New World tropics. This annual is alleged to get as large as 9 m tall and 30 cm diameter at the base of the stem! [= FNA, GW, K, WH, X; > *Acnida cuspidata* Bertero ex Sprengel – S; > *Acnida alabamensis* Standley – S]



\* *Amaranthus blitoides* S. Watson, Matweed Amaranth, Prostrate Pigweed. Disturbed areas; native of mw. North America. Late July-October. [= C, FNA, K, Pa, S, Y; < *A. graecizans* Linnaeus – RAB, F, misapplied]

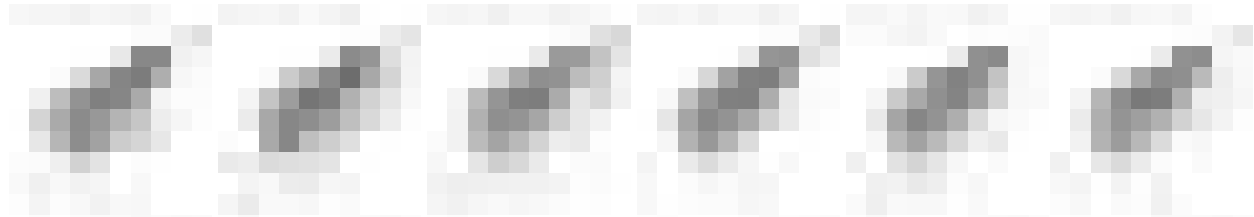
\* *Amaranthus blitum* Linnaeus, Purple Amaranth, Livid Amaranth. Disturbed habitats; native of the tropics. September-October. First reported from South Carolina by Hill & Horn (1997). [= C, FNA, K, Pa; = *Amaranthus lividus* – RAB, F, misapplied; > *Amaranthus blitum* – G; > *Amaranthus lividus* – G; > *Amaranthus blitum* Linnaeus ssp. *emarginatus* (Moquin-Tandon ex Uline & Bray) Carretero – WH, Y; > *Amaranthus blitum* ssp. *polygonoides* (Moquin-Tandon) Carretero]

*Amaranthus cannabinus* (Linnaeus) J.D. Sauer, Salt-marsh Water-hemp. Salt, brackish, and freshwater tidal marshes, especially along the banks of tidal guts. July-December. ME south to ne. FL; AL? Extremely variable in size, flowering and fruiting at heights ranging from 3 dm to 4 m tall. The stem can reach 10 cm in diameter at the base. [= RAB, C, FNA, GW, K, Pa, WH, X; = *Acnida cannabina* Linnaeus – F, G, S]

\* *Amaranthus caudatus* Linnaeus, Love-lies-bleeding. Disturbed areas; native of India. Cultivated and rarely escaped or persistent, as in TN (Chester, Wofford, & Kral 1997), and scattered in PA (Rhoads & Klein 1993). [= FNA, C, F, G, K, Pa, Y]

\*? *Amaranthus crassipes* Schlechtendal var. *crassipes*, Spreading Amaranth. Shores and wet areas; probably introduced from tropical America. Var. *warnockii* (I.M. Johnston) Henrickson occurs in the Chihuahuan Desert region. [= Z; < *Amaranthus crassipes* – RAB, C, FNA, G, GW, K, S]

\* *Amaranthus crispus* (Lepinasse & Thévenau) A. Braun, Crisp-leaved Amaranth. Disturbed areas, especially around seaports; native of South America. Reported for VA by Massey (1961), but no documentation is known. [= FNA, C, F, G, K, S]



\* *Amaranthus cruentus* Linnaeus, Red Amaranth, Blood Amaranth, Purple Amaranth. Disturbed areas, old gardens; native of Central America. July-August. [= RAB, C, F, FNA, K, Pa, S, WV, Y]

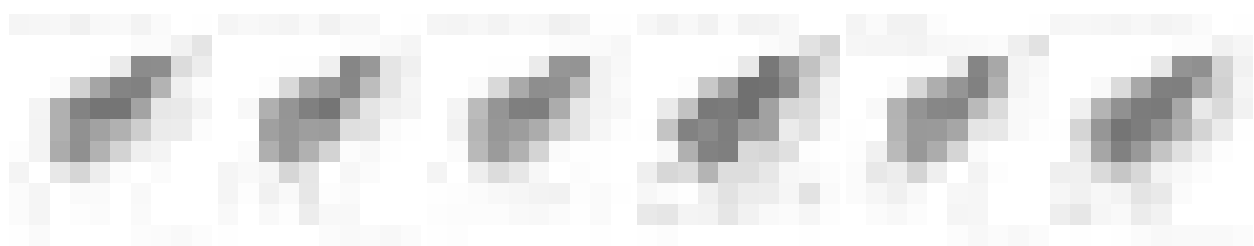
\* *Amaranthus deflexus* Linnaeus, Large-fruit Amaranth, Argentine Amaranth. Disturbed areas; native of South America. July-early October. Reported for VA by Virginia Botanical Associates (2010). [= FNA, C, F, G, K, WH]

*Amaranthus floridanus* (S. Watson) Sauer, Florida Amaranth. Dunes, beaches. Native, endemic to FL peninsula, north to Duval and Alachua counties (Wunderlin & Hansen 2004). [= FNA, K, WH; = *Acnida floridana* S. Watson – S]

*Amaranthus hybridus* Linnaeus, Smooth Amaranth, Green Amaranth, Hybrid Amaranth, Smooth Pigweed. Disturbed areas. July-October. Original distribution obscure because of its very weedy nature, but apparently native in eastern North America. [= RAB, C, F, FNA, G, K, Pa, S, W, WH; = *Amaranthus hybridus* ssp. *hybridus* – Y]

\* *Amaranthus hypochondriacus* Linnaeus, Prince's-feather. Disturbed areas. Type locality is "Virginia". Possibly of hybrid origin, from *A. cruentus* × *powellii*. [= FNA, C, K]

\* *Amaranthus palmeri* S. Watson, Careless-weed. Disturbed areas; native of c. North America. September-October. [= RAB, C, F, FNA, G, K, Pa, WH, X]



\* *Amaranthus polygonoides* Linnaeus, Tropical Amaranth, Smartweed Amaranth. Disturbed areas; native of tropical America. Reported for SC (FNA, K). [= FNA, K, S]

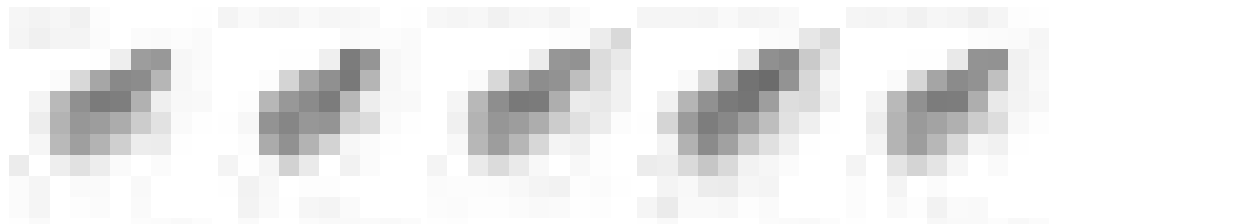
\* *Amaranthus powellii* S. Watson, Green Amaranth, Powell's Amaranth. Disturbed areas; native of w. North America. July-August. Widespread and common in PA (Rhoads & Klein 1993). Many earlier reports of *A. retroflexus* may actually pertain to this species. [= FNA, C, F, G, K, Pa; = *Amaranthus retroflexus* Linnaeus var. *powellii* (S. Watson) Boivin; = *Amaranthus powellii* ssp. *powellii* - Y]

*Amaranthus pumilus* Rafinesque, Seabeach Amaranth, Dwarf Amaranth. Sea beaches, fore-dunes, island end flats, rarely on sound-side beaches. July-November. 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, Pa, S]

*Amaranthus retroflexus* Linnaeus, Rough Pigweed, Redroot. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, GA, NC, SC, VA): common (rare in WV), native of c. and e. North America, now nearly worldwide in distribution and the original native range impossible to determine. July-October. [= RAB, C, F, FNA, G, K, Pa, S, W, Y; = *A. retroflexus* var. *retroflexus*]

\* *Amaranthus spinosus* Linnaeus, Spiny Amaranth. Fields, gardens, roadsides, barnyards, pastures; native of tropical America. July-October. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, Y]

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



\* *Amaranthus tuberculatus* (Moquin-Tandon) J.D. Sauer, Inland Water-hemp. Pd (DE), Mt (WV), {GA, NC, SC}: disturbed areas; uncommon (rare in DE), native of nw. North America. July-October. [= RAB, C, FNA, GW, W; > *Acnida altissima* (Riddell) Moquin-Tandon ex Standley var. *altissima* - F; > *Acnida altissima* var. *subnuda* (S. Watson) Fernald - F; > *Acnida altissima* var. *prostrata* (Uline & Bray) Fernald - F; > *Acnida altissima* - G; > *Acnida subnuda* (S. Watson) Standley - G, S; > *Acnida tamariscina* (Nuttall) Wood - G, S, misapplied; > *Amaranthus tuberculatus* - K, Pa, X; > *Amaranthus rudis* J.D. Sauer - K, Pa; > *Acnida concatenata* Moquin-Tandon - S; > *Amaranthus tamariscinus* Nuttall - X, misapplied]

\* *Amaranthus viridis* Linnaeus, Slender Amaranth, Tropical Green Amaranth. Cp (FL, VA), Mt (VA), {GA, NC, SC}: disturbed areas; rare, native of South America. [= RAB, C, F, FNA, G, K, WH, Y; = *Amaranthus gracilis* Desfontaines - S]

*Atriplex* Linnaeus 1753 (Orach)

A genus of about 300 species, herbs and shrubs, of cosmopolitan distribution. References: Judd & Ferguson (1999)=Z; Clemants (1992)=Y; Welsh in FNA (2003b); Kühn in Kubitzki, Rohwer, & Bittrich (1993). Treatment based closely on Welsh in FNA (2003b)

**Identification notes:** There are a number of idiosyncratic characters that are used for the identification of the species of *Atriplex*. Many important characters are associated with the mature fruits. The fruit is closely invested by 2 **bracteoles**, which are variously shaped and ornamented. Mature seeds are dimorphic in most of our species, with **large, brown seeds** and **small, black seeds**. The **radicle** of the seeds is variously apical, lateral, or basal (which can be seen by observing the seed through the clarified bracteoles or with strong transmitted light).

- 1 Leaves white to gray, densely and finely scurfy, especially adaxially.
  - 2 Seeds dimorphic, black and brown; branches not angled; [introduced, of disturbed situations]; [subgenus *Atriplex*, section *Semibaccata*] ... [A. *semibaccata*]
  - 2 Seeds monomorphic, brown; branches obtusely angled; [native, of coastal saline situations]; [subgenus *Obione*, section *Obione*, subsection *Arenariae*].
    - 3 Fruiting bracteoles (3.5-) 4.5-7 mm long, 3.5-5.6 mm wide, longer than broad; faces with or without appendages .....A. *mucronata*
    - 3 Fruiting bracteoles 2.5-4.5 mm long, 2.6-5 mm wide, as wide as or wider than long; faces with appendages .....A. *pentandra*
- 1 Leaves usually green on both surfaces, glabrous or only sparingly powdery or scurfy; [subgenus *Atriplex*, section *Teuiliopsis*].

