

## Key to Tribes of Wisconsin Compositae

After L. H. Shoinners (May, 1941, unpublished)

Source: Johnson & Iltis, 1963

(edited by R. R. Kowal, 1997 Sep 3)

1. Disk florets (usually bisexual) present; ray florets (pistillate or neuter) absent, or present only around the margin of the head; plants with watery juice.
  2. Pappus of bristles or hairs.
    3. Plants not prickly; phyllaries (involucral bracts) entire, or with ragged edges, but neither deeply laciniate nor spiny or prickly.
      4. Phyllaries in 2-5 rows, equal or unequal; or in 1 row, but conspicuous white, pink, purple, or blue rays present.
        5. Phyllaries not scarious, or scarious only on the margins.
          6. Ray florets absent; flowers white, pink, or purple.
            7. Heads purple-flowered, corymbose; leaves alternate  
.....Tribe VIII. VERNONIEAE.
            7. Plants not with all the above characters at once.....  
..... Tribe VII. EUPATORIEAE.
          6. Ray florets present or absent; disk florets yellow, orange, or brown, if purple- or red-brown, conspicuous rays present.
            8. Disk less than 2.5 cm wide .....Tribe V. ASTEREA.
            8. Disk more than 2.5 cm wide .....Tribe VI. INULEAE (Inula).
        5. Phyllaries either entirely scarious except for a central green line not extending to the tip, or with a scarious tip 1/3 or more their length.
          9. Involucre 1.0-1.6 cm high.
            10. Phyllaries loose, crisped, and rounded; heads spicate or racemose.....  
.....Tribe VII. EUPATORIEAE (Liatris)
            10. Phyllaries appressed, acute; heads loosely corymbose-paniculate.....  
.....Tribe IX. CARDUEAE (CYNAREAE) (Centaurea repens).
          9. Involucre 3-8 mm high .....Tribe VI. GNAPHALIEAE (INULEAE).
      4. Phyllaries equal and in 1 row (sometimes with a few small bractlets below them); rays yellow, or rays absent.
        11. Leaves opposite ..... Tribe VII. EUPATORIEAE (Eupatorium rugosum).
        11. Leaves alternate, or all basal .....Tribe IV. SENECTIONEA.
  3. Plants prickly, or with deeply laciniate, spiny, or prickly phyllaries.....  
..... Tribe IX. CARDUEAE (CYNAREAE).

- 2. Pappus of awns, scales, or teeth; or pappus absent.
  - 12. Phyllaries not at all scarious.
    - 13. Anthers not united; rays absent, flowers not showy, wind-pollinated.....  
.....Tribe I. HELIANTHEAE, subtribe AMBROSIINEAE.
    - 13. Anthers united; rays present or absent, flowers often showy.
      - 14. Rays absent, or present and pointed, ragged, or sharply 2- or 3-toothed at the  
apex, widest near the middle or about the same width throughout.....  
..... Tribe I. HELIANTHEAE.
      - 14. Rays present, widest at the 3- to 5-lobed apex.
        - 15. Leaves opposite ..... Tribe I. HELIANTHEAE (Polymnia & Coreopsis).
        - 15. Leaves alternate .....Tribe II. HELENIEAE.
  - 12. Phyllaries scarious, at least around the margins.
    - 16. Leaves opposite.....Tribe I. HELIANTHEAE (Cosmos & Coreopsis).
    - 16. Leaves alternate.
      - 17. Leaves toothed, lobed, or finely divided .....Tribe III. ANTHEMIDEAE.
      - 17. Leaves not toothed or divided.....Tribe V. ASTEREAE (Boltonia).
- 1. Only ligulate florets (bisexual) present; plants with milky juice .....  
.....Tribe X. LACTUCEAE (CICHORIEAE).

Tribe I. Heliantheae: 1

Tribe I. HELIANTHEAE — sunflower tribe

(Source: Melchert 1960, unpublished;  
edited by R. R. Kowal, 1997 September 4)

[For the wind-pollinated subtribe Ambrosiineae, see the key following the present key]

1. Outer (or larger) phyllaries laterally compressed and infolding the laterally compressed achene; viscid, heavy-scented annual .....17. MADIA.
1. Outer phyllaries not inclosing the opposite flower or achene.
  2. Plants strictly aquatic, submerged or floating, with leaves finely dissected into filiform segments suggesting whorls .....8. MEGALADONTA.
  2. Plants terrestrial (or rarely emergent in shallow water); leaves simple or pinnately divided, the segments lanceolate to linear.
    3. Outermost involucre bracts longer than the inner, the outer green and herbaceous, the inner somewhat membranous and dark brown to yellowish; pappus of 2 to 4 sharp, barbed awns; rays yellow, or lacking in some species .....7. BIDENS.
    3. Involucre bracts all about equal in length, the inner and the outer similar in texture; pappus various or lacking.
      4. Rays white or absent, if present, 1-10 mm long; disk small, 3-10 mm wide.
        5. Leaves alternate; heads whitish; leaves large, rough ..... 13. PARTHENIUM.
        5. Leaves opposite.
          6. Lower leaves deeply lobed, with connate-perfoliate expanded blade tissue at the nodes ..... 11. POLYMNIA.
          6. Leaves simple, toothed (not lobed), without such a foliaceous expansion at the nodes.
            7. Leaves, except the uppermost, petioled, the blades less than three times as long as wide ..... 10. GALINSOGA.
            7. Leaves tapered to the base, not distinctly petioled, the blades more than three times as long as wide; Mississippi River, rare ..... 2. ECLIPTA.
    4. Rays yellow, orange or purple, generally 1-6 cm long; disk generally large, (4-) 10-40 mm wide (small in some spp. of *Bidens*).
      8. Rays purple, the receptacular bracts spiny-pointed .....5. ECHINACEA.
      8. Rays yellow or orange.

Tribe I. Heliantheae: 2

9. Involucral bracts dimorphic: outer bracts green, shorter than or exceeding the inner, or minute, 2 mm or less long; inner bracts somewhat membranaceous, dark brown to yellow.
  10. Pappus of 2 to 4 barbed awns .....7. BIDENS.
  10. Pappus of a few teeth or pappus absent .....9. COREOPSIS.
9. Outer and inner involucral bracts of the same texture, all green and herbaceous, or all bracts in one series.
  11. Disk florets staminate; ray florets pistillate, their large achenes broadly ovate, winged, strongly flattened parallel with the adjoining involucral bracts; plants large, usually resinous ..... 12. SILPHIUM.
  11. Disk florets bisexual; ray florets neuter or pistillate; achenes wingless, sub-terete or angled.
    12. Leaves both alternate and opposite.....1. HELIANTHUS.
    12. Leaves either alternate or opposite, or all basal.
      13. Leaves opposite or all basal.
        14. Outer involucral bracts shorter than the inner; ray florets neuter, their rays thin and easily wilting, deciduous .....  
.....1. HELIANTHUS.
        14. Outer involucral bracts longer than the inner; ray florets pistillate, their rays marcescent (thickish and persistent after flowering)..... 3. HELIOPSIS.
      13. Leaves alternate.
        15. Disk flat or convex; leaves simple, not lobed, cleft, laciniate, or pinnately parted.
          16. Leaves not decurrent; achenes 3- or 4-angled, wingless, forming a flat head..... 1. HELIANTHUS.
          16. Leaves decurrent down the stem; achenes flat, usually winged, forming a globose head..... 1a. VERBESINA.
        15. Disk conical, hemispheric or columnar; leaves simple in Rudbeckia hirta, otherwise lobed, cleft, laciniate or pinnately parted.
          17. Involucral bracts in 2 or 3 rows; leaves simple, 3-lobed, or -cleft, or laciniate ..... 4. RUDBECKIA.
          17. Involucral bracts in 1 row; leaves pinnately divided .....  
.....6. RATIBIDA.

Subtribe AMBROSIINEAE

(Source: Payne 1970)

1. Staminate and pistillate florets in common heads; ray florets pistillate, disk florets staminate .....14. IVA.
1. Staminate and pistillate florets borne in separate heads.
  2. Staminate heads lacking phyllaries, pistillate heads 2-flowered and with many, hooked spines..... 16. XANTHIUM.
  2. Staminate heads with involucre of connate phyllaries, pistillate heads 1-flowered and with a few vestigial spines or none.....15. AMBROSIA.

1. HELIANTHUS — sunflower

Source: T. E. Melchert and Hugh H. Iltis 1976, based on T. E. Melchert's MS Thesis (1960)

Coarse annual or perennial herbs with simple, opposite and alternate, or only alternate leaves; ray florets large, yellow, neuter; disk florets bisexual; involucre bracts green and herbaceous, in several series; receptacle flat or convex, the persistent chaffy bracts clasping the smooth achenes; pappus of 2 (occasionally 4) thin, deciduous, chaffy scales.

A difficult and extremely variable genus, its species boundaries often obscured by natural hybridization and polyploidy. In order to make positive identifications the entire plant must be collected, with special attention and effort directed towards obtaining roots, which in some species offer excellent diagnostic characters. Because of the species' extreme variability, several specimens from any one locality should be collected.

