Lycopodiaceae Palisot de Beauvois 1802 (Clubmoss Family) [in LYCOPODIALLES]

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

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

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

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

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

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

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

4 Leaves of the prostrate stems 1.3-2.1 mm wide, not toothed; leaves of the erect stem few, not overlapping, whorled; leaves of the strobilus (sporophylls) much reduced relative to leaves of the prostrate and upright stems; upright stems 1.5-3 mm in diameter (including the leaves) .......................... 3. Pseudolycopodiella
A genus of about 10–15 species, north temperate and arctic (and tropical mountains of Asia). Within the Lycopodiaceae, *Huperzia* has "an isolated position", basal to the remainder of the family, and is sometimes separated in a separate family, the Huperziaceae (Haines 2003a). References: Wagner & Beitel in FNA (1993b); Haines (2003a)=Z; Øllgaard in Kramer & Green (1990); Wikström & Kenrick (2000).

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

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

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

3. Leaves relatively monomorphic; gemma-bearing branches, if present at all, borne in 1 pseudowhorl at the apex of seasonal growth; lateral leaves of gemmae 1.3-2.5 mm wide. [H. selago]
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subtly differentiated from the circumboreal *H. selago* (for distinctions see Beitel & Mickel 1992; Brunton, Wagner, & Beitel 1992; Haines 2003a), the case for the distinctness of *H. appressa* is confirmed by the production of sterile (abortive-spired) hybrids where it co-occurs with *H. selago*. (= Z; = *H. appalachiana* Beitel & Mickel – FNA, K; < *Lycopodium selago* Linnaeus – RAB, S, W; > < *Lycopodium selago* Linnaeus var. *appressum* (Desvaux) Petrovic – C, F; > < *Lycopodium selago* var. *selago* – C, G)

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


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

2. *Lycopodiella* Holub 1964 (Bog Clubmoss)

A genus of about 15-20 species, temperate and tropical. Additional research on this genus in our area is needed. Two fertile tetraploid species were recently named from MI (Bruce, Wagner, & Beitel 1991), and additional cryptic or semicryptic species may be found in the Southeastern Coastal Plain. This group is variously treated as genus *Lycopodiella*, or as *Lycopodiella* section *Lycopodiella* (Øllgaard in Kramer & Green 1990, Wikström & Kenrick 2000). References: Wagner & Beitel in FNA (1993b); Øllgaard in Kramer & Green (1990); Wikström & Kenrick (2000); Haines (2002a, 2003a, 2003b)=Z. [also see *Pseudolycopodiella*]

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

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

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L. inundata

1 Leaves of the horizontal shoots toothed (except when inundated); horizontal shoots, excluding the leaves, 1.5-5.0 mm in diameter; each horizontal shoot segment producing 2-6 upright shoots; [collectively primarily of the Coastal Plain, with some disjunctions inland into the Piedmont and Mountains].
2 Fertile leaves (sporophylls) 2.9-5.0 (-5.2) mm long, appressed at maturity, entire or with short teeth < 0.3 mm long; strobili 3-6 mm in diameter at maturity ............................................. **L. appressa**

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

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

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

**Lycopodiella alopecuroides** (Linnaeus) Cranfill, Foxtail Clubmoss. Savannas, seepages, and other wet, sandy sites. July-September. Primarily Southeastern Coastal Plain: se. MA south to FL and west to e. TX, and disjunct in the Cumberland Plateau of KY, TN, and VA, the Allegheny Mountains of WV (Morton et al. 2004), the e. Highland Rim of TN, and in ME (Haines 2001); s. Mexico south through Central America to n. South America; Cuba. [= FNA, K, Pa, WH3, Z; < Lycopodium alopecuroides Linnaeus – RAB; = Lycopodium alopecuroides Linnaeus – C, F, G, Md, S, W]


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


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

**Lycopodiella alopecuroides** × *appressa*. [= Lycopodiella × copelandii (Eiger) Cranfill – K, WH3, Z; Lycopodium × copelandii Eiger]


**Lycopodiella alopecuroides** × *prostrata*. [= Lycopodiella × brucei Cranfill – K, WH3; = Lycopodium × brucei (Cranfill) Lellinger]