- 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 acadensis* Taschereau, Maritime Saltbush. Saltville, VA. [= K2] {not yet keyed; add to synonymy}

*Atriplex dioica* Rafinesque. Cp (NC, VA?), Mt (VA): brackish flats; rare? July-frost. NL (Newfoundland) west to AK, south to NC and CA. [= FNA; = *Atriplex subspicata* (Nuttall) Rydberg – K, Y; < *A. littoralis* Linnaeus – C, misapplied; < *A. patula* Linnaeus var. *littoralis* (Linnaeus) A. Gray – F, misapplied]

\* *Atriplex littoralis* Linnaeus, Narrow-leaved Atriplex. Cp (VA): Introduced south to PA (FNA) and MD (Kartesz 1999). [= FNA, K, Pa; < *A. littoralis* Linnaeus – C; < *A. patula* Linnaeus var. *littoralis* (Linnaeus) A. Gray – F]

*Atriplex mucronata* Rafinesque, Seabeach Orach. Cp (DE, FL, NC, VA): ocean beaches, island-end flats; uncommon. July-frost. NH south to FL west to TX. This species and *A. pentandra* are closely related, and have been variously treated as species, subspecies, varieties, and forms. [= FNA; < *A. arenaria* Nuttall – RAB, C, G, GW, S, Y (also see *A. pentandra*); < *A. cristata* Humboldt and Bonpland ex Willenow – K (also see *A. pentandra*); < *A. pentandra* ssp. *arenaria* H.M. Hall & Clements]

\* *Atriplex patula* Linnaeus, Spear Orach. Pd (VA), Mt (VA, WV): disturbed areas, inland saline areas; rare, native of Eurasia. July-frost. [= C, FNA, K, Pa, S, Y; < *A. patula* Linnaeus – RAB, W (also see *A. prostrata*); = *A. patula* var. *patula* – F, G]

*Atriplex pentandra* (Jacquin) Standley in N.L. Britton et al., Seabeach Orach. Cp (FL, GA, NC, SC): ocean beaches, island-end flats; uncommon. July-frost. NC to FL, west to TX; West Indies; South America. This species and *A. mucronata* are closely related, and have been variously treated as species, subspecies, varieties, and forms. [= FNA; < *A. arenaria* Nuttall – RAB, C, G, GW, S, Y (also see *A. mucronata*); < *A. cristata* Humboldt and Bonpland ex Willenow – K (also see *A. mucronata*); = *A. pentandra* ssp. *pentandra*]

\* *Atriplex prostrata* Boucher ex A.P. de Candolle, Thinleaf Orach, Fat-hen. Cp (DE, NC, SC, VA), Mt (VA?, WV): marsh edges, brackish flats; uncommon (rare in WV). July-frost. Widespread in e. North America, also in w. North America and Eurasia, usually considered to be native of Eurasia. [= FNA, K, Pa, Y; ? *A. hastata* Linnaeus – C, S, misapplied; < *A. patula* Linnaeus – RAB, W; ? *A. patula* var. *hastata* (Linnaeus) A. Gray – F, G, GW]

\* *Atriplex semibaccata* R. Brown, Australian Saltbush, Berry Saltbush. Introduced at various localities in North America, including DC (FNA). [= FNA, K]

\* *Atriplex tatarica* Linnaeus, Tatarian Orach. Introduced on ballast at scattered localities, including AL, FL (Escambia County), NJ, and PA (FNA). [= FNA; ? *A. lampa* Gillies – K, S, misapplied] {not keyed}



***Bassia* Allioni 1766 (Bassia)**

A genus of about 21 species, herbs and dwarf shrubs, of Europe, Asia, Africa, and North America. All or part (the annuals) of *Kochia* are now sometimes merged into *Bassia* (Judd & Ferguson 1999). References: Judd & Ferguson (1999)=Z; Mosyakin in FNA (2003b); Blackwell, Baechle, & Williamson (1978)=Y; Collins & Blackwell (1979)=X; Kühn in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Calyx segments (1 lower and 2 upper) bearing stout knobs.....*B. hirsuta*
- 1 Calyx segments (all 5) bearing a horizontal wing.....*B. scoparia*

\* *Bassia hirsuta* (Linnaeus) Ascherson, Bassia. Cp (DE, VA): beaches, salt marshes; uncommon, native of Eurasia. August-October. [= C, F, FNA, G, K, X, Z]

\* *Bassia scoparia* (Linnaeus) A.J. Scott, Summer-cypress, Kochia, Mexican Fireweed. Pd (VA), Mt (VA, WV), Cp (DE, SC, VA): waste ground, particularly along railroad tracks, also in waste areas near wool-combing mill; uncommon (rare in DE and WV), native of Eurasia. Reported for SC (Berkeley Co.) by Pittillo & Brown (1988). [= Z; = *Kochia scoparia* (Linnaeus) Schrader – C, F, G, K, Pa, W, Y; > *Kochia scoparia* ssp. *scoparia* – FNA]

***Beta* Linnaeus 1753 (Beet)**

A genus of about 6-12 species, herbs, of Mediterranean region and w. and c. Asia. References: Schultz in FNA (2003b); Judd & Ferguson (1999)=Z; Kühn in Kubitzki, Rohwer, & Bittrich (1993).

\* *Beta vulgaris* Linnaeus ssp. *vulgaris*, Garden Beet, Swiss Chard, Ruby Chard, Mangel-wurzel. Cp (NC, SC, VA), Pd (NC, SC, VA), Mt (NC, SC, VA, WV): commonly cultivated, rarely escaped or persisting, native of Eurasia. [= FNA; > *B. vulgaris* var. *vulgaris* – G; > *B. vulgaris* var. *cicla* – G; < *B. vulgaris* – K, Z; ? *B. vulgaris* – S]

*Celosia* Linnaeus 1753 (Cockscomb)

A genus of about 45 species, of tropical and warm temperate regions of America and Africa. References: Robertson (1981)=Z; Robertson in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Style ca. 0.2 mm long; inflorescence of lax, interrupted panicles ..... *C. trigyna*
- 1 Style 3-4 mm long; inflorescence very dense.
  - 2 Inflorescence of crowded spikes ..... *C. argentea*
  - 2 Inflorescence crested, fanlike, or elaborately lobed ..... *C. cristata*

\* *Celosia argentea* Linnaeus. Mt (NC, WV), Pd (NC), Cp (NC): commonly cultivated, rarely escaped or persistent in disturbed areas, such as along creeks; rare, native of the Tropics. July-November. [= RAB, C, FNA, G, K, Z; = *C. argentea* var. *argentea* – F; < *C. argentea* – Pa, WH]

\* *Celosia cristata* Linnaeus, Cockscomb. Pd (NC): commonly cultivated, rarely escaped or persistent in disturbed areas; rare, native of the Tropics. July-November. *C. cristata* is clearly closely related to and likely derived from *C. argentea*; it has been variously treated as a species, variety, or form. It is popular in gardens and institutional landscaping, but is not universally appreciated; Stace (2010) calls it "probably the world's ugliest plant." [= C, FNA, G, K, Z; = *C. argentea* Linnaeus var. *cristata* (Linnaeus) Kuntze – F; < *C. argentea* Linnaeus – Pa, WH]

\* *Celosia trigyna* Linnaeus, Woolflower. Cp (FL): disturbed areas; rare, native of tropical Africa. [= FNA, K, WH]

*Chenopodium* Linnaeus 1753 (Goosefoot, Lamb's-quarters, Pigweed)

A genus of about 140 species, herbs, shrubs, and small trees, of nearly cosmopolitan distribution. The genus as currently circumscribed is strongly paraphyletic and will likely be further split in the near future (Fuentes-Bazan, Mansion, & Borsch 2012). References: Clemants & Mosyakin in FNA (2003b); Kadereit et al. (2010); Fuentes-Bazan, Mansion, & Borsch (2012); Judd & Ferguson (1999)=Z; Wahl (1954)=Y; Mosyakin & Clemants (1996); Kühn in Kubitzki, Rohwer, & Bittrich (1993). Draft key based closely on Clemants & Mosyakin in FNA (2003b). [also see *Dysphania*]

- 1 Seeds arranged vertically or both horizontally and vertically in the fruit; leaf blades glabrous or occasionally sparsely farinose; [subgenus *Blitum*].
  - 2 Perianth segments 5; plants perennial; [subgenus *Blitum*, section *Agathophytum*; likely to be re-elevated to genus *Blitum*] ..... *C. bonus-henricus*
  - 2 Perianth segments 3; plants annual.
    - 3 Leaves lanceolate or oblong, glaucous on the lower surface; [likely to be placed in a new genus based on the "*Chenopodium rubrum* clade"] ..... *C. glaucum*
    - 3 Leaves triangular or rhombic, green on the lower surface.
      - 4 Leaves farinose on the lower surface; [subgenus *Blitum*, section *Degenia*] ..... *C. macrospermum*
      - 4 Leaves glabrous on the lower surface.
        - 5 Glomerules 3-10 mm in diameter, borne sessile on unbranched terminal and occasionally axillary spikes; perianth segments fleshy and red at maturity; [subgenus *Blitum*, section *Blitum*; likely to be re-elevated to genus *Blitum*] ..... *C. capitatum* var. *capitatum*
        - 5 Glomerules 2-5 mm in diameter, borne sessile on lateral branched spikes; perianth segments membranaceous, green at maturity; [subgenus *Blitum*, section *Pseudoblitum*; or to be placed in a new genus based on the "*Chenopodium rubrum* clade"] ..... *C. rubrum*
- 1 Seeds arranged horizontally in the fruit; leaf blades usually farinose; [subgenus *Chenopodium*].
  - 6 Flowers individually disposed in panicles; leaf blades glabrous; [subgenus *Chenopodium*, section *Grossefoveata*] ..... *C. simplex*
  - 6 Flowers in loose or dense glomerules; leaf blades usually farinose; [subgenus *Chenopodium*, section *Chenopodium*].
    - 7 Primary leaves linear, linear-lanceolate, at least 2-3× as long as wide, usually untoothed and unlobed (but often with 2 basal lobes in *C. foggii*); [subsection *Leptophylla*].
      - 8 Leaves 2-3× as long as wide ..... *C. atrovirens*
      - 8 Leaves > 3× as long as wide.
        - 9 Perianth spreading from fruit at maturity; plants strictly erect ..... *C. pratericola*
        - 9 Perianth enclosing the fruit at maturity; plants erect to spreading.
          - 10 Plants usually spreading; perianth segments obtuse; leaf blades usually unlobed ..... [*C. desiccatum*]
          - 10 Plants erect; perianth segments acute; leaf blades often with basal lobes ..... *C. foggii*
    - 7 Primary leaves ovate, rhombic, triangular, or lanceolate, usually with basal lobes and often also with additional teeth on the margins.
      - 11 Seeds honeycomb-pitted; [subsection *Favosa*].
        - 12 Seeds 1.2-2.0 mm in diameter.
          - 13 Style bases with yellow area; seeds 1.2-1.5 mm in diameter ..... *C. berlandieri* var. *zschackei*
          - 13 Style bases without yellow area; seeds 1.3-2.0 mm in diameter.
          - 14 Inflorescences large and drooping; seeds 1.7-2.0 mm in diameter ..... *C. berlandieri* var. *bushmanum*