1. Annuals; disk, when in flower, usually brown or purple-black, 1.5-4 cm broad (when yellow, then 3-40 cm broad); upper leaves alternate.
  2. Involucre bracts broadly ovate or lance-ovate, usually 5 mm or more wide, usually abruptly narrowed to acuminate tips, ciliate with hairs that are decidedly longer than those on the bract surface; leaves frequently cordate, serrate; central receptacular bracts hispid..... 1. H. annuus.
  3. Plants branched; disk 3-5 cm in diam.; rays 21-35, 3-5 cm long, 1.0-1.5 cm wide; weedy..... ssp. annuus.
  3. Plants usually unbranched; disk 6-30 or more cm in diam.; rays 30-70, 4-10 cm long, 1.5-3.0 cm wide; often grown in gardens ..... ssp. macrocarpus.
  2. Involucre bracts lanceolate or narrowly ovate, usually less than 5 mm wide, gradually tapering to acute or acuminate tips, ciliate with hairs that are about as long as those on the bract surface; leaves truncate or wedge-shaped, entire or nearly so; central receptacular bracts with long, white-villous tips; southern half and northwest Wisconsin .....2. H. petiolaris.
1. Perennials; disk, when in flower, yellow (except in H. rigidus), 1-3 cm broad; upper leaves alternate or opposite.

Tribe I. Heliantheae: 4

4. Leaves mostly basal, the stems slender, elongate, and scapose (nearly leafless); heads few, small, the disks mostly 1-1.5 cm broad; common in sandy soil..... 3. H. occidentalis.
4. Plants leafy throughout, though leaves reduced upwards in H. rigidus; stems coarse.
  5. Leaves cordate to subcordate, sessile, usually somewhat clasping, copiously villous throughout; very rare adventive ..... 4. H. mollis.
  5. Leaves petioled, or, if sessile, linear-lanceolate to ovate-lanceolate, not cordate or clasping.
    6. Involucral bracts strongly appressed, shorter than the disk (rarely over 10 mm long), oblong to ovate, glabrous or nearly so, the margins sometimes ciliate; leaves narrowly lanceolate to subrhombic, rigid, scabrous, usually strongly reduced upward; stems usually rough throughout .....5. H. rigidus.  

[Helianthus hirsutus and H. divaricatus, characterized by sessile leaves, occur in Wisconsin according to Heiser 1969 (Mem. Torrey Bot. Club, Vol. 22). Most specimens so designated seem to us to be H. strumosus.]
    6. Involucral bracts loose, ovate-lanceolate to attenuate, with acute to acuminate spreading tips, usually equaling or exceeding the disk, generally pubescent; leaves opposite, alternate, or both alternate and opposite, only moderately reduced upward.
      7. Roots usually conspicuously thickened, fusiform and fascicled, or with short thickened rhizomes, the rhizomes not elongate; leaves usually alternate, linear-lanceolate to lanceolate, mostly 1-3 (-4) cm wide, tapering to sessile or petioled bases.
        8. Leaves linear to linear-lanceolate, entire or nearly so, frequently folded along the midrib; roots from a short thickened rhizome; stem copiously rough-pubescent throughout (whitened underneath the heads); heads normally in a racemose inflorescence; uncommon adventive.....6. H. Maximilianii.
        8. Leaves lance-linear to lanceolate, serrate, flat; roots short, usually conspicuously thickened, somewhat fascicled, never with elongate rhizomes; stem glabrous, or scabrous with short, scattered hairs.
          9. Petioles prominent, 1.5-4 cm long; stems glabrous, often glaucous, the uppermost parts sometimes sparsely pubescent; lower leaf surfaces with short, dense, appressed pubescence, often whitened .....7. H. grosseserratus.
          9. Petioles 0-1.5 cm long; stem usually pubescent with short scabrous hairs; lower leaf surface with scattered, or occasionally rather dense, harsh, ascending pubescence, never whitened..... 8. H. giganteus.
  7. Roots not thickened, cord-like; leaves usually opposite, if alternate, then more than 3 cm wide.

Tribe I. Heliantheae: 5

10. Leaves opposite below, alternate above, usually broadly lance-ovate to ovate, abruptly tapering to rather long, usually winged, petioles.
  11. Rhizomes frequently tuber-bearing; stem rough-pubescent throughout; leaves coarse, the lower surface densely pubescent, usually velutinous; involucral bracts frequently dark green or blackish ..... 9. H. tuberosus.
  11. Rhizomes not tuber-bearing; stem smooth; leaves thin, coarsely toothed, the lower surface essentially glabrous, or slightly scabrous; involucral bracts light green, frequently considerably exceeding the disk, leaf-like.....10. H. decapetalus.
10. Leaves essentially opposite throughout, lanceolate to ovate-lanceolate, the blades often contracted at the base to a short unwinged petiole or abruptly tapering to, and decurrent on, the petiole.
  12. Rhizomes frequently with tuber-bearing rootlets; stems normally scabrous or hispid throughout or smooth near the base; leaves usually velutinous beneath; involucral bracts not greatly exceeding the disk, usually dark green or blackish at maturity, with conspicuous white cilia ..... 9. H. tuberosus.
  12. Rhizomes elongate, often woody (not tuber-bearing); stems essentially glabrous or scabrous on the upper internodes; leaves either thin, the lower surface glabrous to slightly scabrous, or coarse, the lower surface slightly to densely scabrous or grayed with soft, appressed pubescence; involucral bracts equaling to greatly exceeding the disk, not dark green.
  13. Leaves thin, the blades tapering to and decurrent on the often winged petiole; lower leaf surface essentially glabrous to lightly scabrous; leaf margins coarsely to moderately serrate; involucral bracts, often leaflike, exceeding the disk.....  
..... 10. H. decapetalus.
  13. Leaves coarse, the blades normally abruptly contracted at the base to a short unwinged petiole or slightly decurrent on the petiole; lower leaf surface densely to slightly scabrous or grayed with soft, dense, appressed or ascending pubescence; leaf margins moderately serrate to subentire; involucral bracts not leaflike, equaling or exceeding the disk..... 11. H. strumosus.

1a. VERBESINA

1. V. alternifolia — wing-stem

2. ECLIPTA

1. E. prostrata (E. alba) — yerba-de-tajo

3. HELIOPSIS

1. H. helianthoides — ox-eye

4. RUDBECKIA — black-eyed susan, coneflower

1. Leaves simple, not lobed or cleft below, oblanceolate to elliptic, entire or slightly toothed, fleshy, densely hirsute or hispid; pappus absent ..... 1. R. hirta var. pulcherrima.
1. Leaves, at least the lower, laciniate or 3-lobed or 3-cleft, thin, coarsely serrate, not densely hirsute; pappus present.
  2. Stem essentially glabrous; lower leaves very large, deeply laciniate; disk yellow-brown, the rays yellow, drooping ..... 2. R. laciniata.
  2. Stem pubescent; lower leaves 3-lobed or cleft, the upper entire; disk brownish-black.
    3. Bracts of receptacle (chaff) acuminate-cuspidate, glabrous; stem and leaves pubescent with rather long and scattered hairs; rays partly or completely orange ..... 3. R. triloba.
    3. Bracts of receptacle (chaff) rounded, pubescent; stem and leaves with dense, short appressed pubescence; rays yellow..... 4. R. subtomentosa.

5. ECHINACEA — coneflower

1. E. pallida — purple coneflower

6. RATIBIDA — prairie coneflower

1. Rays longer than the ellipsoid-globose head; leaflets 5-20 mm wide; pappus none ..... 1. R. pinnata.
1. Rays as long or shorter than the elongate columnar head; leaflets mostly 2-5 mm wide; pappus of 1 or 2 teeth ..... 2. R. columnifera.

7. BIDENS — beggar's-ticks, stick-tight  
(gender m. in Voss, 1996)

1. Leaves pinnately compound or tri-foliolate.
  2. Leaves 3- to 5-foliolate; leaflets lanceolate to lance-ovate; achenes 2-awned; awns barb-like, without a thin margin.
    3. Outer involucre bracts 3 to 5, smooth-margined (non-ciliate) or nearly so; achenes with antrorsely barbed awns (B. frondosa forma anomala, rare in Wisconsin, also has antrorsely barbed awns)..... 1. B. discoidea.
    3. Outer involucre bracts 5 to many, ciliate, at least at the base; achenes retrorsely barbed.
      4. Outer involucre bracts 5-9, usually 8, the inner bracts oblong, equaling the disk ..... 2. B. frondosa.
      4. Outer involucre bracts 10-16, usually 12 or 13, the inner bracts ovate-triangular, shorter than the disk ..... 3. B. vulgata.