**Lycopodiella appressa** × *prostrata*.

3. Pseudolycopodiella Holub 1983 (Carolina Bog Clubmoss)
A genus of about 12 species, sub-cosmopolitan. This group has often been treated as section of *Lycopodium* (or of *Lycopodiella*); it appears to warrant status as a genus separate from *Lycopodiella*. In addition to the morphologic distinctions, this species has considerable anatomical differences, a different base chromosome number than the four species of *Lycopodiella* (x = 35 vs. x = 78), and does not hybridize with *Lycopodiella* (Wagner & Beitel 1992). Øllgaard in Kramer & Green (1990) and Wikström & Kenrick (2000) retain it as *Lycopodiella* section *Caroliniana*. References: Wagner & Beitel in FNA (1993b); Haines (2003a) = Z; Øllgaard in Kramer & Green (1990); Wikström & Kenrick (2000).

*Pseudolycopodiella caroliniana* (Linnaeus) Holub, Carolina Bog Clubmoss, Slender Clubmoss. Savannas, seepages. July-September. This species occurs in se. North America, the West Indies, and is widespread in the Southern Hemisphere; in North America, it ranges from MA south to s. FL and west to e. TX. [= FNA, Z; = *Lycopodium carolinianum* Linnaeus – C, F, G, Md, RAB, S; > *Lycopodiella caroliniana* (Linnaeus) Pichi Sermolli var. *caroliniana* – K; = *Lycopodiella caroliniana* (Linnaeus) Pichi Sermolli – WH3]


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

*Palhinhaea cernua* (Linnaeus) Vasconcellos & Franco, Nodding Clubmoss, Staghorn Clubmoss. Wet savannas, ditches and other disturbed moist areas. This species is pantropical, occurring in both the Neotropics and the Paleotropics. Some of its occurrences in our area may be adventive. [= FNA; > *Lycopodiella cernua* (Linnaeus) Pichi Sermolli var. *cernua* – K; = *Lycopodium cernuum* Linnaeus – S; = *Lycopodiella cernua* (Linnaeus) Pichi Sermolli – WH3]

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

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

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

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

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

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


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

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

* **Hydrocotyle bonariensis** Lamarck, Dune Pennywort. Beaches, dunes, and moist sandy areas. April-September. Widespread in South and Central America, north in North America to the Southeastern Coastal Plain, se. VA to s. FL and TX. [= RAB, GW, K, MC, S, WH]


Kalopanax Miquel 1863 (Castor Aralia)


Panax Linnaeus 1753 (Ginseng)


1 Leaflets (3-) 5, petiolulate, the petiolules (7-) 10-25 mm long; larger leaflets 6-15 cm long, 3.5-7 cm wide, averaging about 1.8× as long as wide, the apex acuminate; fruit bright red when ripe .... P. quinquefolius

1 Leaflets 3 (-5), sessile or subsessile, the petiolules to 3 mm long; larger leaflets 4-8 cm long, 0.5-2.5 cm wide, averaging about 2.5× as long as wide, the apex obtuse to acute; fruit yellow-green when ripe . P. trifolius

Panax quinquefolius Linnaeus, Ginseng, Sang, American Ginseng. Cove forests, mesic hardwood forests, generally in nutrient-rich forests though tending to avoid the richest coves. May-June; August-October. ME and QC west to MN and SD, south to e. VA, e. NC, nc. SC, sw. GA, s. AL, s. MS, e. LA, and OK. P. quinquefolius is gathered in quantity throughout its range for the herbal trade; most of the North American harvest is shipped to China, where it is prized for medicinal uses. Dried roots command prices in excess of $1000 per kilogram; in our area, "sang" is a multimillion dollar industry. Formerly abundant and occurring in large populations, P. quinquefolius has been reduced in most of its range to small populations of scattered individuals, a classic example of a " predator-prey" relationship. Collection and trade in ginseng is monitored and regulated in most states. In NC, it is illegal for ginseng dealers to buy ginseng from collectors before September; this allows the plants to mature fruits prior to collection. Schlessman (1985) discusses the floral biology of P. quinquefolius. [= F, K, Pa, W, WV, Y, Z; = P. quinquefolium – RAB, C, G, S, orthographic variant]


Tetrapanax (K. Koch) K. Koch 1859 (Ricepaper-plant)

A monotypic genus, a robust herb or shrub, of China.