- 14 Inflorescences small and erect; seeds 1.3-1.9 mm in diameter ..... *C. berlandieri* var. *macrocalyrium*
- 12 Seeds 1.0-1.3 mm in diameter.
- 15 Leaves rhombic-triangular, usually without basal lobes; inflorescences becoming bractless..... *C. berlandieri* var. *boscianum*
- 15 Leaves 3-lobed; inflorescences with or without bracts.
- 16 Inflorescences bractless..... [*C. berlandieri* var. *berlandieri*]
- 16 Inflorescences with leafy bracts ..... *C. berlandieri* var. *zschackei*
- 11 Seeds smooth or areolate.
- 17 Leaves triangular.
- 18 Seeds 1.0-1.5 mm in diameter, the seed margin sharp; leaf blades without basal lobes; [subsection *Undata*; or to be placed in a new genus based on the "*Chenopodium murale* clade"] ..... *C. murale*
- 18 Seeds 0.8-1.2 mm in diameter, the seed margin rounded; leaf blades often with basal lobes; [subsection *Urbica*] ..... *C. urbicum*
- 17 Leaves ovate to broadly ovate, rhombic, or lanceolate, variously lobed or toothed.
- 19 Leaf blades without teeth, except for the often present basal lobes or teeth.
- 20 Leaves not aromatic; flowers in each glomerule in markedly different stages of development; [subsection *Standleyana*] ..... *C. standleyanum*
- 20 Leaves strongly malodorous; flowers in each glomerule in similar stages of development; [subsection *Chenopodium*]..... *C. vulvaria*
- 19 Leaf blades with lateral teeth and often basal lobes; [subsection *Chenopodium*].
- 21 Leaves widely ovate, 1× as long as wide; lateral leaf lobes as large as the terminal lobe..... *C. opulifolium*
- 21 Leaves ovate, rhombic, or lanceolate, >1× as long as wide; lateral leaf lobes smaller than the terminal lobe (or absent).
- 22 Leaf margins tapering to an acute apex; leaves ovate, rhombic, or lanceolate; inflorescence branched (spicate or cymose) . ..... *C. album*
- 22 Leaf margins more or less parallel below the obtuse apex; leaves lanceolate to narrowly elliptic; inflorescence generally moniliform, not profusely branched..... *C. strictum*

***Chenopodium album*** Linnaeus, Lamb's-quarters, Pigweed. Disturbed soils, gardens. June-November. As broadly interpreted (but additional study is needed), this species includes both native and alien races and is now distributed nearly worldwide. [= FNA, W; < *C. album* – RAB, in part (also including *C. berlandieri* and all vars); > *C. album* Linnaeus var. *album* – K; > *C. album* Linnaeus var. *missouriense* (Aellen) I.J. Bassett & C.W. Crompton – K; > *C. album* – C, Pa; < *C. album* – G; > *C. missouriense* Aellen – C, Pa, Y; > *C. pagatum* – F, S, misapplied; < *C. album* – FNA, G; > *C. album* var. *album* – Y; > *C. album* var. *lanceolatum* (Muhlenberg ex Willdenow) Coss. & Germ. – Y; > *C. giganteum* Don – Y; > *C. lanceolatum* Muhlenberg ex Willdenow]

\* ***Chenopodium atrovirens*** Rydberg. Waste areas near wool-combing mills, perhaps merely a waif; native of w. North America. [= FNA, K]

*Chenopodium berlandieri* Moquin-Tandon var. *berlandieri*. Reported for SC and VA by Kartesz (1999), but not attributed to our area by FNA (2003b). [= FNA, K] {rejected; keyed; not mapped}

***Chenopodium berlandieri*** Moquin-Tandon var. *boscianum* (Moquin-Tandon) H.A. Wahl. Beaches, marshes. August-September. FL west to e. TX; with scattered occurrences farther north (these of unknown nativity). [= FNA, K, Y; < *C. album* – RAB]

***Chenopodium berlandieri*** Moquin-Tandon var. *bushianum* (Aellen) Cronquist, Soybean Goosefoot. Disturbed areas, alluvial forests. June-November. ME west to ND, south to VA, TN, LA, and KS. [= C, FNA, K; < *C. album* – RAB, G; < *C. berlandieri* – S; = *C. bushianum* Aellen – Pa, Y]

***Chenopodium berlandieri*** Moquin-Tandon var. *macrocalyrium* (Aellen) Cronquist. Coastal sands, beaches. August-October. NS south to FL. [= C, FNA, K; < *C. album* – RAB, G; = *C. macrocalyrium* Aellen – Y]



\* ***Chenopodium berlandieri*** Moquin-Tandon var. *sinuatum* (J. Murr) H.A. Wahl. Waste areas near wool-combing mills, perhaps merely a waif; native of sw. North America. [= FNA, K, Y] {not yet keyed}

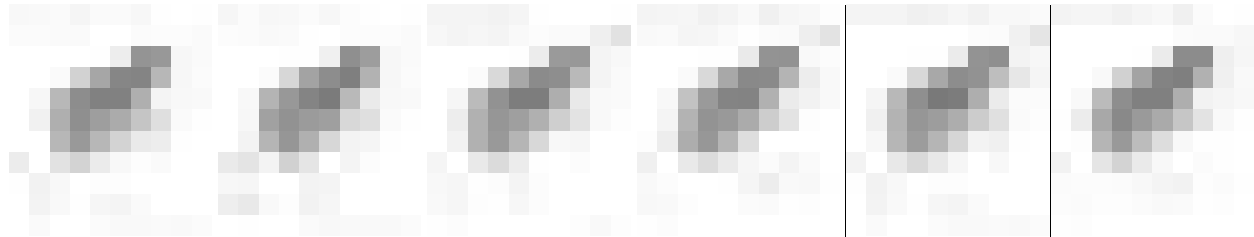
\*? ***Chenopodium berlandieri*** Moquin-Tandon var. *zschackei* (J. Murr) J. Murr ex Ascherson. Disturbed areas. ON west to AK, south to LA, CA, and Mexico; scattered eastern occurrences may be introduced. [= C, FNA, K, Y; < *C. album* – RAB; < *C. berlandieri* – Pa]

\* ***Chenopodium bonus-henricus*** Linnaeus, Good King Henry. Disturbed areas; native of Europe. Cultivated and is known from as far south as KY, NJ, and PA. [= FNA, C, K, Pa, Y; = *Blitum bonus-henricus* (Linnaeus) C.A. Meyer; or likely to be placed in a circumscribed genus *Blitum*, related to *Spinacia*, based on "Clade 3" of Fuentes-Bazan, Mansion, & Borsch (2012) and "Chenopodieae II" of Kadereit et al. (2010)]

***Chenopodium capitatum*** (Linnaeus) Ascherson var. *capitatum*, Indian-paint, Strawberry-blite. Disturbed areas. Native, south to scattered locations in PA (Rhoads & Klein 1993), s. OH, and s. IN (Kartesz 2010). [= FNA, Y; < *C. capitatum* – C, Pa; = *C. capitatum* – K, in a narrow sense; *Blitum capitatum* Linnaeus; or likely to be placed in a circumscribed genus *Blitum*, related to *Spinacia*, based on "Clade 3" of Fuentes-Bazan, Mansion, & Borsch (2012) and "Chenopodieae II" of Kadereit et al. (2010)]

\* *Chenopodium desiccatum* A. Nelson. {Resolve against *C. pratericola*}. [= FNA; = *C. pratericola* var. *oblongifolium* (S. Watson) H.A. Wahl – Y]

\* *Chenopodium foggii* H.A. Wahl. Rocky, mountain slopes. July. ME and ON south to w. VA and w. NC. [= FNA, K, Pa, Y; < *C. pratericola* Rydberg – C]



\* *Chenopodium fremontii* S. Watson. Waste areas near wool-combing mills, perhaps merely a waif; native of w. North America. [= FNA; = *C. fremontii* var. *fremontii* – K, Y] {not yet keyed}

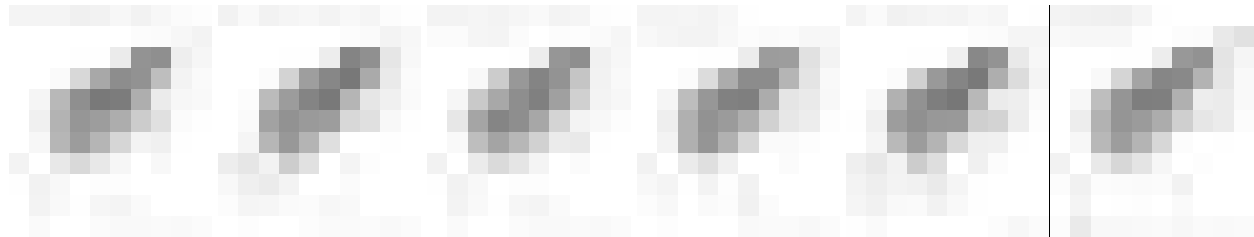
\* *Chenopodium glaucum* Linnaeus, Oakleaf Goosefoot. Disturbed areas; native of ne. North America and Europe. [= FNA, K, Pa; < *C. glaucum* – C, F, G, WV; = *C. glaucum* var. *glaucum* – Y; probably to be separated as a new genus, based on the “*Chenopodium rubrum* clade” of Fuentes-Bazan, Mansion, & Borsch (2012)]

\* *Chenopodium incanum* (S. Watson) Heller var. *incanum*. Waste areas near wool-combing mills, perhaps merely a waif; native of w. North America. [= FNA, K; ? *C. incanum* – Y] {not keyed}

\* *Chenopodium macrospermum* Hooker f. Disturbed areas; native of South America. Reported for NC (FNA 2003b). [= FNA; > *C. macrospermum* Hooker f. var. *farinosum* (S. Watson) J.T. Howell – K; > *C. macrospermum* Hooker f. var. *halophilum* (Phil.) Standley – K, Y]

\* *Chenopodium murale* Linnaeus, Nettleleaf Goosefoot, Sowbane. Disturbed areas; native of Europe, Asia, and n. Africa. May–November. [= RAB, C, F, FNA, G, K, Pa, S, W, Y]

\* *Chenopodium opulifolium* Schrader ex Koch & Ziz, Gray Goosefoot. Disturbed areas, on ship's ballast; native of s. Europe. [= RAB, C, FNA, K]



\* *Chenopodium pratericola* Rydberg, Narrowleaf Goosefoot. Sandy soils, roadsides, disturbed areas; native of w. North America. May–November. Maine and ON west to YT, south to FL, TX, and CA. [= FNA, K, Pa; = *C. desiccatum* A. Nelson var. *leptophylloides* (J. Murray) H.A. Wahl – RAB, W, misapplied; < *C. pratericola* – C (also see *C. foggii*); ? *C. leptophyllum* – F, G, misapplied; = *C. pratericola* var. *pratericola* – Y]

\* *Chenopodium rubrum* Linnaeus, Red Goosefoot. Reported as far south as MD and in other widely scattered sites (such as AL) (Kartesz 1999) and PA (FNA). [= C, K; > *C. rubrum* var. *rubrum* – FNA, Y; probably to be separated as a new genus, based on the “*Chenopodium rubrum* clade” of Fuentes-Bazan, Mansion, & Borsch (2012)]

\* *Chenopodium simplex* (Torrey) Rafinesque, Mapleleaf Goosefoot. In shaded situations, generally at cliff bases. July–October. NS west to AK, south to nw. NC, LA, TX, and UT. [= FNA, K, Pa; = *C. gigantospermum* Aellen – C, W, Y; = *C. hybridum* Linnaeus var. *gigantospermum* (Aellen) Rouleau – F; < *C. hybridum* – G; = *C. hybridum* Linnaeus ssp. *gigantospermum* (Aellen) Hultén]

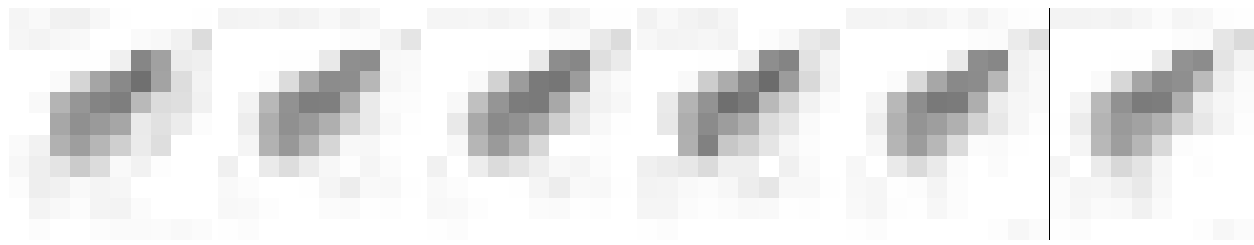
\* *Chenopodium standleyanum* Aellen, Woodland Goosefoot. Rock outcrops, steep slopes, shaded disturbed soils. QC west to ND, south to FL and e. TX. [= RAB, C, FNA, G, K, Pa, W; < *C. boschianum* – F, S, misapplied]