Tribe I. Heliantheae: 7

2. Leaves with 3 to 7 lance-linear to linear segments; achenes with 2 to 4 awns, if 2-awned the awns normally with a thin ciliate margin on the inner surface and on the summit of the achene.
  5. Rays showy, 1-3 cm long; achenes 2-awned, the awns with a thin margin near the base; barbs on awns and achene margins antrorse ..... 4. B. coronata.
  5. Rays, if developed, inconspicuous, to 8 mm long; achenes normally 4-awned, occasionally 2- or 3-awned, the awns aristate, without a thin margin; barbs on awns and on achene margins retorse ..... 7. B. connata.
1. Leaves simple (sometimes lobed), not compound.
  6. Stem usually hispid below; leaves linear to lanceolate, sessile or the lowermost sometimes slightly petioled; achenes with a convex cartilagenous summit, normally curved in the compacted head, the surface glabrous or with a few retrorse hairs ..... 5. B. cernua.
  6. Stem smooth; leaves lanceolate to ovate, with winged petioles; achenes without a convex cartilagenous summit, straight, the surface with antrorse or retorse hairs or glabrous.
    7. Achenes 4-awned, the surface with antrorse hairs ..... 7. B. connata.
    7. Achenes 2- or 3-awned.
      8. Surface of achenes with antrorse hairs, the margins of achenes usually with at least a few antrorse barbs near the base..... 7. B. connata.
      8. Surface of achenes glabrous or with a few retorse hairs, the margins of achenes with retorse barbs throughout..... 6. B. comosa.

8. MEGALODONATA — water-marigold

1. M. Beckii

9. COREOPSIS — coreopsis, tickseed

1. Outer involucre bracts minute, 2 mm or less long; inner involucre bracts and base of the rays reddish-brown at anthesis; heads many; achenes wingless; pappus wanting; leaf segments filiform to linear ..... 1. C. tinctoria.
1. Outer involucre bracts more than 2 mm long; inner involucre bracts greenish at anthesis; heads solitary or several; achenes winged; pappus present.
  2. Leaves sessile, palmately 3- to 5-lobed (very rarely simple and linear-oblong); achenes narrowly winged, essentially glabrous..... 2. C. palmata.
  2. Basal leaves petioled, simple or pinnately parted, oblanceolate to spatulate; achenes broadly winged, dorsally papillate.
    3. Plants essentially leafy throughout; upper leaves pinnatifid (appearing whorled), the segments linear to narrowly lanceolate, the lowermost entire, spatulate to oblanceolate; peduncles normally less than 15 cm long..... 4. C. grandiflora.
    3. Leaves mostly on the lower half of the stem, simple or with 1 or 2 pairs of lateral lobes, long petioled, spatulate or oblanceolate (not appearing whorled above); peduncles normally (10-) 15-35 cm long ..... 3. C. lanceolata.

Tribe I. Heliantheae: 8

10. GALINSOGA — Peruvian daisy

1. G. quadriradiata (G. ciliata)

11. POLYMNIA — leafcup

1. P. canadensis

12. SILPHIUM — rosinweed

1. Leaves either alternate or nearly all basal, at least the lower leaves long-petioled.
  2. Stem leafy, hirsute; leaves deeply lacinate ..... 1. S. laciniatum.
  2. Stem essentially naked except for a few bracts, glabrous; leaves all basal, broadly cordate, dentate..... 2. S. terabinthinaceum.
1. Leaves opposite, either sessile or perfoliate.
  3. Leaves sessile, not perfoliate, slightly, if at all clasping, entire or slightly serrate; stem terete . .....3. S. integrifolium.
  3. Leaves, or their petiolar bases, strongly connate-perfoliate, grossly serrate; stem square.....4. S. perfoliatum.

13. PARTHENIUM

1. P. integrifolium — wild-quinine

14. IVA — marsh-elder

1. Plants annual; phyllaries free.
  2. Leaves ovate, coarsely serrate; heads subtended by prominent bracts; phyllaries 3-4.....1. I. annua.
  2. Leaves subcordate to ovate, usually coarsely lobed and toothed; heads ebracteate; phyllaries 5 . ..... 2. I. xanthifolia.
1. Plants perennial; phyllaries basally connate..... 3. I. axillaris.

15. AMBROSIA — ragweed

1. Leaves pinnately or bipinnately lobed or parted; staminate involucre lacking dorsal striations; upper cauline leaves usually alternate.
  2. Plants perennial with horizontal runner-like underground roots; involucre spines blunt or absent; leaves usually coarsely lobed..... 1. A. psilostachya.
  2. Plants annual with taproots; involucre spines usually sharply pointed; leaves usually delicately lobed and parted ..... 2. A. artemisiifolia.
1. Leaves palmately lobed or unlobed; staminate involucre marked with dorsal striations; usually all cauline leaves opposite; plants annual ..... 3. A. trifida.

16. XANTHIUM — cocklebur

- 1. Leaves pinnately lobed; stems bearing long, golden, three-rayed, axillary spines .....  
.....1. X. spinosum.
- 1. Leaves coarsely palmately lobed; stems unarmed.....2. X. strumarium.

17. MADIA — tarweed

- 1. M. glomerata

Tribe II. Helenieae: 1

Tribe II. HELENIEAE — sneezeweed tribe

(Source: Mickelson and Iltis 1966)

1. Leaves opposite; bracts united at base; pappus scales with numerous, long bristles; heads short-radiate; very rare adventive.....17a. DYSSODIA.
1. Leaves alternate; bracts free at base; pappus of long-awned scales; heads globose, conspicuously radiate, the rays yellow.....18. HELENIUM.

17a. DYSSODIA — fetid marigold

1. D. papposa.

18. HELENIUM — sneezeweed

1. Leaves lanceolate; stems winged by the decurrent leaf bases.
  2. Disk florets yellow, 5-lobed; ray florets pistillate; cauline leaves 1-3.5 cm wide; widespread throughout .....1. H. autumnale.
  2. Disk florets dark brown, 4-lobed; ray florets neuter; cauline leaves to 1 cm wide; very rare, in central Wisconsin ..... 2. H. flexuosum.
1. Leaves filiform, less than 2 mm wide; stems not winged; disk yellow; very rare introduced weed..... 3. H. amarum.

[25. ARNICA — arnica]

No species in Wisconsin.

Tribe III. Anthemideae: 1

Tribe III. ANTHEMIDEAE — chamomile tribe

(Source: Mickelson and Iltis 1966)

1. Receptacle chaffy, the heads radiate.
  2. Heads rather large, 1-4 cm wide, solitary and terminal on long peduncles; receptacle conic at maturity; achenes terete or angled..... 19. ANTHEMIS.
  2. Heads small, 5 mm or less, densely corymbose; receptacle flat; achenes compressed.....20. ACHILLEA.
1. Receptacle naked or villous, the heads radiate or discoid.
  3. Inflorescence corymbose or heads terminal on long peduncles; ray florets showy, yellow or white (sometimes obsolete).
    4. Receptacle flat or low-convex.
      5. Heads radiate (rarely discoid); pappus absent; achenes 5-10 ribbed ..... 21. CHRYSANTHEMUM.
      5. Heads discoid or short-radiate; pappus short-membranaceous; achenes 3-5 ribbed .....22. TANACETUM.
    4. Receptacle conic at maturity; leaves pinnatisect ..... 23. MATRICARIA.
  3. Inflorescence paniculate, racemose, or spike-like with inconspicuous (2-8 mm high), discoid heads; florets green..... 24. ARTEMISIA.

19. ANTHEMIS — chamomile, dog fennel

1. Ray florets white; receptacle conic; involucre 2.5-5 mm high; achenes tuberculate (10x); very common, especially southern Wisconsin .....1. A. Cotula.
1. Ray florets yellow; receptacle flat to shallowly convex; involucre 5-8 mm high; achenes smooth; rare adventive ..... 2. A. tinctoria.

20. ACHILLEA — yarrow

1. Leaves finely dissected into linear segments; plant tomentose; ubiquitous throughout ..... 1. A. Millefolium.
1. Leaves undissected, serrulate; plant glabrate to subglabrous; rare adventive..... 2. A. Ptarmica.

21. CHRYSANTHEMUM — chrysanthemum, ox-eye daisy

1. Heads with conspicuous white rays.
  2. Heads few, large, 4-6 cm in diam.; leaves toothed to lobed.
    3. Heads solitary on long, slender, naked peduncles; upper leaves strongly reduced or lacking; stems slender, 4-6 dm tall; abundant throughout.....1. C. Leucanthemum.
    3. Heads few to many at end of robust, leafy, 1-2 m tall stems; peduncles 5-10 mm long; rare escape.....2. C. uliginosum.
  2. Heads several to many, small, 1.2-2.2 cm in diam., corymbose; leaves pinnatisect; rare escape...  
.....3. C. Parthenium.
1. Heads discoid or with minute, white rays, ca 5 mm in diam.; leaves serrate; rare adventive .....  
.....4. C. Balsamita.

22. TANACETUM — tansy

1. Heads 25-100 or more in dense corymbs, 7-10 mm in diam., the ray florets without rays; leaves glabrate; plants in dense, many stemmed clumps; common introduced weed ..... 1. T. vulgare.
1. Heads 3-17 in loose corymbs, 1-2 cm in diam., with yellow, 2-4 mm long rays; leaves tomentose, stems solitary; rare on inner beaches of L. Michigan, Door Co .....2. T. huronense.