* Tetrapanax papyriferus (Hooker) K. Koch, Ricepaper-plant. Disturbed forests; native of Asia. [= K, WH; = T. papyrifer, orthographic variant]
A family of about 445 genera and about 3540 species of herbs (rarely shrubs or trees), cosmopolitan, but especially north temperate. *Hydrocotyle* is more closely related to Araliaceae, and has been transferred there (Chandler & Plunkett 2004).

References: Mathias & Constance (1945)=MC. [also see **ARALIACEAE**]

**Identification notes:** The Apiaceae is an easy family to recognize (with some exceptions). These are herbs, typically with a clasping petiole base and often a variously (and often highly) compound leaf, either 1-5× pinnately, palmately, pinnately-ternately, or ternately compound (less commonly simple or phyllodial). The inflorescence is typically a simple or compound umbel (sometimes subcapitate or truly modified into a head) with numerous small flowers. Subtending the inflorescence is (usually) an involucre of individual bracts. If the umbel is compound, rays support umbellets, each of which may be subtended by an involucel of individual bractlets. The ovary is 2-carpellate, with 2 styles at the summit, these often swollen at the base into a stylodium capping the ovary. The fruit develops into 2 mericarps, united by their faces at the commissure; each mericarp may be terete, flattened dorsally (parallel to the commissure, the commissure therefore broad), or flattened laterally (perpendicular to the commissure, the commissure therefore narrow). Each mericarp has 5 primary ribs, one down the back (the dorsal rib), 2 near each edge near the commissure (the lateral ribs or lateral wings), and 2 in-between (the intermediate ribs). The ribs may be thin and filiform in ×-section, corky, or winged, and they (or the entire outer surface of the mericarp) may also be ornamented with hairs, spines, uncinate prickles, etc.

1. Principal leaves **either** all simple (though sometimes palmately or pinnately lobed) **or** those that are basally disposed simple (those on the upper stem sometimes compound) ................................................... **Key A**
   1. Principal leaves all variously compound (small bracteal leaves on the upper stem sometimes reduced and simple).
   2. Leaves 1-pinnately or 1-pinnately compound (all leaflets attached to the summit of the petiole or to the primary inflorescence rachis).
   3. Leaves 1-pinnately compound, all of the 3-7 leaflets attached to the summit of the petiole **Key B**
   3. Leaves 1-pinnately compound, all of the 3-13 leaflets attached to a primary inflorescence rachis **Key C**
   2. Leaves 2-5× compound.
   4. Leaves 2-4× pinnately or pinnately-ternately compound, the ultimate segments consisting of relatively few (usually < 25), discreet, typically broad (elliptic, ovate, or lanceolate) leaflets ......................... **Key D**
   4. Leaves 2-5× pinnately or pinnately-ternately decompound, the ultimate segments **either** linear (and then flat or angled in ×-section) **or** broader, but then very many (> 50) and often imperfectly separated from one another **Key E**

**Key A – Apiaceae with simple leaves**

1. Leaves linear, lanceolate, or oblanceolate, > 4× as long as wide.
2. Leaves phyllodial (hollow, septate, segmented); flowers white or purple; [plants of wetlands].
   3. Umbels simple; leaves spatulate, broader towards the tip, often flattened in ×-section, rounded or obtuse at the apex .......................................................... **Lilaeopsis**
   3. Umbels compound; leaves tapering to a pointed tip, terete in ×-section.
   4. Plants 1-11 dm tall, annuals, sometimes mat-forming and adventiously perennial; fruits 1-3 mm long, with lateral ribs; rays 3-15 .......................................................... **Harperella**
   4. Plants 6-24 dm tall, perennials from rhizomes or tubers; fruits 4-9 mm long, with lateral wings; rays 5-20 .......................................................... **Tiedemannia**
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2 Leaves “normal” (flat, non-septate, continuous, and in some cases lobed, toothed, or spinose-margined); flowers blue, yellow, white, or whitish-green; [plants of wetlands or uplands].