\* *Chenopodium strictum* Roth. Disturbed areas. Scattered locations south to se. PA. Reported for SC (Kartesz 1999). [= FNA, K2; = *Chenopodium album* Linnaeus var. *striatum* (Krašan) comb. nov. ined. – K1; > *Chenopodium strictum* ssp. *glaucophyllum* (Aellen) Aellen & Just.; > *Chenopodium strictum* Roth var. *glaucophyllum* (Aellen) H.A. Wahl – Pa, Y] {not yet mapped}

\* *Chenopodium urbicum* Linnaeus, City Goosefoot. Disturbed areas; native of Eurasia. Introduction in waste ground south to MD, s. PA (Rhoads & Klein 1993), WV, KY, and TN (Kartesz 1999, FNA 2003b). [= C, FNA, K, Pa, Y]

\* *Chenopodium vulvaria* Linnaeus, Stinking Goosefoot. Disturbed areas; native of Eurasia. 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), Mt (WV): sandy fields, railroad banks, maritime dunes; uncommon (rare in NC, VA, and WV), native of w. North America, adventive in our area. May-frost. [= RAB, C, F, FNA, G, GW, K, Pa, S, WV]

*Dysphania* R. Brown 1810

A genus of about 32 species, annual and perennial herbs, nearly cosmopolitan, mostly in the tropics, subtropics, and warm temperate areas. The exclusion of *Dysphania* from *Chenopodium* and its placement in a separate tribe (Dysphanieae) is strongly supported (Fuentes-Bazan, Mansion, & Borsch 2012; Kadereit et al. 2010). References: Clemants & Mosyakin in FNA (2003b); Wahl (1954)=Y; Fuentes-Bazan, Mansion, & Borsch (2012); Kadereit et al. (2010).

- 1 Leaves deeply pinnately lobed, the lobes linear; plant perennial; mature calyx shallowly toothed, obovoid-urceolate, reticulate-veiny; [section *Adenois*].....*D. multifida*
- 1 Leaves serrate to sinuate-pinnatifid, the lobes broad-based and triangular-tapered; plant annual; mature calyx deeply lobed, neither reticulate nor prominently veined.
  - 2 Flowers in a slender thyrsoid inflorescence of lateral cymes; [section *Botryoides*].....*D. botrys*
  - 2 Flowers in dense glomerules arranged in spikes and panicles.
    - 3 Leaf blades 2-8 cm long; seeds mostly horizontal; stems 3-15 dm tall; [section *Adenois*].
      - 4 Inflorescences foliose throughout.....*D. ambrosioides*
      - 4 Inflorescences leafless (leaves in the inflorescence absent or shorter than the glomerules).....*D. anthelmintica*
    - 3 Leaf blades 0.5-2.7 cm long; seeds vertical; stems 0.5-5 dm tall; [section *Orthospora*].
      - 5 Perianth segments keeled and crested.....*D. cristata*
      - 5 Perianth segments rounded.....*D. pumilio*

\*? *Dysphania ambrosioides* (Linnaeus) Mosyakin & Clemants, Mexican-tea, Epazote. Cp (DE, GA, NC, SC, VA), Pd (DE, GA, NC, SC, VA), Mt (GA, NC, SC, VA, WV): disturbed habitats; common, probably native southward. Widespread in North America to South America, the original range unclear. [= FNA, Pa; < *Chenopodium ambrosioides* – RAB, C, G, W, Y (also see *Dysphania anthelmintica*); = *C. ambrosioides* var. *ambrosioides* – F; < *C. ambrosioides* var. *ambrosioides* – K (also see *Dysphania anthelmintica*); < *Ambrina ambrosioides* (Linnaeus) Spach – S (also see *D. anthelmintica*)]

*Dysphania anthelmintica* (Linnaeus) Mosyakin & Clemants, Wormseed, Epazote. Cp (GA, NC, SC, VA): dunes; common. NY south to FL, west to TX; Mexico, West Indies, Bermuda, Central America; scattered inland in North America probably as an introduction. [= FNA; < *Chenopodium ambrosioides* – RAB, C, G, W, Y; = *C. ambrosioides* var. *anthelminticum* (Linnaeus) A. Gray – F; < *C. ambrosioides* var. *ambrosioides* – K; < *Ambrina ambrosioides* (Linnaeus) Spach – S]

\* *Dysphania botrys* (Linnaeus) Mosyakin & Clemants, Jerusalem-oak, Feather-geranium. Cp (DE, NC, VA), Pd (DE), Mt (WV): disturbed areas, ship's ballast; uncommon (rare in NC and VA), native of Eurasia. August-October. [= FNA, Pa; = *Chenopodium botrys* Linnaeus – RAB, C, F, G, K, Y; = *Botrydium botrys* (Linnaeus) Small – S]

\* *Dysphania cristata* (F. Mueller) Mosyakin & Clemants, Crested Goosefoot. Cp (SC): wool mill waste areas; rare, native of Australia. July. [= FNA; = *Chenopodium cristatum* (F. Mueller) F. Mueller – K]

\* *Dysphania multifida* (Linnaeus) Mosyakin & Clemants, Cutleaf Goosefoot, Scented Goosefoot. Cp (GA, NC, SC, VA), Pd (GA, NC, SC): disturbed areas, rare, native of South America. [= FNA; = *Chenopodium multifidum* Linnaeus – C, K, Y; = *Roubieva multifida* (Linnaeus) Moquin-Tandon – RAB, F, S]

\* *Dysphania pumilio* (R. Brown) Mosyakin & Clemants, Clammy Goosefoot. Pd (DE, GA, SC, VA): disturbed areas; rare, native of Australia. First reported for South Carolina by Hill & Horn (1997). Also known from DC. [= FNA, Pa; = *Chenopodium pumilio* R. Brown – C, G, K, Y; < *C. carinatum* R. Brown – F, misapplied]

*Froelichia* Moench 1794 (Cottonweed, Snake-cotton)

A genus of about 18 species of tropical and subtropical America. References: McCauley in FNA (2003b); Robertson (1981)=Z; Townsend in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Calyx conical in fruit, ca. 3-4 mm long; plant 2-7 dm tall, branching from the base .....*F. gracilis*

- 1 Calyx flask-shaped in fruit, ca. 5 mm long; plant 3-20 dm tall, not branching from the base  
 2 Hairs of the peduncles <0.5 mm long; plants typically 3-10 dm tall; [of w. KY Mississippi Embayment westward] ..... *F. campestris*  
 2 Hairs of the peduncles mostly 1-2 mm long; plants typically 10-20 dm tall; [of the Southeastern Coastal Plain] ..... *F. floridana*

***Froelichia campestris*** Small, Plains Cottonseed. Cp (KY): disturbed areas; rare. OH, MN, and CO south to w. KY, AR, and TX. [= *F. floridana* var. *campestris* (Small) Fernald – C, F, G, K, Z; < *F. floridana* – FNA]

***Froelichia floridana*** (Nuttall) Moquin-Tandon, Florida Cottonseed, Common Cottonweed. Cp (DE\*, FL, GA, NC, SC): sandhills, sandy fields, sandy roadsides; common (rare in NC, uncommon in DE). June-October. S. NC south to FL, and west to LA, north in the interior to w. TN; disjunct (probably introduced) in DE and e. MD. *F. campestris* Small is more midwestern, ranging from OH, IN, WI, and SD south to KY, AR, and TX; it is sometimes treated as a variety of *F. floridana*, but seems amply distinct in morphology, and with an allopatric distribution. [= RAB, S; = *F. floridana* var. *floridana* – C, F, G, K, Z; < *F. floridana* – FNA, WH]

\* ***Froelichia gracilis*** (Hooker) Moquin-Tandon, Slender Cottonweed. Cp (DE, GA, NC, SC, VA), Pd (GA, NC, SC, VA), Mt (NC, VA, WV): vacant lots, sandy fields, railroad banks; uncommon (rare in GA, NC, SC, VA, and WV), native of mw. United States. June-October. [= RAB, C, F, FNA, G, K, Pa, W, WV, Z]

### ***Gomphrena*** Linnaeus 1753 (Globe-amaranth)

A genus of about 100-120 species, of the tropics and subtropics of America and Australia (naturalized elsewhere). References: Clemants in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993). Key based on Clemants in FNA (2003b).

- 1 Heads 20-28 mm in diameter; stems erect ..... *G. globosa*  
 1 Heads 8-16 mm in diameter; stems prostrate or decumbent ..... *G. serrata*

\* ***Gomphrena globosa*** Linnaeus, Globe-amaranth. Cp (SC) {VA?}: disturbed areas; rare, native of s. Asia. Introduced and known from scattered locations in s. PA (Rhoads & Klein 1993). Also reported for VA (Kartesz 1999) and MD (Reed 1961b). [= FNA, C, F, G, K]

***Gomphrena serrata*** Linnaeus, Arrasa con todo. Cp (FL, GA, VA): sandy woodlands and disturbed areas; rare, native of tropical America. Reported for chrome ore piles in Newport News, VA (Reed 1961, Virginia Botanical Associates 2010), where presumably only a waif. [= FNA, K, WH; > *G. dispersa* Standley – S]

### Guilleminea Kunth 1823

A genus of 2-5 species of sw. North America, Central America, and South America. References: Clemants in FNA (2003b); Henrickson (1987)=Z; Townsend in Kubitzki, Rohwer, & Bittrich (1993).

\* ***Guilleminea densa*** (Humboldt & Bonpland ex Willdenow) Moquin-Tandon var. ***aggregata*** Uline & Bray. Cp (SC): sandy disturbed area; rare, native of sw. United States. First reported for SC by Nelson & Kelly (1997). [= FNA, K, Z]

### ***Iresine*** P. Browne 1856 (Bloodleaf)

A genus of about 80 species of tropical and temperate regions (especially America). References: Clemants in FNA (2003b); Townsend in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Plant an annual to weak perennial, 4-30 dm tall, with fibrous roots; tepals 0.6-0.8 mm long, the tips obtuse to rounded ..... *I. diffusa*  
 1 Plant a perennial, 3-10 dm tall, with stolons; tepals 1.0-1.3 mm long, the tips acute to acuminate ..... *I. rhizomatosa*

***Iresine diffusa*** Humboldt & Bonpland ex Willdenow, Judas-bush. Cp (FL): hammocks, disturbed areas; rare. Reported for NC by Small (1933), so far as is known in error. Ne. FL, Panhandle FL, south to s. FL. [= FNA, K, WH; < *Iresine celosia* Linnaeus – S]

***Iresine rhizomatosa*** Standley. Cp (FL, GA, NC, SC, VA), Pd (VA): moist interdune thickets, hammocks, edges of maritime forests, moist thickets inland, floodplain forests, bluff forests of the Coastal Plain; rare. August-October. MD south to FL, west to se. TX; also inland from KY and TN west and south to KS and n. TX. [= RAB, C, F, FNA, G, K, S, WH]

### ***Salicornia*** Linnaeus 1753 (Glasswort)

A genus of about 10-20 species, succulent herbs, of cosmopolitan distribution. References: Judd & Ferguson (1999)=Z; Ball in FNA (2003b); Kadereit et al. (2007); Kühn in Kubitzki, Rohwer, & Bittrich (1993). [also see *Sarcocornia*]