23. MATRICARIA — wild chamomile

1. Ray florets none; disk florets greenish, 4-lobed; heads short-stalked; achenes marked by elongate red-brown oil glands; very common throughout ..... 1. M. discoidea (matricarioides).
1. Ray florets white; disk florets yellow, 5-lobed; heads long-stalked.
  2. Receptacle conic at maturity; achenes ribbed, smooth, unmarked; involucre 2-3 mm high; rare, but see also Anthemis cotula .....2. M. Chamomilla.
  2. Receptacle hemispheric at maturity; achenes prominently ribbed, transversely rugulose or tuberculate with apical oil glands; involucre 3.5-6 mm high; rare on Lake Superior shores.....  
..... 3. M. maritima.

24. ARTEMISIA — wormwood

1. Receptacle hairy; leaves white-silky canescent; plants perennial and somewhat woody at base.
  2. Leaves short, 1-2 cm, the segments filiform, 0.5-1 mm wide; flowering stems ascending, to 5 dm tall, the vegetative stems forming mats; inflorescence a narrow panicle; very local on Mississippi River bluffs from Pierce Co. to Trempealeau Co., rarely weedy elsewhere.....  
..... 1. A. frigida.
  2. Leaves 5-15 cm long, the segments 2-3 mm wide; flowering stems erect, to 9 dm tall; inflorescence a leafy panicle; sporadic adventive.....2. A. Absinthium.

Tribe III. Anthemideae: 3

1. Receptacle naked; leaves tomentose to glabrous; plants annual, biennial, or perennial.
  3. Disk florets staminate, their ovaries aborting; adult plants usually glabrous.
    4. First year lower leaves forming a basal rosette; leaves tomentose-glabrate; involucre 2-3.5 mm high; taprooted biennial; common in sandy areas.....3. A. caudata.
    4. Lower leaves not in a rosette; involucre 2 mm high; robust glabrous herbs from a rootstock; very rare and sporadic.....4. A. dracunculoides.
  3. Disk florets producing achenes.
    5. Leaves glabrous-glabrate, 2-3 times pinnatisect or pinnatifid.
      6. Annual or biennial herbs; involucre 1-2 mm high; bracts glabrous.
        7. Inflorescence a dense racemose panicle with many spike-like branches from the leaf axils; heads erect; common weed ..... 5. A. biennis.
        7. Inflorescence a broad terminal panicle with nodding heads; rare annual weed..... ..... 6. A. annua.
      6. Perennial shrub; involucre 2-2.5 mm high; bracts canescent or tomentose; rarely escaped cultigen..... 7. A. Abrotanum.
    5. Leaves tomentose at least on one surface, simple or dissected.
      8. Leaves unlobed and linear-lanceolate, the margins regularly serrate to entire in the inflorescence, densely white-tomentose beneath, bright green-glabrous above; moist deep-soil prairies..... 8. A. serrata.
      8. Leaves deeply lobed or cut, or entire with the margins irregularly toothed.
        9. Leaves delicately divided, the segments filiform, gray-green pubescent; rarely escaped cultigen ..... 9. A. pontica.
        9. Leaf segments broader or leaves entire.
          10. Leaves green-glabrate above, white-tomentose beneath, coarsely lobed; rare weed, eastern Wisconsin .....10. A. vulgaris.
          10. Leaves pubescent on both surfaces.
            11. Involucre 2-4 mm high; leaves entire or irregularly toothed, densely white-tomentose beneath, tomentose to glabrate above; common prairie species..... .....11. A. ludoviciana.
            11. Involucre 5-8 mm high; leaves obtusely lobed, densely creamy white wooly; rarely escaped on L. Michigan or L. Superior ..... 12. A. Stelleriana.

Tribe IV. Senecioneae: 1

Tribe IV. SENECTIONEAE — groundsel tribe

(Source: Kowal 1984; references: Fernald 1950; Cronquist 1980; Gleason & Cronquist 1991)

1. Perennials with green leaves borne only by the underground rhizome; aerial stems represented only by scaly bracted flowering scapes arising before or as the leaves develop.
  2. Heads solitary, yellow, monoecious; radical leaves rounded-cordate, dentate and very shallowly lobed .....29. TUSSILAGO.
  2. Heads numerous, creamy-white, more-or-less dioecious; radical leaves either merely dentate or deeply lobed.....30. PETASITES.
1. Habit various but with well developed cauline leaves (though these may differ from the basal leaves).
  3. Corollas yellow to orange; heads usually with rays..... 26. SENECIO.
  3. Corollas whitish or creamy; heads without rays.
    4. Annuals; heads disciform, with 2 to several marginal rows of pistillate florets with filiform corollas ..... 27. ERECHTITES.
    4. Perennials; heads discoid, containing only bisexual florets with 5-lobed corollas .....28. CACALIA.

26. SENECIO — groundsel, ragwort

(Source: Barkley 1963; edited by R. R. Kowal, 1997 September 7)

1. Leaves more or less equal in size up the stem; annuals (perhaps rarely biennials).
  2. Rays conspicuous; leaves entire to weakly toothed; pubescence often copious. Rare native, N Wisconsin.....1. S. congestus.
  2. Rays inconspicuous or absent; leaves, or some of them, lobed to pinnatifid; pubescence short and often scant, crisp. Introduced weeds.
    3. Rays absent; calyculate bracts well developed with distinct black tips..... 2. S. vulgaris.
    3. Rays present, small; calyculate bracts usually without distinct black tips.....3. S. sylvaticus.
1. Cauline leaves progressively reduced upward and lobed (unlike the basal leaves); perennials (rarely monocarpic), usually with obvious asexual reproduction (Packera).

Tribe IV. Senecioneae: 2

4. Basal leaves cordate or abruptly contracted to the petiole.
  5. Rays prominent, much longer than 5 mm.
    6. Basal leaves prominently cordate; asexual reproduction by horizontal rhizomes (sometimes with adventitious shoots on roots as well). Shady, wet areas throughout, common.....4. S. aureus.
    6. Basal leaves subcordate to abruptly contracted; asexual reproduction only by adventitious shoots on roots, producing a simple, short, erect rootstock. Sunny, wet areas (e.g., wet prairies) in s WI, infrequent.....  
..... 5. S. pseudoreus var. semicordatus (P. semicordata).
  5. Rays inconspicuous, shorter than 5 mm, or absent, basal leaf blades usually abruptly contracted to the petiole. Apostle Islands, Lake Superior, rare .....8. S. indecorus.
4. Basal leaves tapering to the petiole, sometimes rounded or subtruncate.
  7. Pubescence normally persistent, at least along the upper stem, among the heads in the inflorescence, and in and near the axils of the basal leaves; asexual reproduction only by adventitious shoots on roots, producing a simple, short, erect rootstock; cauline leaves usually fewer, less quickly reduced from base to inflorescence, uppermost leaves usually pinnatifid to the leaf tip. Infrequent in dry areas in w WI (e.g., bluff prairies).....  
..... 6. S. plattensis.
  7. Glabrous or nearly so at maturity; asexual reproduction either by horizontal rhizomes and/or by adventitious shoots on roots; cauline leaves usually more numerous, more quickly reduced up the stem, uppermost leaves often unlobed at leaf tip. Common and widespread ..... 7. S. pauperculus complex.

27. ERECHTITES — fireweed

1. E. hieraciifolia.

28. CACALIA — Indian-plantain

1. Heads with ca 13 phyllaries and 20-40 florets; receptacle flat; larger leaves hastate; stems more-or-less uniformly leafy up the stem (Hasteola) ..... 1. C. suaveolens.
1. Heads with ca 5 phyllaries and ca 5 florets; receptacle with a short conic projection in the center; leaves not hastate; stems with leaves largest at base and becoming smaller up the stem (Arnoglossum).
  2. Lower leaves lance-ovate or oval, entire or shallowly crenate or dentate, with arcuate venation ..... 4. C. plantaginea.
  2. Lower leaves reniform, roundish or deltoid, lobed or coarsely angulate-dentate, with palmate venation.
    3. Leaves not glaucous; stem angled or sulcate, not glaucous..... 2. C. Muhlenbergii.
    3. Leaves glaucous beneath; stem terete or slightly striate, glaucous..... 3. C. atriplicifolia.

29. TUSSILAGO — coltsfoot

1. T. Farfara.

30. PETASITES — sweet coltsfoot

1. Leaves lobed more than two-thirds to base, reniform or suborbicular, essentially glabrous above ..... 1. P. palmatus.
1. Leaves unlobed with margin dentate, deltoid-oblong to reniform-hastate, floccose above ..... 2. P. sagittatus.