5 Flowers borne in involucrate heads; corolla blue or greenish-white ..................... Eryngium

Eryngium aquaticum var. aquaticum, Eryngium aquaticum var. ravenelii, Eryngium yuccifolium var. synchaetum, Eryngium yuccifolium var. yuccifolium, Eryngium aromaticum

5 Flowers in compound umbels; corolla yellow or white.

6 Stem leaves similar to the basal, all simple; corollas yellow; [alien, of disturbed areas] Bupleurum

Bupleurum gerardii, Bupleurum lancifolium, Bupleurum odontites

6 Stem leaves palmately 3-5-foliolate with linear leaflets, differing from the simple basal leaves; corollas white; [native, of blackland prairies and associated disturbed areas, from AL and TN westward] Cynosciadium

Cynosciadium digitatum

1 Leaves orbicular, ovate, or elliptic, < 4× as long as wide.

7 Leaves orbicular, as wide as or wider than long; base peltate or cordate.

8 Leaves leathery, with spinose margins; inflorescence a head; flowers blue; [rare introduction] Eryngium maritimum

Bowlesia incana

9 Foliage and fruits (or ovaries) stellate-pubescent or glochidiate; leaves lobed, but otherwise entire; [rare alien]

.....................................................................................................................

9 Foliage and fruits (or ovaries) glabrous; leaves toothed, sometimes also lobed; [common natives and aliens]

.........................................................................................

[see Hydrocotyle, in Araliaceae]

7 Leaves ovate or elliptic, 1.2-4× as wide as long; base cordate, peltate, or truncate.

10 Leaves perfoliate; flowers yellow; [rare aliens].

11 ........................................................................................................ Bupleurum rotundifolium

........................................................................................................ Smyrnium perfoliatum

10 Leaves cordate or truncate at the base; flowers white, green, yellow, blue, or purple;

12 Flowers greenish or blue; leaves all simple (sometimes stem leaves lobed); inflorescence a head or very congested (subcapitate) umbel; [plants of wetland situations, prostrate, creeping, or erect].

13 Inflorescence a very congested (subcapitate) umbel, with 4-9 flowers; leaves cordate at the base, long-petiolate, the petioles characteristically 2× as long as the leaf............................ Centella erecta

13 Inflorescence a head, with > 20 flowers; leaves cuneate to truncate at the base, sessile to short petiolate, the petioles < 1× as long as the leaf (except E. prostratum)............................... Eryngium

12 Flowers yellow or purple; basal leaves simple, stem leaves usually compound; Inflorescence a compound umbel; [erect plants of upland situations].

14 Fruits (partly to fully mature) with thin-edged wings; flowers yellow or purple; central flower of each umbellet staminate and pedicelled; fruits all pedicelled in all umbellets ...................... Thaspium

14 Fruits ribbed (with rounded, cordlike ribs), lacking thin-edged wings; flowers yellow; central flower of each umbellet either staminate and pedicelled, or pistillate and sessile; fruits all pedicelled in some umbellets (those with a staminate central flower), or the central fruit sessile in some umbellets (those with a pistillate central flower)................................. Zizia

Key B – Apiaceae with 1-palmate leaves

1 Leaflets narrowly lanceolate or linear, > 8× as long as wide, entire; umbels compound and regular, the rays and pedicels each of relatively uniform lengths; leaves 3-5-foliolate.

2 Fruit 2-3 mm long; leaves 1-5-foliolate; [of calcareous or rich moist to wet areas, AL and TN and westward] Cynosciadium

...................................................................................................................

2 Fruit 3-5 mm long; leaves 1-3-foliolate; [of saturated acid wetlands, of the FL Panhandle, e. GA, e. SC, e. NC, and e. VA]........................................................................................................... Oxypolis

1 Leaflets ovate, obovate, broadly lanceolate, 1-5× as long as wide, serrate or variously incised or cleft; umbels compound and irregular, the rays and/or pedicels of widely varying lengths; leaves 3-7-foliolate.