- 1 Scale-leaves below the spikes mucronate; spikes mostly 4.5-6 mm in diameter ..... *S. bigelovii*  
 1 Scale-leaves below the spike obtuse to slightly acute; spikes mostly 1.5-4.5 mm in diameter ..... *S. virginica*

***Salicornia bigelovii*** Torrey, Dwarf Glasswort, Dwarf Saltwort. Cp (DE, GA, NC, SC, VA): salt pannes in coastal marshes; common (rare in DE). July-October. ME (NS?) south to FL, west to TX; also West Indies; also CA. [= RAB, C, F, FNA, G, GW, K, S, Z]

*Salicornia maritima* Wolff & Jefferies, Sea Saltwort, supposedly occurs south to MD (Kartesz (1999); FNA (2003b) does not map it south of the Canadian Maritimes. [= FNA, K] {not keyed; synonymy incomplete}

***Salicornia virginica*** Linnaeus, Samphire. Cp (DE, GA, NC, SC, VA), Mt (VA): salt pannes in coastal marshes; common. July-October. NS and QC south to FL. It is unclear whether our eastern North American plants are distinct from European plants of the *S. europaea* complex. Recent European workers recognize multiple species in the *S. europaea* complex. *S. europaea* (in the narrow sense) is a diploid species; our plants are apparently all tetraploid and may or may not be conspecific with one of the European tetraploid entities in this complex. Until further studies are completed, it seems best to recognize our plants as distinct. The oldest name available for the American plants is *Salicornia virginica* Linnaeus, which has unfortunately been generally misapplied to the perennial glasswort, *Sarcocornia perennis*. [= K; = *Salicornia depressa* Standley in N.L. Britton et al. – FNA; < *Salicornia europaea* Linnaeus – RAB, C, G, GW, S, W, Z, misapplied; >< *Salicornia europaea* var. *europaea* – F]

### ***Salsola*** Linnaeus 1753 (Saltwort, Russian-thistle)

A genus of about 116 species, herbs and shrubs, of Europe, Asia, n. Africa, and America. References: Mosyakin in FNA (2003b); Judd & Ferguson (1999)=Z; Kühn in Kubitzki, Rohwer, & Bittrich (1993). Treatment based on Mosyakin in FNA (2003b).

- 1 Leaf blades not fleshy in fresh material, narrowly linear to filiform, < 1 mm wide in herbarium material; leaves with a weak apical spine.....  
.....*S. tragus*
- 1 Leaf blades fleshy in fresh material, linear, 1-2 mm wide in dried specimens; leaves with a strong apical spine.  
2 Perianth segments with a weak non-spiny apex and obscure midvein; bracteoles connate at base, swollen..... *S. caroliniana*  
2 Perianth segments with a subspinose apex and prominent midvein; bracteoles distinct, not swollen .....*S. kali*

\*? ***Salsola caroliniana*** Walter, Southern Saltwort. Cp (AL\*, DE?, GA, NC, SC, VA): upper beaches, fore-dunes, and island-end flats, rarely inland in disturbed areas; uncommon. June-frost. MA to FL, west to TX and Mexico; Eurasia, n. Africa; introduced on the west coast of North America. Generally considered to be introduced in North America, but it may well be a native. [< *S. kali* Linnaeus – RAB, C, S, Z; = *S. kali* var. *caroliniana* (Walter) Nuttall – F; < *S. kali* Linnaeus ssp. *pontica* (Pallas) Mosyakin – FNA, K; < *S. kali* var. *kali* – G]

\*? ***Salsola kali*** Linnaeus, Northern Saltwort. Cp (DE?, NC, SC, VA): upper beaches, fore-dunes, and island-end flats; uncommon. June-frost. NL (Newfoundland) to SC; Europe. Generally considered to be introduced in North America, but it may well be a native. [< *S. kali* Linnaeus – RAB, C, Pa, S, Z; = *S. kali* var. *kali* – F; = *S. kali* ssp. *kali* – FNA, K; < *S. kali* var. *kali* – G; = *Kali soda* Moench; ? *Kali australis* (R. Brown) Akhiani & E.H. Roalson]

\* ***Salsola tragus*** Linnaeus, Russian Thistle, Tumbleweed. Mt (VA, WV), Pd (GA?, NC, SC?, VA): disturbed areas; rare, native of Eurasia. June-frost. [= C, FNA, K, Pa; < *S. kali* Linnaeus – RAB; = *S. kali* var. *tenuifolia* Tausch – F, G, WV; = *S. pestifer* A. Nelson – S, Z; = *S. iberica* Sennen & Pau; = *Kali tragus* (Linnaeus) Scopoli]

### ***Sarcocornia*** A.J. Scott 1978 (Woody Glasswort)

A genus of about 15 species, dwarf shrubs. Of controversial and uncertain taxonomic status, *Sarcocornia* is sometimes included in *Salicornia*, sometimes in *Arthrocnemum*, and sometimes maintained as a separate genus. References: Judd & Ferguson (1999)=Z; Ball in FNA (2003b); Kühn in Kubitzki, Rohwer, & Bittrich (1993).

***Sarcocornia pacifica*** (Standley) A.J. Scott, Woody Glasswort, Perennial Glasswort. Cp (DE, GA, NC, SC, VA): coastal salt marshes; common (uncommon in DE). July-October. NH south to FL; CA south into w. Mexico. Ball in FNA (2003b) treats all North American *Sarcocornia* as *Sarcocornia pacifica*, which is also present on the Pacific coast of North America. *Sarcocornia perennis* is restricted to the Pacific and Atlantic coasts of North America, as well as being in Europe, sw. Asia, and Africa. [= FNA; ? *Sarcocornia perennis* (P. Miller) A.J. Scott – K, apparently misapplied to East Coast material; ? *Salicornia virginica* Linnaeus – RAB, C, F, G, GW, misapplied; ? *Salicornia perennis* P. Miller – S, Z, apparently misapplied to East Coast material; ? *Arthrocnemum perenne* (P. Miller) Moss; ? *Salicornia ambigua* Michaux]

### ***Spinacia*** Linnaeus 1753 (Spinach)

A genus of 3 species, herbs, of n. Africa and w. Asia. References: Judd & Ferguson (1999)=Z; Schultz in FNA (2003b); Kühn in Kubitzki, Rohwer, & Bittrich (1993).

\* ***Spinacia oleracea*** Linnaeus, Spinach. Mt (NC, SC, VA), Pd (NC, SC, VA), Cp (NC, SC, VA): commonly grown in gardens, rarely persisting, native of Eurasia. [= F, FNA, G, K, S, Z]

### ***Suaeda*** Forsskål ex Scopoli 1777 (Sea-blite)

A genus of about 100 species, herbs and subshrubs, of cosmopolitan distribution. References: Judd & Ferguson (1999)=Z; Ferren & Schenk in FNA (2003b); Hopkins & Blackwell (1977)=Y; Fisher et al. (1997); Kühn in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Calyx segments keeled on the back; flowers in 1-3-flowered glomerules, these aggregated in a dense panicle; seeds dimorphic, black seeds shiny, 1-1.8 mm in diameter, brown seeds dull, 1.5-2.6 mm in diameter.....*S. linearis*
- 1 Calyx segments rounded or obscurely keeled on the back; flowers in axillary glomerules of 1-3 (-4) flowers; seeds monomorphic, reddish brown or black, 1-2.2 mm in diameter.....*S. maritima*

*Suaeda linearis* (Elliott) Moquin, Southern Sea-blite. Cp (DE, FL, GA, NC, SC, VA), Mt\* (WV\*): island-end flats, marsh edges, brackish flats, rarely adventive inland in disturbed areas; uncommon (rare in WV). August-frost. ME south to FL, west to TX; West Indies. [= C, F, FNA, G, GW, K, RAB, WH, Y, Z; = *Dondia linearis* (Eliot) Heller – S]

\*? *Suaeda maritima* (Linnaeus) Dumortier, White Sea-blite. Cp (DE, VA): salt marsh edges and disturbed saline habitats; common (uncommon in DE), possibly native, introduced, or a combination. Usually considered (as by C, GW, S) to be naturalized from Eurasia, but Ferren & Schenk (2003b) consider *S. maritima* in North America to include native and naturalized components. [= C, F, FNA, G, GW, Y, Z; > *S. maritima* ssp. *maritima* – K; = *Dondia maritima* (Linnaeus) Druce – S]

**304. AIZOACEAE** Rudolphi 1830 (Fig-marigold Family) [in CARYOPHYLLALES]

A family of about 128 genera and about 1850-2500 species, mostly succulent herbs and subshrubs, of tropical and subtropical regions, especially in s. Africa and Australia. References: Boetsch (2002); Vivrette, Bleck, & Ferren in FNA (2003b); Hartmann in Kubitzki, Rohwer, & Bittrich (1993). [also see *MOLLUGINACEAE*]

- 1 Leaves opposite, connate-perfoliate around the stem, triangular in cross-section; fruit a fleshy, indehiscent berry; [subfamily *Ruschioideae*] .....*Carpobrotus*
- 1 Leaves opposite or alternate, sessile or short-petiolate, flattened in cross-section (though often succulent-thickened); fruit **either** a dry, indehiscent nut **or** a capsule.
  - 2 Leaves linear, lanceolate, or oblanceolate, the blade > 3× as long as wide; [subfamily *Sesuvioideae*].....*Sesuvium*
  - 2 Leaves orbicular, obovate, or triangular-ovate, the blade < 2.5× as long as wide.
    - 3 Leaves opposite to subopposite; fruit a circumscissile capsule; [subfamily *Sesuvioideae*].....*Trianthema*
    - 3 Leaves alternate; fruit **either** a loculicidal capsule **or** an indehiscent nut.
      - 4 Fruit a loculicidal capsule; ovary superior; stems densely covered with white scales; [subfamily *Aizoideae*].....*Galenia*
      - 4 Fruit an indehiscent nut; ovary inferior; stems green; [subfamily *Tetragonioideae*] .....*Tetragonia*

*Carpobrotus* N.E. Brown 1925 (Fig-marigold)

A genus of 13 species, succulent subshrubs, native of s. Africa. References: Vivrette in FNA (2003b); Hartmann in Kubitzki, Rohwer, & Bittrich (1993).

- \* *Carpobrotus edulis* (Linnaeus) N.E. Brown, Hottentot-fig. Dunes, disturbed sandy sites; native of s. Africa. [= FNA, WH]

*Cypselea* Turpin 1806

A genus of 8 species, annual herbs, of the Neotropics. References: Ferren in FNA (2003b); Hartmann in Kubitzki, Rohwer, & Bittrich (1993).

- \* *Cypselea humifusa* Turpin, Panal. Disturbed wet areas; native of West Indies. March-December. [= K2, S, WH] {not yet keyed}

*Galenia* Linnaeus 1753

A genus of 15-25 species, perennial subshrubs, native of s. Africa and Australia. References: Vivrette in FNA (2003b).