Tribe V. ASTEREAE — aster tribe

(Source: Kowal 1984;  
references: Fernald 1950, Gleason & Cronquist 1963, Cronquist 1980)

1. Ray corollas yellow, conspicuous; disk corollas yellow.
  2. Pappus of 2-8 caducous awns; involucre more or less glutinous.....33. GRINDELIA.
  2. Pappus of numerous capillary bristles or hairs; involucre not glutinous.
    3. Pappus simple; heads small with disks no wider than 5 mm and with rays no longer than 4 mm.
      4. Inflorescence corymbiform; leaves glandular punctate, linear to narrowly oblong, only slightly reduced upwards on stem; ray florets more numerous than the disk florets ..... 31 b. EUTHAMIA (see Solidago key).
      4. Plants not with both inflorescence corymbiform and ray florets more numerous than the disk florets; leaves usually broader, not glandular punctate ..... 31 a. SOLIDAGO.
    3. Pappus double with long capillary bristles surrounded by short, somewhat chaffy bristles; heads wider and rays longer ..... 32. HETEROTHECA (CHRYSOPSIS).
1. Ray corollas white, pink, violet, bluish or purple; disk corollas various.
  5. Pappus inconspicuous, of 2-4 awns up to 2 mm long and several minute bristles; receptacle low-conical or hemispherical..... 37. BOLTONIA.
  5. Pappus of long capillary bristles or hairs; receptacles flat.
    6. Rays minute, shorter than the corolla tube and barely longer than the pappus; heads small with involucre no more than 4 mm long, disks no more than 4 mm wide, and disk florets numbering no more than 21..... 36. CONYZA.
    6. Rays conspicuous, larger; heads larger.
      7. Phyllaries approximately in one series, neither chartaceous at base nor with herbaceous green tip; style appendages roundish or obtuse, no longer than 0.3 mm; plants blooming chiefly in spring and early summer .....34. ERIGERON.
      7. Phyllaries clearly imbricated or with a foliaceous outer series; style appendages longer and more acute; plants blooming in late summer or fall ..... 35. ASTER.

31 a. SOLIDAGO — goldenrod

(Source: Salamun 1963; references: Fernald 1950; Cronquist in Gleason 1952)

1. Heads in clusters or short racemes in the axils of upper leaves or on elongate branches forming racemose, thyrsoïd or spreading panicles.
2. Inflorescence a series of clusters or short racemes in the axils of upper cauline leaves or, if a terminal panicle or thyrse, with erect summit, the heads spirally arranged on the branches, thus not secund.
  3. Inflorescence a series of axillary clusters or short racemes, all but the uppermost of which are exceeded by their subtending leaves.
    4. Cauline leaves lanceolate, acuminate, tapering to a sessile or obscurely short-petiolate base; stem glabrous, glaucous, terete; rare, in southeastern-most Wisconsin .....1. S. caesia.
    4. Cauline leaves ovate to elliptic, abruptly acuminate at the tip, abruptly narrowed to a short winged petiole; stem glabrous or slightly pubescent above, somewhat angled; widespread.....2. S. flexicaulis.
  3. Inflorescence a terminal panicle or thyrse, or if of axillary clusters or racemes only the lowermost exceeded by the subtending leaves.
    5. Lower cauline leaves, including petioles, seldom more than 7 times as long as wide, if longer, then without sheathing petioles; plants chiefly of upland areas.
    6. Involucres mostly 3-5 mm (sometimes 6 mm) high; pedicels mostly less than 5 mm long.
      7. Stems pubescent from base through inflorescence; leaves pubescent above and below .....3. S. hispida.
      7. Stems glabrous except for occasional sparse puberulence in the inflorescence and uppermost stem; leaves glabrous except for hispidulous margins and sometimes sparse pubescence beneath.
        8. Achenes short-hairy; basal and lower cauline leaves broadly spatulate to obovate; mostly on cliffs, in the Driftless Area of southwestern Wisconsin .  
..... 4. S. sciaphila.
        8. Achenes glabrous; basal and lower cauline leaves ovate to oblong-lanceolate; widespread..... 5. S. speciosa.
    6. Involucres mostly 5-9 mm high; many pedicels 5-15 mm long; very local, Door County ..... 6. S. spathulata.
    5. Lower cauline leaves, including petioles, mostly 7-15 times as long as wide, petioles with sheathing bases; plants of marshes and bogs .....7. S. uliginosa.
  2. Inflorescence a terminal panicle with nodding summit and with at least the lower branches more or less recurved; heads secund (one sided), viz., borne on the upper side of the branches.

9. Leaves triple-nerved, i.e., the two obvious lateral nerves prolonged parallel with the midrib.
10. Stems more or less pubescent or scabrous, at least in the upper portion below the inflorescence.
  11. Cauline leaves obovate, oblanceolate to linear, entire or sparingly serrate, obscurely 3-nerved; basal leaves present at flowering time; very widespread ..... 8. S. nemoralis.
  11. Cauline leaves mostly lanceolate to ovate, evidently 3-nerved; basal leaves wanting or deciduous at flowering time.
    12. Cauline leaves canescent on both surfaces, mostly ovate to elliptic, acute to roundish at the tips; very rare, adventive .....9. S. mollis.
    12. Cauline leaves glabrous to puberulent beneath, glabrous or scabrous above, mostly narrowly lance-elliptic, acuminate at the tips; widespread species.
      13. Involucres 2-3 mm high .....10. S. canadensis.
      13. Involucres 3-6 mm high.
        14. Leaves glabrous or scabrous above, pubescent on the veins beneath; stem pilose chiefly above the middle .....10. S. canadensis.
        14. Leaves scabrous above, densely pubescent beneath; stem grayish with close puberulence throughout, except sometimes near the base..... 11. S. altissima.
  10. Stems glabrous below the inflorescence.
    15. Basal and lower cauline leaves the largest, persistent at flowering time; cauline leaves progressively reduced upwards.
      16. Basal and lower cauline leaves mostly 2-7.5 cm wide, scarcely 3-nerved, glabrous except for ciliate margins, sometimes sparingly hirsute on one or both surfaces; achenes short-hairy; throughout Wisconsin..... 12. S. juncea.
      16. Basal and lower cauline leaves mostly 0.5-2 cm wide, more or less strongly 3-nerved, glabrous except for ciliate margins; achenes glabrous or sparsely hairy; prairies south of Tension Zone .....13. S. missouriensis.
    15. Basal and lower cauline leaves mostly smaller than the middle ones, deciduous and lacking at flowering time; cauline leaves reduced only slightly upwards.
      17. Branchlets of panicle and pedicels glabrous; prairies south of Tension Zone..... 13. S. missouriensis.
      17. Branchlets of panicle and pedicels more or less pilose; throughout Wisconsin ... 14. S. gigantea.
9. Leaves pinnately veined, the lateral veins not conspicuously prolonged parallel with the midrib.

- 18. Stems glabrous or only slightly pubescent in the upper portion below the inflorescence.
  - 19. Upper surface of leaves strongly scabrous; upper portions of stems strongly angled .....15. S. patula.
  - 19. Upper surface of leaves only slightly pubescent or glabrous; stems terete.
    - 20. Basal and lower cauline leaves with long-tapering bases, glabrous or sometimes short hirsute on both surfaces; inflorescence more or less compact.
      - 21. Plant with stout branched caudex and fibrous roots; basal and lower cauline leaves mostly 2-7.5 cm wide; achenes short-hairy; throughout Wisconsin ..... 12. S. juncea.
      - 21. Plant with creeping rhizome; basal and lower cauline leaves mostly 0.5-2 cm wide; achenes glabrous or sparsely-hairy; prairies south of Tension Zone .....13. S. missouriensis.
    - 20. Basal and lower cauline leaves elliptic or elliptic-ovate and abruptly tapering to the petiole, loosely hirsute on midrib and main veins beneath; inflorescence an open panicle with a few long, slender and strongly divergent or arched ascending branches .....16. S. ulmifolia.
  - 18. Stems pubescent or scabrous their entire length; very widespread ..... 8. S. nemoralis.
- 1. Heads in flat corymbiform inflorescences.
  - 22. Basal and lower cauline leaves with either petioles or sheathing bases, middle and upper cauline ones progressively reduced and less petiolate or sessile; involucre bracts obtuse or broadly rounded, more or less longitudinally striate.
    - 23. Cauline leaves elliptic, broadly lanceolate to broadly ovate, densely pubescent above and below; stems densely pubescent; plants of mesic-dry habitats, common, mostly south of the Tension Zone..... 17. S. rigida.
    - 23. Cauline leaves narrowly elliptic to linear-lanceolate, glabrous except for scabrous margins; stems glabrous or slightly puberulent below the inflorescence; plants of marshes, swamps, wet prairies and moist calcareous meadows.
      - 24. Basal and lower cauline leaves narrowly elliptic, flat, obtuse or rounded at the tip, often serrate above the middle, not triple-nerved; southeastern Wisconsin and Door County .....18. S. ohioensis.
      - 24. Basal and lower cauline leaves linear-lanceolate, often longitudinally folded, acute, entire, tending to be triple-nerved; southeastern Wisconsin.....19. S. Riddellii.
  - 22. Leaves uniform, only slightly reduced upwards, linear to narrowly lanceolate or narrowly oblong, tapering abruptly to a short base or sessile, the basal ones soon deciduous; involucre bracts acute, not striate. [EUTHAMIA]

25. Leaves 1-nerved or sometimes faintly 3-nerved, but without any additional nerves, 2-5 mm (rarely 6 mm) wide and 4-9 cm long, with conspicuous, dark and viscid punctation; heads slenderly cylindric (becoming slenderly turbinate on pressing), tending to be evidently pedicellate; involucre 4.5-6.5 mm high; not common; south of the Tension Zone.....  
.....20. E. gymnospermoides.
25. Leaves evidently 3-nerved, the larger ones ordinarily with 1 or 2 additional pairs of fainter lateral nerves, 2-12 mm wide and 4-13 cm long, with less conspicuous punctation; heads slenderly campanulate to turbinate, chiefly sessile or subsessile in small glomerules; throughout Wisconsin ..... 21. E. graminifolia.