3 Rays 3-8, the involucre absent or inconspicuous; umbels with 3-10 pedicellate perfect flowers; fruits linear-oblong, glabrous; leaves 3-foliolate, the lateral leaflets often 2-parted; corollas white .... Cryptotaenia
3 Rays few, the involucre of prominent, broad, foliaceous bracts; umbellets with 3 sessile to subsessile or short-pedicellate perfect flowers and a variable number of pedicellate staminate flowers; fruits ovoid, obovoid, or subglobose, covered with uncinate bristles; leaves palmately 3-7-foliolate, the lateral sometimes 2-parted; corollas greenish-white, yellowish-green, or white .................................................. Sanicula

Key C – Apiaceae with 1-pinnate leaves

1 Larger leaves 20-50 cm wide, 3 (-5) foliolate, many of the leaflets deeply lobed into segments often > 10 cm wide; fruits 8-15 mm long, pubescent; petioles sheathing and also strongly dilated .................. Heracleum

1 Larger leaves 3-25 cm wide, 5-15 (or more) foliolate, the leaflets variously toothed, if also deeply lobed, the segments < 3 cm wide; fruits 1-7 mm wide; petioles sheathing, not dilated.

2 Leaflets entire or with a few teeth (rarely as many as 7 on each side), these usually near the midpoint of the leaflet; fruits 4-7 mm long; corolla white .......................................................... Oxypolis

2 Leaflets rather finely toothed (and sometimes also deeply lobed), the teeth evenly disposed along the margins; fruits 1-6 mm long; corolla white or yellow.

3 Corolla yellow; fruits 5-6 mm long; longer rays in each compound umbel > 5 cm long Pastinaca

3 Corolla white; fruits 1-5 mm long; longer rays in each compound umbel < 4 cm long.

4 Leaflets obtuse to broadly rounded, < 1.5× as long as wide; upper leaves often dramatically more dissected (i.e., bipinnate) and with narrower leaflets or segments than the basal and lower leaves; outer flowers of the umbel asymmetric, with the outer petals larger and often bifid (raylike); [plants of disturbed upland situations].

5 .................................................................................................................. Coriandrum

5 .................................................................................................................. Pimpinella

4 Leaflets acute to acuminate at the apex, > 1.5× as long as wide; upper leaves similar to the basal in shape and degree of dissection, smaller or with fewer leaflets if they differ at all; all flowers symmetric; [plants of wetlands].

6 Umbels sessile or subsessile; leaf margins crenate; highly dissected submersed leaves absent Helosciadium

6 Umbels on stout peduncles 4-10 cm long; leaf margins sharply serrate; highly dissected submersed leaves sometimes present

............................................................................................................................. Sium

Key D – Apiaceae with leaves 2-4× pinnately-ternately compound, the ultimate leaflets distinct and relatively broad

1 Leaflets entire.

2 Leaflets linear (resembling winged rachises); corolla white ............................................. Falcaria

2 Leaflets broad, elliptic, ovate, or obovate, sparingly lobed; corolla yellow ......... Taenidia

1 Leaflets variously serrate, dentate, and/or incised.

3 Plants in flower.

4 Corolla yellow, maroon, or pale creamy yellow.

5 Flowers yellow, maroon, or pale creamy-yellow; central flower of each umbellet staminate and pedicelled; fruits all pedicelled in all umbellets; developing fruits subterete to slightly dorsally compressed, several or all of the ribs with thin-edged wings .......................................................... Thaspium

5 Flowers yellow; central flower of each umbellet either staminate and pedicelled, or pistillate and sessile; fruits all pedicelled in some umbellets (those with a staminate central flower), or the central fruit sessile in some umbellets (those with a pistillate central flower); developing fruits laterally compressed, all of the ribs rounded and cordlike

............................................................................................................................. Zizia

4 Corolla white.

6 Ovary hispid or pubescent.

7 Rays 16-25; leaves somewhat coriaceous; leaflet bases often cuneate or obliquely truncate; [plants of dry habitats] ................................. Angelica

7 Rays 3-5; leaves thin in texture; leaflet bases rounded, subcordate, or broadly cuneate; [plants of moist forests] ........................................ Osmorhiza

6 Ovary glabrous.

8 Plants 1-9 dm tall at maturity; [rarely naturalized aliens].

9 Ovary (and later the fruits) laterally compressed, not winged; [plants of uplands] Aegopodium