- \* *Galenia secunda* (Linnaeus f.) Sonder. Disturbed areas; native of s. Africa. [= FNA, S, WH]

*Sesuvium* Linnaeus 1759 (Sea-purslane)

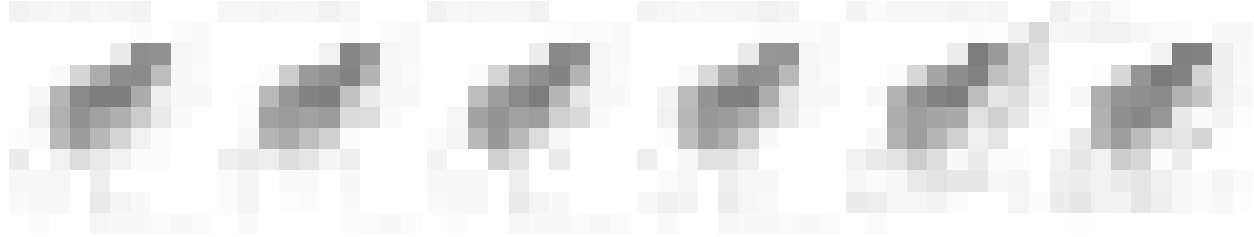
A genus of about 8-12 species, especially in tropical and subtropical coastal areas. References: Boetsch (2002)=Z; Ferren in FNA (2003b); Hartmann in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Flowers and fruits on pedicels (3-) 5-20 mm long ..... *S. portulacastrum*
- 1 Flowers and fruits sessile (or on pedicels to 1 mm long).
  - 2 Stamens numerous, in fascicles; leaves 3-6 cm long, 10-20× as long as wide; [rare waif] ..... *S. crithmoides*
  - 2 Stamens 5, distinct; leaves 1-3.5 cm long, 3-10× as long as wide; [native] ..... *S. maritimum*

\* *Sesuvium crithmoides* Welwitsch, Tropical Sea-purslane. Disturbed area, presumably a waif; native of Africa. Reported for GA by Small (1933) and Boetsch (2002) based on collections in Brunswick, GA in 1902 by Roland Harper. [= FNA, K, S, Z]

*Sesuvium maritimum* (Walter) Britton, Sterns, & Poggenburg, Small Sea-purslane, Slender Sea-purslane. Island end flats and sea beaches, salt flats. May-December. NY south to s. FL, west to TX; also in the West Indies. [= RAB, C, F, FNA, G, GW, K, S, WH, Z]

*Sesuvium portulacastrum* (Linnaeus) Linnaeus, Large Sea-purslane, Shoreline Sea-purslane. Island end flats and sea beaches. May-December. A pantropical coastal species, in North America from e. NC south to s. FL, west to e. TX; also in the West Indies and south into the tropics (introduced on ballast in se. PA). [= RAB, FNA, GW, K, S, WH, Z]



***Tetragonia* Linnaeus 1753 (New Zealand Spinach)**

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

\* *Tetragonia tetragonoides* (Pallas) Kuntze, New Zealand Spinach. Persistent after cultivation; native of e. Asia. July-November. *T. tetragonoides* is a member of subgenus *Tetragonioides* (Taylor 1994). [= *T. tetragonioides* – C, F, FNA, G, K, Y, Z, orthographic variant; = *T. expansa* Murray – RAB, S, WV]

***Trianthema* Linnaeus 1753 (Horse-purslane)**

A genus of about 17-20 species, of tropical and warm temperate areas, especially Australia. References: Boetsch (2002)=Z; Ferren in FNA (2003b); Hartmann, Meve, & Liede-Schumann (2011)= Y; Hartmann in Kubitzki, Rohwer, & Bittrich (1993).

\* *Trianthema portulacastrum* Linnaeus, Horse-purslane. Disturbed areas; native of the Old World and New World tropics, the limits of its native distribution unclear. April-November. [= RAB, C, F, FNA, G, GW, K, S, Y, Z]

**305a. PHYTOLACCACEAE R. Brown 1818 (Pokeweed Family) [in CARYOPHYLLALES]**

A family of about 18 genera and 70 species, herbs, shrubs, vines, and trees, of tropical and warm temperate regions, especially America. References: Nienaber & Thieret in FNA (2003b); Rohwer in Kubitzki, Rohwer, & Bittrich (1993). [also see *PETIVERIACEAE*]

***Phytolacca* Linnaeus 1753 (Pokeweed)**

A genus of about 25 species, herbs, shrubs, and trees, of tropical and warm temperate regions. References: Caulkins & Wyatt (1990)=Z; Hardin (1964a)=Y; Rogers (1985)=X; Nienaber & Thieret in FNA (2003b); Rohwer in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Fruiting pedicels (6-) 7-12 (-15) mm long; raceme (not including the peduncle) 10-20 (-25) cm long, divergent or drooping in flower and fruit (or erect in flower); [widespread in our area].....***P. americana***  
 1 Fruiting pedicels (2-) 4-6 (-7) mm long; raceme (not including the peduncle) (3-) 6-9 (-13) cm long, erect (rarely divergent) in flower and fruit; [restricted in our area to maritime habitats] .....***P. rigida***

***Phytolacca americana*** Linnaeus, Common Pokeweed. In a wide variety of natural and disturbed habitats, usually associated with exposed mineral soil. May-frost. An abundant "native weed" occurring throughout e. North America, *P. americana* is widely dispersed by birds and quickly colonizes exposed mineral soil even in undisturbed forests, such as on tree-fall tip-up mounds or flood scours. It is most abundant, however, as a weed of urban, suburban, and agricultural disturbances. The berries and mature stems are poisonous; the young stems have been used as a potherb and the purple berries as a source of ink. [= C, F, G, Pa, S, W, WV, X, Y; < *P. americana* – RAB, GW, WH; = *P. americana* var. *americana* – FNA, K, Z]

***Phytolacca rigida*** Small, Maritime Pokeweed. Dune slacks, dune slopes, edges of tidal marshes, disturbed areas on barrier islands, xeric sandhills near the coast. May-frost. DE (reportedly), se. VA south to FL and west to TX in the Southeastern Coastal Plain. In the northern parts of our area, in NC and VA, *P. rigida* is rather rare, limited to the vicinity of the coast, and less weedy than *P. americana*. Caulkins and Wyatt (1990) reduce *P. rigida* to a variety of *P. americana*, but it seems distinct at the species level. [= S, X, Y; < *P. americana* – RAB, GW, WH; = *P. americana* var. *rigida* (Small) Caulkins & Wyatt – FNA, K, Z]

**305b. PETIVERIACEAE** C. Agardh 1824 (Petiveria Family) [in CARYOPHYLLALES]

A family of about 9 genera and 13 species, herbs, vines, and trees, of tropical areas. Sometimes included in the Phytolaccaceae.

**Rivina** Linnaeus 1753 (Rouge-plant)

A monotypic genus, an herb, of the American tropics.

**Rivina humilis** Linnaeus, Rouge-plant, Baby-pepper. Hammocks. January-December. Neotropics, north to ne. FL, LA, AR, OK, TX, NM, and AZ. [= K1, K2, S, WH]



**307. NYCTAGINACEAE** A.L. de Jussieu 1789 (Four-o'clock Family) [in CARYOPHYLLALES]

A family of about 31 genera and 400 species, trees, shrubs, vines, and herbs, of tropical, subtropical, and (less commonly) warm temperate regions, especially diverse in the New World. Both our genera are in tribe Nyctagineae (Douglas & Spellenberg 2010). References: Bogle (1974)=Z; Spellenberg in FNA (2003b); Bittrich & Kühn in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Flowers < 3 mm long, lacking involucre bracts subtending the petaloid calyx..... **Boerhavia**
- 1 Flowers > 10 mm long, with involucre bracts (simulating a calyx) subtending the petaloid calyx ..... **Mirabilis**

**Boerhavia** Linnaeus 1753 (Spiderling)

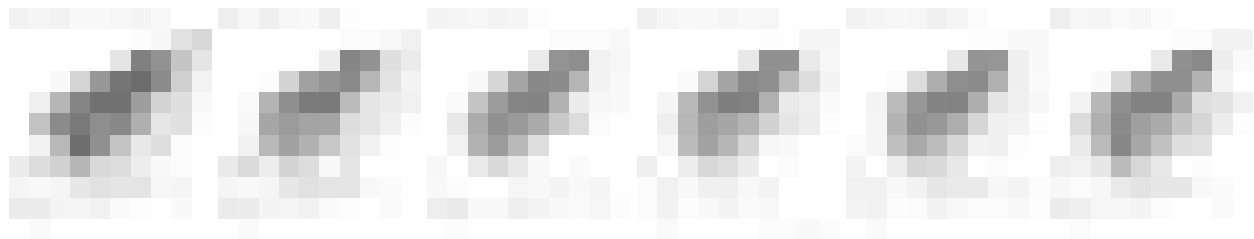
A genus of about 20-40 species, annual and perennial herbs, of tropical, subtropical, and warm temperate regions of the Old and New World. References: Spellenberg in FNA (2003b); Bogle (1974)=Z; Bittrich & Kühn in Kubitzki, Rohwer, & Bittrich (1993). Key based on Spellenberg in FNA.

- 1 Fruit truncate at the apex, glabrous, with longitudinal ribs acute and winglike; annual..... **B. erecta**
- 1 Fruit rounded at apex, stipitate-glandular, with longitudinal ribs rounded; perennial.
  - 2 Leaves well-distributed throughout the plant; inflorescences axillary and terminal; branches spreading-villous or hispid to minutely and finely pubescent ..... **B. coccinea**
  - 2 Leaves mostly concentrated in the basal 1/2 of the plant; inflorescences mostly terminal; branches glabrate or glabrous ..... **B. diffusa**

\* **Boerhavia coccinea** P. Miller, Wineflower. Disturbed areas, adventive on ballast; native of tropical America. June-September. Contrary to the statement in RAB that this species is "apparently not established," it is well established on the Wilmington (New Hanover County, NC) waterfront. [= RAB, FNA, K; = *Boerhaavia coccinea* – S, orthographic variant]

**Boerhavia diffusa** Linnaeus, Red Spiderling, Spreading Hogweed. Vacant lots, road shoulders, other disturbed areas. Pantropical and subtropical. [= FNA, K, Z]

**Boerhavia erecta** Linnaeus, Erect Spiderling. Sandy fields, roadsides, disturbed areas, railroad yards. May-October. NC south to FL, west to TX and AZ, perhaps only introduced in our area, at least in the Carolinas. [= RAB, FNA, K, Z; = *Boerhaavia erecta* – G, S, orthographic variant]



**Mirabilis** Linnaeus 1753 (Umbrella-wort, Four-o'clock)

A genus of about 55-60 species, annual and perennial herbs, of warm temperate America and s. Asia. References: Spellenberg in FNA (2003b); Le Duc (1995); Bittrich & Kühn in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Petaloid calyx with a narrow tube 3-4 cm long, the spreading portion to 5 cm in diameter; involucre with 1 flower, not expanding in fruit; [section *Mirabilis*] ..... *M. jalapa*
- 1 Petaloid calyx with a broad tube < 0.5 cm long, the spreading portion < 1.5 cm in diameter; involucre with 3-5 flowers, expanding in fruit; [section *Oxybaphus*].
  - 2 Leaves linear to narrowly lanceolate, 0.1-1 cm wide, 7-15× as long as wide ..... *M. linearis* var. *linearis*
  - 2 Leaves lanceolate to ovate, 1-8 cm wide, 1-6× as long as wide.
  - 3 Leaves cordate at the base, 1-2× as long as wide; [introduced, of disturbed habitats] ..... *M. nyctaginea*
  - 3 Leaves cuneate at the base, 2.5-6× as long as wide; [native, of dry sandy habitats in s. SC southward] ..... *M. albida*

*Mirabilis albida* (Walter) Heimerl, Wild Four-o'clock, Pale Umbrella-wort. Sandhills, adjacent disturbed sandy soils. May-August. S. SC south to GA, west to TX, north in the interior to c. TN, IA, and KS. [= RAB, C, F, K, Z; = *Oxybaphus albidus* (Walter) Sweet - G; = *Allionia albida* Walter - S]

\* *Mirabilis jalapa* Linnaeus, Garden Four-o'clock, Marvel-of-Peru. Disturbed areas, or persistent at former garden sites; native of tropical America. June-November. [= RAB, C, F, G, K, Pa, S, Z]