31 b. EUTHAMIA — flat-topped goldenrod

(Species 20 and 21 in Solidago key)

32. HETEROTHECA (CHRYSOPSIS) — golden aster

1. H. villosa.

33. GRINDELIA — gumweed

1. Involucre heavily glutinous; phyllaries strongly recurving at tip; leaf margin (when not entire) crenate to serrate..... 1. G. squarrosa.
1. Involucre barely glutinous; phyllaries loosely spreading; leaf margin (when not entire) sharply serrulate with bristle-tipped teeth..... 2. G. lanceolata.

34. ERIGERON — fleabane

(References: as for Asteraceae plus Morley 1969)

1. Disk corollas 3.5 mm long or more; rays 1 mm wide or more; inflorescence of 1-9 heads; perennials with either a ligneous caudex or flagelliform stolons.
2. Pappus double, with short bristles outside the long ones; rays 125-175; leaves coriaceous, mostly entire; stolons absent.....1. E. glabellus var. pubescens.
2. Pappus simple; rays 50-80 (-100); leaves softer, mostly toothed; stolons present.....  
.....2. E. pulchellus.
1. Disk corollas less than 3.5 mm long; rays 1 mm wide or less; inflorescence usually with more than 9 heads; annuals to short-lived perennials, lacking both a ligneous caudex and stolons.
3. Disk corollas 2.5 mm long or more; pappus simple, of long capillary bristles in both disk and ray florets; rays 150-400, commonly pink; short-lived perennials .....3. E. philadelphicus.
3. Disk corollas 2.5 mm long or less; pappus of disk florets double, with short, slender outer scales surrounding long capillary bristles, but pappus of ray florets lacking the long bristles; rays 50-100; commonly white; annuals or rarely biennials.

- 4. Pubescence of stem (half-way up the plant) sparsely spreading-hispid; leaves membranous, coarsely toothed; plants robust, mostly 6-15 dm tall.....4. E. annuus.
- 4. Pubescence of stem (half-way up the plant) minutely cinereous-strigose; leaves firm, entire or nearly so; plants more slender, mostly 3-7 (-9) dm tall..... 5. E. strigosus.

35. ASTER — aster

(Source: Shinnars, 1941; nomenclature up-dated by Kowal using Wetter, 1991)

- 1. Middle and lower stem leaves distinctly petioled; most of the petioles more than 1 cm long, wingless, or winged but less than 1/4 as wide as the blades; blades (except the uppermost) more than 12 mm wide, abruptly narrowed or truncate or cordate at base.
- 2. Outer phyllaries (involucral bracts) 1.0-2.5 mm wide, less than 2 1/2 times as long as wide.
  - 3. Peduncles and involucre without glands; rays white (rarely rosy or rosy-lilac) when fresh, drying white, brown, or rosy lilac; leaves lanceolate or ovate-lanceolate, the upper petioled ones with blades twice or more as long as wide; stems evenly and rather densely leafy, with 6-14 stem leaves below the inflorescence; upper leaves little reduced, the blade of the lowest stem leaf one to two times as long as the blade of the first leaf below the inflorescence; clones without abundant tufts of root leaves .....1. A. furcatus.
  - 3. Peduncles and involucre with or without glands; rays lilac or violet blue (rarely white) when fresh, retaining their color or turning brown in drying; leaves ovate-lanceolate to ovate, the upper petioled ones with blades usually less than twice as long as wide, sometimes longer; stems rather sparingly leafy, with 3-8 leaves below the inflorescence; upper leaves usually abruptly and conspicuously reduced, the blade of the lowest stem leaf 1.5-7.0 times as long as the blade of the first leaf below the inflorescence; clones usually with abundant tufts of root leaves .....2. A. macrophyllus.
- 2. Outer phyllaries 0.2-1.0 mm wide, more than 2 1/2 times as long as wide.
  - 4. Middle phyllaries with slender green tips 1/3 - 2/3 their length, not diamond-shaped, the central green line gradually expanded from below or slightly above the middle, the broad apical portion more than 4 times as long as wide; phyllaries rather loose, acute or acuminate, gradually tapered in the apical 1/3 or more.
    - 5. Heads loosely corymbose-paniculate, on peduncles of very uneven lengths, or solitary and terminal on branches of the inflorescence; disks 4.5-7.5 mm across; innermost phyllaries 5-8 mm long ..... 3. A. ciliolatus ("A. Lindleyanus").
    - 5. Heads racemose-paniculate, on peduncles of uniform lengths, or on peduncles grading in size from base to tip of main branches of the inflorescence; disks 3-5 mm across; innermost phyllaries 3-6 mm long.
  - 6. Peduncles 0.2-7.0 mm long, the majority of those on each plant 2-4 mm long; branches of the inflorescence loosely to closely ascending or nearly erect.
    - 7. Stems glabrous or pubescent in lines .....4a. A. urophyllus ("A. sagittifolius f. hirtellus").
    - 7. Stems densely pubescent over the surface, at least in the upper part ..... 4b. A. Drummondii ("A. sagittifolius var. Drummondii").

Tribe V. Astereae: 7

6. Peduncles 3-10 mm long, the majority of those on each plant usually more than 4 mm long; branches of the inflorescence loosely ascending, widely spreading, or horizontal.
  8. Phyllaries pubescent on the back..... 5a. A. cordifolius? ("A. Finkii").
  8. Phyllaries glabrous on the back.....  
.....5b. A. cordifolius? ("A. Finkii var. moratus").
4. Middle phyllaries with prominent more or less diamond-shaped green tips 1/5 - 1/3 their length, the central green line rather abruptly expanded above the middle, the broad apical portion not more than 4 times as long as wide; phyllaries more or less closely appressed, acute, abruptly tapered in the apical 1/4.
  9. Involucres 3.5-5.0 mm high; disks 3-5 mm across; rays 3-6 mm long.....  
.....6. A. cordifolius.
  9. Involucres 5-8 mm high; disks 5-8 mm across; rays 6-10 mm long.
    10. Phyllaries pubescent on the back..... 7. A. Shortii.
    10. Phyllaries glabrous on the back.
      11. Main branches of the inflorescence with linear-subulate bracts not clasping at base; leaves normally very rough on both surfaces .....  
.....8. A. oolentangiensis ("A. azureus").
      11. Main branches of the inflorescence with reduced leaves or bracts broadest at base and clasping; leaves normally smooth on both surfaces .....9. A. laevis.
1. Middle and lower stem leaves sessile, or subsessile on petioles less than 0.5 cm long, or apparently on broad-winged petioles more than 1/4 as wide as the blades, or with long narrow tapering petiole-like bases, but the blades not more than 12 mm wide.
  12. Phyllaries (involucral bracts) glabrous on the back (ciliate or glabrous on the margins).
    13. Rays much reduced, apparently wanting; plants annual, with taproots.....  
.....28. Brachyactis ciliata ssp. angusta ("A. angustus").
    13. Rays present, conspicuous; plants perennial, with creeping rootstocks, or growing in clumps.
      14. Middle phyllaries with colored tips, keeled, but not with a central green or colored line extending to the base..... 26. A. linariifolius.
      14. Middle phyllaries with a central green or colored line extending to the base.
        15. Leaves not with auriculate bases, slightly or not at all clasping.
          16. Middle phyllaries 0.8-1.2 mm wide, less than 4 times as long as wide.
            17. Phyllaries broadly acute or blunt, the outermost usually less than 1/3 as long as the innermost..... 27. Solidago ptarmicoides ("A. ptarmicoides").
            17. Phyllaries slenderly and sharply pointed, the outermost usually more than 1/3 as long as the innermost.