\* *Mirabilis linearis* (Pursh) Heimerl var. *linearis*. Disturbed areas; native of c. North America, scattered farther east as a rare introduction. [= FNA; < *M. linearis* - C, F, K; < *Oxybaphus linearis* (Pursh) B.L. Robinson - G]

\* *Mirabilis nyctaginea* (Michaux) MacMillan, Heart-leaved Umbrella-wort, Wild Four-o'clock. Railroad embankments, other disturbed areas; native of c. North America. May-October. [= RAB, C, F, K, Pa, W, WV, Z; = *Oxybaphus nyctagineus* (Michaux) Sweet - G; = *Allionia nyctaginea* Michaux - S]

308. **MOLLUGINACEAE** Hutchinson 1926 (Carpetweed Family) [in CARYOPHYLLALES]

A family of about 13-14 genera and 120-125 species, herbs, of tropical and warm temperate areas. References: Vincent in FNA (2003b); Boetsch (2002)=Z; Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

*Mollugo* Linnaeus 1753 (Carpetweed)

A genus of about 35 species, annual herbs, of tropical and subtropical regions of both hemispheres, introduced in temperate regions. References: Endress & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

\* *Mollugo verticillata* Linnaeus, Carpetweed, Indian-chickweed. Fields, disturbed areas, drawdown zones on river- and pond-shores; native of tropical America. May-November. [= RAB, C, F, FNA, G, GW, K, Pa, S, W, WV, Z]



309. **MONTIACEAE** Rafinesque 1820 (Montia Family) [in CARYOPHYLLALES]

A family of about 14 genera and 250 species, annual and perennial herbs and subshrubs, primarily of the Southern Hemisphere, but also occurring in North America and e. Asia. References: Packer in FNA (2003b); Nyffeler & Eggle (2010); Carolin in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Leaves terete, alternate; subshrubs with woody bases ..... *Phemeranthus*
- 1 Leaves flat, opposite or alternate; herbs.
  - 2 Stems with 2 opposite cauline leaves; petals 6-14 mm long ..... *Claytonia*
  - 2 Stems with > 2 leaves, opposite or alternate; petals 1-6 mm long ..... *Montia*

*Claytonia* Linnaeus 1753 (Spring-beauty)

A genus of about 30 species, perennial herbs, of North America and e. Asia. References: Miller & Chambers (2006)=Y; Miller in FNA (2003b); Davis (1966)=Z; Lewis & Suda (1968); Lewis, Oliver, & Suda (1967); Carolin in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Cauline leaves **either** fused together, perfoliate, the pair together nearly round, **or** not fused but each broadly ovate; annual, from fibrous roots with minute tubers; [cultivated, rarely naturalizing].
- 2 Basal rosette leaves erect or ascending, the blade 1-7 cm long ..... *C. perfoliata* ssp. *perfoliata*

- 2 Basal rosette leaves flattened against the ground, the blade 0.5-1.5 cm long..... *C. rubra* ssp. *rubra*
- 1 Cauline leaves not fused, each linear, lanceolate, or ovate; perennial, from tubers 1-2 cm in diameter; [native, of moist forests].
- 3 Cauline leaves 3-6 (-11) cm long (including the evident petiole), the blade narrowly diamond-shaped, 2.5-6 (-8)× as long as wide; leaves 10-15 (-30) mm wide..... *C. caroliniana*
- 3 Cauline leaves (5-) 7-20 cm long (including the poorly differentiated petiole), the blade > 8× as long as wide; leaves 1-10 (-20) cm wide.
- 4 Broadest leaves on a plant 1-2 (-4) mm wide..... *C. virginica* var. *acutiflora*
- 4 Broadest leaves on a plant 5-10 (-20) mm wide..... *C. virginica* var. *virginica*

*Claytonia caroliniana* Michaux, Carolina Spring-beauty. Moist forests, especially northern hardwood forests and cove forests at moderate to high elevations. March-May. NS west to MN, south to w. NC, e. TN, and n. GA; disjunct in AR. [= RAB, C, F, FNA, G, Pa, S, W, Y, Z; > *C. caroliniana* var. *caroliniana* – K; > *C. caroliniana* Michaux var. *lewisii* McNeill – K]

\* *Claytonia perfoliata* Donn ex Willdenow ssp. *perfoliata*, Miners’-lettuce. Disturbed areas, lawns, gardens; native of w. North America. [= FNA, K]

\* *Claytonia rubra* (Howell) Tidestrom ssp. *rubra*, Miners’-lettuce. Disturbed areas; native of w. North America. Naturalizing in Arlington County, VA (Steury 2010, 2011). [= FNA, K]

*Claytonia virginica* Linnaeus var. *acutiflora* A.P. de Candolle, Southern Spring-beauty. Mt (GA, NC, SC, VA), Pd (GA, NC, SC, VA), Cp (GA, NC, SC, VA): moist forests; common. (January-) February-April. VA west to IL, south to sw. GA and TX. This variety has chromosome numbers of n=6, n=7, and polyploid and polyploid/aneuploid derivatives of those numbers. [= C, K; < *C. virginica* – RAB, F, FNA, G, Pa, W, Y; = *C. virginica* – S; = *C. virginica* var. *simsii* (Sweet) R.J. Davis – Z; = *C. simsii* Sweet]

*Claytonia virginica* Linnaeus var. *virginica*, Eastern Spring-beauty. Mt (DE, GA, NC, SC, VA, WV), Pd (NC, SC, VA), Cp (DE, NC, SC, VA): moist forests. (January-) February-April. NS west to MN, south to GA and TX. This variety has chromosome numbers of n=8 and polyploid and polyploid/aneuploid derivatives of that number. [= K, Z; < *C. virginica* – RAB, F, FNA, G, Pa, W, Y; < *C. virginica* var. *virginica* – C; = *C. media* (A.P. de Candolle) Link – S]

*Montia* Linnaeus 1753 (Blinks, Montia)

A genus of about 10 species, annual herbs, of nearly cosmopolitan distribution in temperate regions. References: Miller in FNA (2003b); Carolin in Kubitzki, Rohwer, & Bittrich (1993).

- 1 Leaves opposite..... *M. fontana*
- 1 Leaves alternate..... *M. linearis*

\* *Montia fontana* Linnaeus, Water Blinks. Cp (VA): wet places; rare, native of northern North America and Eurasia. [= FNA; > *M. fontana* var. *fontana* – C; > *M. fontana* ssp. *fontana* – K]



\* *Montia linearis* (Douglas ex Hooker) Greene, Narrow-leaved Montia. Pd (NC), Cp (VA): lawns, disturbed areas; rare, native of western North America. Also in c. TN (Chester, Wofford, & Kral 1997). [= FNA, K]

*PheMERanthus* Rafinesque 1814 (Rock-pink, Fameflower)

A genus of about 20 species, herbs and dwarf shrubs, of America. Our North American "Talinums" are not closely related to the broad-leaved type of *Talinum* and are transferred to *PheMERanthus* (Kiger 2001). Adaptation of our native species of *PheMERanthus* to different rock substrates is discussed by Ware & Pinion (1990). References: Kiger in FNA (2003b); Price & Ferguson (2012); Wilson (1932)=X; Ware (1967)=Y; Kiger (2001)=Z; Murdy & Carter (2001)=Q; Carter & Murdy (1985); Rose & Standley (1911); Carolin in Kubitzki, Rohwer, & Bittrich (1993); Hershkovitz & Zimmer (2000).

- 1 Stamens 4-8; flowers open in late afternoon..... *P. parviflorus*
- 1 Stamens 12-80; flowers variously open from early or late afternoon.
- 2 Style 2-3.5 mm long, shorter than or about the same length as the stamens; stamens 12-30; flowers open from (3-) 3:30 to 7 p.m. E.D.S.T.. .. *P. teretifolius*
- 2 Style 3.8-7 mm long; stamens 25-80 (-90); flowers open from about 1 to 7 p.m. E.D.S.T.
- 3 Stigma distinctly 3-lobed; mature seeds covered with a dull gray coating; [of calcareous rock outcrops] ..... *P. calcaricus*
- 3 Stigma subcapitate; mature seeds brown-black and lustrous; [of noncalcareous rocks].
- 4 Stamens (40-) 50-80 (-90); [of granite and sandstone from SC southward]..... *P. mengesii*
- 4 Stamens 25-42; [of mafic and ultramafic rocks, known from nc. NC and sc. VA]..... *P. piedmontanus*



***Phemeranthus calcaricus*** (S. Ware) Kiger, Cedar-glade Rock-pink. Calcareous glades. C. TN south to n. AL. A tetraploid species, probably derived from *P. calycinus* Engelmann. [= FNA, Z; = *Talinum calcaricum* S. Ware – K, Q, Y]

***Phemeranthus mengesii*** (W. Wolf) Kiger, Large-flowered Rock-pink. Pd (GA, SC), Cp (GA): in shallow soil over felsic rocks (granite) or sandstone (in GA and AL), or Altamaha Grit (GA), where periodically wet by seepage; rare (locally common in GA). June-September. C. SC south to c. GA (where it extends into the Coastal Plain on outcrops of Altamaha Grit), west to n. AL and sc. TN. *P. mengesii* and *P. parviflorus* Nuttall of the midwestern United States (and disjunct as far east as AL) are apparently the parents of the allotetraploid *P. teretifolius*. Diploid and tetraploid populations are known of this taxon; further investigation is needed to determine if the tetraploids are allotetraploids or autotetraploids. [< *Phemeranthus mengesii* – FNA, Z (also see *P. species 1*); = *Talinum mengesii* W. Wolf – Q, S, X, Y; < *Talinum mengesii* – K (also see *P. species 1*)]

***Phemeranthus parviflorus*** (Nuttall) Kiger, Small-flowered Rock-pink. More western, occurs as an eastern disjunct in n. AL. A diploid species. [= FNA, Z; = *Talinum parviflorum* Nuttall – C, F, G, K, Q, X; > *Talinum parviflorum* – Y; > *Talinum appalachianum* W. Wolf – Y]

***Phemeranthus piedmontanus*** S. Ware, Piedmont Rock-pink. Pd (NC, VA): in periodic seepage on mafic or ultramafic rocks; rare. (June?) July-September. This taxon was discovered at a diabase glade in Granville County, NC and ultramafic barrens in Franklin County, VA, floristically rich in other species of disjunct and relict distribution. See Ware (2011) for detailed information. [< *Talinum mengesii* – K; < *Phemeranthus mengesii* – FNA, Z]

***Phemeranthus teretifolius*** (Pursh) Rafinesque, Appalachian Rock-pink. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (GA): in shallow soil over felsic or mafic rocks (granite, gneiss, schist, granite, diabase, greenstone, metabasalt, sandstone, Altamaha grit), especially where periodically wet by seepage (often in mats of the moss *Grimmia*); common (rare in WV). June-September. DE (at least formerly), se. PA, and WV, south to se. TN, GA (where it extends into the Coastal Plain on outcrops of Altamaha Grit), and AL, in the Appalachians and adjacent provinces. *P. teretifolius* is an allotetraploid, probably derived from hybridization followed by polyploidization of the diploids *P. mengesii* and *P. parviflorus*. [= FNA, Pa, Z; = *Talinum teretifolium* Pursh – RAB, C, F, G, K, Q, S, W, WV, X, Y]



**311. BASELLACEAE** Moquin-Tandon 1840 (Madeira-vine Family) [in CARYOPHYLLALES]

A family of 4 genera and about 20 species, fleshy perennial vines and herbs, of the tropics and subtropics. References: Vincent in FNA (2003b); Sperling & Bittrich in Kubitzki, Rohwer, & Bittrich (1993); Nyffeler & Eggli (2010).