Tribe V. Astereae: 8

18. Stem pubescent over the surface.....19a. A. pilosus.
18. Stem glabrous or pubescent in lines.....19b. A. pilosus var. Pringlei.
16. Middle phyllaries 0.2-1.0 mm wide, more than 4 times as long as wide.
19. Stem leaves pubescent or scabrous beneath, at least on the midrib.
20. Leaves about the same width throughout, bluntly pointed, 0.1-0.5 cm wide, 1.7 cm long; phyllaries oblong, oblanceolate, or spatulate, rounded and abruptly apiculate at the apex, with oval green tips (A. fulcatus var. commutatus and A. ericoides).....40.
20. Leaves tapering to both ends, sharply pointed, 0.3-5.0 cm wide, 5-15 cm long; phyllaries linear or lanceolate, blunt or acute, but not apiculate, without prominent tips, or with elongate green tips.
21. Phyllaries with a thick central line very slightly or not at all expanded above the middle, without prominent green or colored tips (A. umbellatus) .....44.
21. Phyllaries with a thin central line much expanded above the middle, forming a prominent green or colored tip.
22. Outermost phyllaries not more than 3/4 as long as the innermost; heads 3-8 mm high; disks 3-8 mm across.
23. Rays 6.5-10 mm long; innermost phyllaries 5-7 mm long, middle and outer phyllaries 0.8 mm or more wide; involucre urn-shaped, slightly constricted near the middle. ....19. A. pilosus.
23. Rays 4-6.5 mm long; innermost phyllaries 3-5 mm long; middle and outer phyllaries less than 0.8 mm wide; involucre top-shaped, not constricted.
24. Leaves pubescent only on the midrib beneath .....  
.....10. A. lateriflorus var. pendulus.
24. Leaves pubescent over the surface beneath.....  
..... 11. A. ontarionis ("A. pantotrichus").
22. Outermost phyllaries equalling or exceeding the innermost; heads 7-12 mm high; disks 8-12 mm across .....  
..... (some forms of 14 x 17 A. lanceolatus  
..... ("A. paniculatus") X A. puniceus.
19. Stem leaves glabrous beneath.
25. Outermost phyllaries more than 2/3 as long as the innermost; the tips flat, the green portions not sharply marked.....  
..... 15. A. hesperius ("A. coerulescens" = A. praealtus?).

25. Outermost phyllaries not more than 2/3 as long as the innermost (sometimes longer in A. pilosus var. Pringlei, which has phyllaries with distinct green tips and margins inrolled at the apex).
26. Peduncles with numerous close-set bracts 2-6 mm long, the top bracts frequently grading into the phyllaries, the first bract below the involucre usually shorter than the height of the involucre.
27. Pappus tawny or rusty; leaves and bracts in the inflorescence broadest at base and clasping.....9. A. laevis.
27. Pappus white or gray; leaves and bracts in the inflorescence about the same width throughout, or widest near the middle, or slightly wider at the base than above, but little or not at all clasping.
28. Middle phyllaries 0.8-1.2 mm wide, the margins becoming inrolled at the apex, forming slender subulate tips; involucre urn-shaped, slightly constricted near the middle. ....19b. A. pilosus var. Pringlei.
28. Middle phyllaries less than 0.8 mm wide, flat or concave at the apex, the margins not becoming inrolled and not forming subulate tips; involucre top-shaped, not constricted.
29. Leaves more than 12 times as long as wide .....  
.....12. A. dumosus var. strictior.
29. Leaves less than 12 times as long as wide.....  
.....[some forms of 10 x 14. A. lateriflorus  
.....var. pendulus X A. lanceolatus  
.....("A. paniculatus").
26. Peduncles with few slender leafy bracts 5-20 mm long, the first bract below the involucre usually equalling or exceeding the height of the involucre.
30. Rootstock slender, thread-like, 0.5-2.0 mm thick, without branch shoots; stems normally solitary; stem leaves not with axillary sterile shoots or tufts of leaves; disks 7-12 mm across; innermost phyllaries 5.5-8.0 mm long.....  
..... 13. A. borealis ("A. junciformis").
30. Rootstock stout, 2-6 mm thick, usually with young branch shoots; stems usually numerous from an extensive system of creeping rootstocks; stem leaves commonly with axillary sterile shoots or tufts of leaves; disks 4-7 mm across; innermost phyllaries 3.0-5.5 mm long.
31. Leaves 12 times or more as long as wide .....  
.....14a. A. lanceolatus ("A. paniculatus").
31. Leaves less than 12 times as long as wide.....  
.....14b. A. lanceolatus  
.....("A. paniculatus var. simplex").

- 15. Leaves with auriculate clasping bases encircling the stem half way or more.
  - X. Outermost phyllaries not more than half as long as the innermost; phyllaries with diamond-shaped green tips.....9. A. laevis.
  - XX. Outermost phyllaries more than half as long as the innermost; phyllaries with elongate green tips, or the outer wholly green.
    - 32. Leaves abruptly contracted below the middle, entire or subentire and with straight margins in the basal portion, sharply serrate and with strongly curving margins in the terminal portion; pappus dingy yellow, ochre, or brown ..... 18. A. prenanthoides
    - 32. Leaves tapering from near the middle to both ends, or nearly the same width throughout, entire or serrate; pappus white, yellowish, or gray.
      - 33. Middle and upper internodes 0.5-1.6 cm long, glabrous or hispid-pubescent in lines..... 16. A. puniceus ("A. lucidulus").
      - 33. Middle and upper internodes 1-2.5 or sometimes 6 cm long, hispid-pubescent over the surface (very rarely glabrous) ..... 17. A. puniceus
- 12. Phyllaries pubescent or glandular or both on the back.
  - 34. Phyllaries with prominent green or colored tips, straw-colored or whitish near the base, with or without a central green or colored line extending to the base.
    - 35. Leaves silvery-silky on both surfaces..... 24. A. sericeus.
    - 35. Leaves not silvery-silky.
      - 36. Phyllaries and peduncles with sessile or stalked glands, with or without coarse hairs in addition.
        - 42. Leaves with auriculate clasping bases more than half encircling the stem.....  
.....22. A. novae-angliae.
        - 42. Leaves not with auriculate bases, slightly or not at all clasping.
          - 43. Middle and upper stem leaves less than 7 times as long as wide, most of them 1.5-4.0 cm long ..... 23a. A. oblongifolius.
          - 43. Middle and upper stem leaves 7 times or more as long as wide, most of them 3.5-6.0 cm long..... 23b. A. oblongifolius var. angustatus.
  - 36. Phyllaries and peduncles with fine or coarse hairs, not glandular.
    - 37. Stem leaves tapering to both ends, 0.3-5.0 cm wide, 5-15 cm long.
      - 38. Leaves less than 10 times as long as wide.....  
..... 11. A. ontarionis ("A. pantotrichus").
      - 38. Leaves more than 10 times as long as wide .....  
..... 27. Solidago ptarmicoides ("A. ptarmicoides").

37. Stem leaves about the same width throughout, 0.1-0.5 cm wide, 1-7 cm long.
39. Phyllaries with green tips 2.3-3.0 mm long; disks 2.5-5.0 mm across; rays 3.5-6.0 mm long.
40. Outermost phyllaries more than 2/3 as long as the innermost .....  
 .....20. A. falcatus var. commutatus ("A. commutatus").
40. Outermost phyllaries not more than 2/3 as long as the innermost.
41. Stems with appressed or closely ascending hairs .....  
 ..... 21a. A. ericoides.
41. Stems with widely spreading or slightly deflexed hairs .....  
 .....21b. A. ericoides var. prostratus.
39. Phyllaries with green tips 3.5-4.0 mm long; disks 5-8 mm across; rays 6-8 mm long .....21 X 22. A. ericoides X A. novae-angliae.
34. Phyllaries not with prominent green or colored tips, with a thick central line extending to the base, slightly or not at all expanded above the middle.
44. Leaves glabrous beneath, or pubescent on the midrib and main veins, or sparingly pubescent over the surface, but then much more densely pubescent on the main veins .....25a. A. umbellatus.
44. Leaves densely and evenly pubescent over the lower surface.....  
 .....25b. A. umbellatus var. pubens.

36. CONYZA

1. Plant usually unbranched below the inflorescence, with a well-defined central axis; stem spreading-hirsute; often taller than 3 dm..... 1. C. canadensis.
1. Plant diffusely branched from near the base, without a central axis; stem cinereous-strigose; mostly 1-3 dm tall ..... 2. C. ramosissima.

37. BOLTONIA

1. B. asteroides sensu lato (including B. latisquama and B. latisquama var. recognita).

Tribe VI. Inuleae: 1

Tribe VI. INULEAE — elecampane tribe  
[Including GNAPHALIEAE — the pussy's-toes tribe]

(Source: Beals and Peters 1966)

1. Plants slender 1-5(-10) dm tall; heads 1 cm or less in diam., white or stramineous.
  2. Cauline leaves few, strongly ascending, much smaller than those of the persistent basal rosette; stolons creeping or ascending; all plants dioecious.....38. ANTENNARIA.
  2. Cauline leaves many, the same size as the basal leaves which soon wither; stolons absent.
    3. Phyllaries pure white, with conspicuous, longitudinal creases creating the appearance of wrinkled tissue paper; plants dioecious, the fertile head often with a few perfect but sterile florets in center; dry plants without a strong odor..... 39. ANAPHALIS.
    3. Phyllaries grayish white, yellow, or brown, scarios, with very small longitudinal ridges but no conspicuous creases; heads perfect; dry plants with strong tobacco-like odor.....  
.....40. GNAPHALIUM.
1. Plants very large and robust, 1-2 m tall; heads very showy, the disk 3-5 cm in diam., yellow. Infrequently adventive with large woolly leaves..... 41. INULA.