- 1 Filaments free nearly to base, adnate for < ¼ of their length to the petals ..... **Anredera**
- 1 Filaments adnate for > ½ of their length to the petals ..... **Basella**

***Anredera*** Jussieu (Madeira-vine)

A genus of about 12 species, perennial vines, of tropical and subtropical Americas. References: Vincent in FNA (1993b); Sperling & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

\* ***Anredera cordifolia*** (Tenore) Steenis, Madeira-vine. Cp (FL): disturbed areas; rare, native of South America. In Panhandle FL (Leon County) and n. peninsular FL (Alachua County) (Wunderlin & Hansen 2004). [=FNA, K1, K2, WH; < *Boussingaultia leptostachya* Moquin – S]

***Basella*** Linnaeus 1753

A genus of 5 species, perennial vines, of the tropics and subtropics. References: Sperling & Bittrich in Kubitzki, Rohwer, & Bittrich (1993).

\* ***Basella alba*** Linnaeus. Disturbed areas, grown as a vegetable, and rarely found as a waif; native of s. Asia. Reported for Calhoun County, AL (AL Atlas in prep.; Kartesz 2010). [= K2]

**313. TALINACEAE** Doweld 2001 (Fameflower Family) [in CARYOPHYLLALES]

A family of about 2 genera and 35 species, herbs and shrubs, primarily of the Southern Hemisphere, but also occurring in North America and e. Asia. References: Packer in FNA (2003b); Carolin in Kubitzki, Rohwer, & Bittrich (1993); Nyffeler & Eggli (2010).

- 1 Leaves linear, terete, 1-2 mm wide; plants to 5 dm tall; [native] ..... [*Phemeranthus* in **MONTIACEAE**]  
 1 Leaves obovate or elliptic, 20 mm or more wide; plants to 8 dm tall; [alien, persistent or escaped]..... **Talinum**

**Talinum** Adanson 1763 (Jewels-of-Opar)

A genus of about 15 species, herbs, and dwarf shrubs, mainly of Africa but with 3 species of the New World tropics and sw. United States and Mexico (Price & Ferguson 2012). References: Kiger in FNA (2003b); Price & Ferguson (2012); Wilson (1932)=X; Carolin in Kubitzki, Rohwer, & Bittrich (1993). [also see *Phemeranthus*]

\* **Talinum paniculatum** (Jacquin) Gaertner, Jewels-of-Opar. Fairly commonly cultivated, locally escaped to disturbed areas and garden edges; native of the West Indies. June-September. [= FNA, S, X; ? *T. paniculatum* var. *paniculatum* – K]

**314. PORTULACACEAE** A.L. de Jussieu 1789 (Purslane Family) [in **CARYOPHYLLALES**]

A family of 1 genus and 40-100 species, annual and perennial herbs, primarily of the Southern Hemisphere, but also occurring in North America and e. Asia. References: Packer in FNA (2003b); Carolin in Kubitzki, Rohwer, & Bittrich (1993); Nyffeler & Eggli (2010).

- 1 Flowers sessile or subsessile; capsule circumscissile..... **Portulaca**  
 1 Flowers pedicelled; capsule opening longitudinally.  
 2 Flowers borne on a scape, with cymose branching.....[see **TALINACEAE**]  
 2 Flowers solitary or in racemes..... [see **MONTIACEAE**]

**Portulaca** Linnaeus 1753 (Purslane, Portulaca)

A genus of about 40-100 species, annual and perennial herbs, nearly cosmopolitan, but especially in tropical, subtropical, and warm temperate regions. *Portulaca* flowers open only for a few hours each on sunny days (Matthews & Levins 1985). References: Matthews in FNA (2003b); Matthews & Levins (1985)=Z; Matthews, Faircloth, & Allison (1991); Matthews & Levins (1986); Matthews, Ketron, & Zane (1992a, 1992b, 1993); Matthews & Ketron (1991); Carolin in Kubitzki, Rohwer, & Bittrich (1993). Key based closely on Matthews in FNA (2003b).

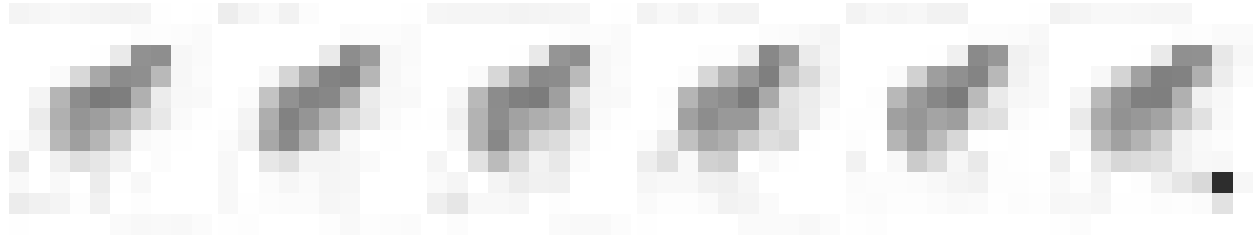
- 1 Plants in flower.  
 2 Petals yellow, orange, copper, bronze, or white.  
 3 Flowers > 25 mm across (single petals > 15 mm long).  
 4 Leaves terete; capsule not encircled by an expanded, membranaceous wing..... **P. grandiflora**  
 4 Leaves flat; capsule encircled by an expanded, membranaceous wing..... **P. umbraticola**  
 3 Flowers < 20 mm across (single petals < 12 mm long).  
 5 Leaf blades terete or hemispheric in cross-section, linear, usually < 2 mm wide; [rare waif]..... **P. halimoides**  
 5 Leaf blades flattened in cross-section, obovate or spatulate, > 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 0.4- 0.6 mm wide, round; leaves narrowly elliptic, 3-5× as long as wide ..... **P. pilosa**  
 10 Petals medium to pale pink; seeds 0.7-0.9 mm wide, elongate; leaves linear, ca. 8× as long as wide..... **P. smallii**  
 1 Plants in fruit.  
 11 Capsule encircled by an expanded membranaceous wing.  
 12 [Native in our area, in thin soil on granitic and sandstone outcrops in SC and GA]..... **P. coronata**  
 12 [Introduced cultivar, persistent to weakly spreading from plantings]..... **P. umbraticola**  
 11 Capsule not encircled by an expanded membranaceous wing.  
 13 Leaves flattened in cross-section, > 2.5 mm wide, obovate to spatulate.  
 14 Trichomes at nodes conspicuous; seeds round, < 0.6 mm wide..... **P. amilis**  
 14 Trichomes at nodes inconspicuous; seeds elongate, > 0.6 mm long ..... **P. oleracea**  
 13 Leaves terete to hemispherical in cross-section, usually < 2 mm wide, linear to lanceolate.  
 15 Nodes and inflorescences with inconspicuous trichomes ..... **P. biloba**  
 15 Nodes and inflorescences with conspicuous trichomes  
 16 Seeds > 0.65 mm wide.

- 17 Longest leaves mostly > 20 mm long; capsules mostly > 4 mm in diameter; [introduced, usually in obviously disturbed sites]....  
..... *P. grandiflora*
- 17 Longest leaves mostly < 17 mm long; capsules mostly < 3.5 mm in diameter; [native, on granitic or diabase flatrocks].....  
..... *P. smallii*
- 16 Seeds < 0.65 mm wide
- 18 Capsules 1.1-2.0 mm in diameter; seeds 0.3-0.5 mm in diameter ..... *P. halimoides*
- 18 Capsules 1.5-5 mm in diameter; seeds (0.4-) 0.5-0.6 mm in diameter ..... *P. pilosa*

\* *Portulaca amilis* Spegazzini, Broadleaf Pink Purslane. Sandy fields, lawns, and other dry, sandy, disturbed habitats; native of South America. May-September. Matthews & Levins (1985) describe the spread of this alien species in North America, apparently from an introduction in North Carolina (the earliest North American collection in 1932 in Robeson County, NC). Reported for Lowndes County, MS (Whitson 2010). [= FNA, K, WH, Z]

*Portulaca biloba* Urban, Grit Purslane. Outcrops of Altamaha Grit. This species has been collected repeatedly on outcrops of the Altamaha Grit in s. GA (Matthews, Faircloth, & Allison 1991); it also occurs in Cuba. Matthews, Faircloth, & Allison (1991) hypothesize introduction to the United States by hurricane. [= FNA, K; < *Portulaca teretifolia* ssp. *cubensis* (Urban) Ortega]

*Portulaca coronata* Small, Flatrock Portulaca. On or around granitic flatrocks, usually under *Juniperus virginiana*, and on Altamaha Grit outcrops. June-September. SC south to GA, endemic to granitic and sandstone outcrops in the Piedmont and rarely Altamaha grit (sandstone outcrops in the upper Coastal Plain). Matthews & Levins (1985) includes this taxon in *P. umbraticola*. Later, Matthews & Ketron (1991) and Matthews, Ketron, & Zane (1992) treated our southeastern material as *P. umbraticola* ssp. *coronata*. While the distinctive nature of the capsule unifies the southeastern "*coronata*," southwestern "*lanceolata*," and Central and South and Central American "*umbraticola*," the difference in chromosome number and flower color, associated with disjunctly allopatric distributions renders specific recognition equally plausible. [= RAB, S; < *P. umbraticola* Kunth - Z; = *P. umbraticola* Kunth ssp. *coronata* (Small) J.F. Matthews & Ketron - FNA, K]



\* *Portulaca grandiflora* Hooker, Rose-moss. In sandy soil or around granitic flatrocks; native of Argentina. [= RAB, C, FNA, G, K, Pa, S, Z]

\* *Portulaca halimoides* Linnaeus. Waste area along railroad; probably only a waif, native of sw. North America. Reported by Reed (1964). [= FNA, K; > *P. parvula* A. Gray]

\* *Portulaca oleracea* Linnaeus, Common Purslane, Garden Purslane, Pussley. Mt (GA, NC, SC, VA, WV), Pd (DE, GA, NC, SC, VA), Cp (DE, FL, GA, NC, SC, VA): gardens, disturbed areas, cracks in sidewalks; common (uncommon in DE and FL), originally native (apparently) of Asia, probably introduced to North America from Europe. May-October. The various subspecies recognized may or may not be taxonomically significant; a decision awaits an analysis of variation worldwide, or, at least, in the native range of the species. In North America, *P. oleracea* is a widespread, sometimes noxious weed, probably representing numerous introductions of various genotypes, treated as multiple subspecies by some authors. In North America, these genotypes appear to have intermixed; in our area (at least), the recognition of infraspecific taxa has been considered unwarranted, difficult, and unmeaningful (see Matthews, Ketron, & Zane 1993); see Danin & Anderson (1986) for a contrasting opinion. During the Great Depression, *P. oleracea* was eaten extensively in the Valley of Virginia as a potherb. [= RAB, C, F, FNA, G, K, Pa, S, W, WH, WV, Z]

*Portulaca pilosa* Linnaeus, Kiss-me-quick. Disturbed sandy soils. June-October. NC south to s. FL, west to NM, north in the interior to c. TN, AR, and OK, and in Central America; the native range perhaps obscure. See Matthews, Ketron, & Zane (1992a) for a further discussion of this species. [= RAB, FNA, K, S, WH, Z]

*Portulaca smallii* P. Wilson, Small's Portulaca. In thin soils on granitic and diabase flatrocks, sometimes locally spreading to adjacent fields, mowed areas, or other disturbed areas. (June-) Late August-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, Chinese-hat, Wingpod Purslane. Disturbed areas, spreading weakly or persistent following cultivation; native of South America and the West Indies. See *P. coronata* for further discussion. [< *P. umbraticola* Kunth - Z; = *P. umbraticola* Kunth ssp. *umbraticola* - K]

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