38. ANTENNARIA — pussy's-toes, everlasting, ladies'-tobacco

1. Rosette leaves with 1-3 prominent veins, the lateral veins if present rarely prominent beyond broadest part of leaf.
  2. Stolons prostrate, lash-like.
    3. Cauline leaves with scarios appendages ..... 1. A. neglecta.
    3. Cauline leaves without scarios appendages .....2. A. petaloidea.
  2. Stolons short, ascending stiff.
    4. Upper cauline leaves with scarios appendages; leaves glabrous above .....  
.....3. A. canadensis.
    4. Cauline leaves without scarios appendages; leaves glabrous to pubescent above .....  
..... 4. A. neodioica.
1. Rosette leaves with 3-7 prominent veins, the two main lateral veins converging toward and nearly reaching the tip.
  5. Stolons prostrate, lash-like..... 5. A. munda.
  5. Stolons short, ascending, stiff.
    6. Involucre 4-7 mm high, pistillate corolla 4-6 mm long; staminate corolla 3-4 1/2 mm long; nodes on flowering stem 3-5 ..... 6. A. plantaginifolia.
    6. Involucre 6-8 mm high, pistillate corolla 5-8 mm long; staminate corolla 4-5 1/2 mm long; nodes on flowering stem 5-12.

- 7. Rosette leaves tomentose above.....7. A. fallax.
- 7. Rosette leaves glabrous above; stem often purple-glandular ..... 8. A. Parlinii.

38. ANTENNARIA [Alternate Key]

(Source: Bayer and Stebbins, 1982. Edited by R. R. Kowal to include only Wisconsin species. "s" = "sporophytic chromosome number" with x = 14.)

- 1. Basal leaves with 3-7 prominent nerves.
  - 2. Pistillate involucre 5-7 mm long; pistillate corollas 3-4 mm long; staminate corollas 2-3.5 mm long; basal leaves tomentose adaxially; young stolons mostly ascending; staminate and pistillate plants equally common; plants of Appalachians, Piedmont, the Atlantic seaboard, and the driftless area of Wisconsin and Minnesota (s = 2x) ..... A. plantaginifolia.
  - 2. Pistillate involucre 7-10 mm long; pistillate corollas 4-7 mm long; staminate corollas 3.5-5 mm long; basal leaves tomentose or glabrous adaxially; young stolons mostly lying flat with only the tips ascending [decumbent]; sexual and apomictic populations present; plants widespread throughout the eastern United States (s = 4x, 5x, 6x, 8x).
    - 3. Basal leaves glabrous adaxially or nearly so; summit of young cauline stem usually glandular ..... A. Parlinii subsp. Parlinii.
    - 3. Basal leaves tomentose adaxially; summit of young cauline stem usually glandless.....  
..... A. Parlinii subsp. fallax.
- 1. Basal leaves with 1 prominent nerve.
  - 4. Stolons 8-12 cm long, lying flat [procumbent], leaves along the stolon smaller than those of the basal rosette; basal leaves gradually tapering to the base, non-petiolate.
    - 5. Young leaves glabrous above, bright green; pistillate plants common, staminate rare or absent; widespread above terminal glacial margin (s = 4x, 6x) .....  
..... A. neodioica subsp. canadensis.
    - 5. Young leaves tomentose adaxially, gray-green; staminate plants equal in number to pistillate or completely absent.
      - 6. Upper cauline leaves tipped by a flat or curled scarious, flag-like tip; involucral bracts brown at base; pistillate and staminate plants equally common (s = 2x).....  
..... A. neglecta.
      - 6. Upper cauline leaves subulate or only those about the corymb scarious-tipped; involucral bracts white or green at base; pistillate plants only, staminate absent (s = 4x, 6x)..... A. neodioica subsp. petaloidea.
  - 4. Stolons 5-8 cm long, lying flat but with tips ascending [decumbent], leaves along the stolon about equal in size to those of the basal rosette; basal leaves having a distinct petiole or nearly so; plants widespread north of glacial margin in the eastern United States; pistillate plants common, staminate rare or absent (s = 4x, 6x).....A. neodioica subsp. neodioica.

39. ANAPHALIS — everlasting

1. A. margaritacea — pearly everlasting.

40. GNAPHALIUM — cudweed, everlasting

(Source: Ralph F. Peters in Beals and Peters 1966)

1. Heads 2-3 mm high, in capitate leafy-bracted clusters; upper stems very densely white-floccose-tomentose, obvious to the naked eye; stems usually much branched, 1-2 dm tall..... 1. G. uliginosum.
1. Heads 4-6 mm high, capitate or corymbose; upper stems with appressed, or nearly microscopic loose-spreading tomentum; stems erect, seldom branching except within a corymbose inflorescence, 1-10 dm tall.
  2. Leaf bases decurrent; middle or lower stem with glandular-hirsute pubescence 0.2-0.5 (-1) mm long; leaves usually 10-15 times as long as wide, tapering gradually to an acute tip; achenes distinctly papillate under high magnification.....2. G. Macounii.
  2. Leaf bases not decurrent; middle or lower stem with glandular-hirsute pubescence less than 0.25 mm long or lacking; leaves usually only 7-10 times as long as wide, tapering more abruptly to the acute tip; achenes ridged but glabrous and not papillate..... 4. G. obtusifolium.

41. INULA

1. I. Helenium — elecampane.

Tribe VII. Eupatorieae: 1

Tribe VII. EUPATORIEAE — boneset tribe

(Source: Johnson and Iltis 1963)

1. Leaves opposite or whorled; roots fibrous; achenes 5-angled; pappus of capillary bristles; involucre bracts not ribbed ..... 42. EUPATORIUM.
1. Leaves alternate; plants from a stout taproot or enlarged corm; achenes 10-ribbed; pappus of plumose or barbellate bristles; involucre bracts weakly or strongly ribbed.
  2. Plants from stout taproots; pappus plumose; involucre bracts strongly ribbed; inflorescence corymbiform, the heads creamy-white ..... 43. BRICKELLIA (KUHNIA).
  2. Plants from enlarged corms; pappus plumose or barbellate; involucre bracts strongly imbricate, weakly ribbed; inflorescence spicate or racemose, the heads purple and often very showy ..... 44. LIATRIS.

42. EUPATORIUM — throughwort, Joe-Pye-weed

1. Leaves in whorls of 3, 4, or 5; heads purple or dull rose, cylindrical.
  2. Stem purple throughout or purple spotted; florets 9-24 per head; very common throughout, wet habitats..... 1. E. maculatum.
  2. Stem green, purple only at nodes, not spotted; florets 3-6 (-8) per head; dry woods..... 2. E. purpureum.
1. Leaves opposite (rarely in 3's in no. 5); heads white (rarely purple in no. 5).
  3. Leaves sessile or very short-petioled, narrowly lanceolate (ovate-lanceolate in no. 4).
    4. Leaves free at base and not fused.
      5. Leaves attenuate to the winged petiole, broadest near middle, with 3 prominent veins beneath; plants pubescent; SW Wisconsin..... 3. E. altissimum.
      5. Leaves sessile, broadest at the rounded base.
        6. Plants glabrous; leaves with very prominent white midrib beneath; S Wisconsin ... ..... 4. E. sessilifolium.
        6. Plants pubescent; leaves with midrib not very prominent beneath..... 5c. E. perfoliatum forma truncatum.
    4. Leaves perfoliate, their bases fused around the stem; very common throughout..... 5. E. perfoliatum.
  3. Leaves long-petioled, broadly lanceolate to ovate.
    7. Leaves lanceolate, scabrous-pilose, thickish; plants branched above; rare in S Wisconsin ... ..... 6. E. serotinum.
    7. Leaves ovate, glabrous, membranaceous; plants branched at inflorescence, rarely below; throughout Wisconsin, except the Northwest..... 7. E. rugosum.

43. BRICKELLIA (KUHNTIA)

1. *B. eupatorioides* var. *corymbulosa* — false boneset.

44. LIATRIS — blazing star

1. Pappus barbellate, not plumose, the lateral cilia 3-6 times the diameter of the bristle.
  2. Inflorescence a usually dense spike; heads sessile, small, the involucre 7-11 mm high.
    3. Inflorescence rachis glabrous to pilose-hirsute; involucre bracts obtuse, erect, appressed, the tips not reflexed, 7-8 mm high; SE-most Wisconsin ..... 1. *L. spicata*.<sup>1</sup>
    3. Inflorescence rachis pilose-hirsute; involucre bracts acute, the acuminate tips reflexed, 9-11 mm high.....2. *L. pycnostachya*.<sup>1</sup>
  2. Inflorescence an spike or raceme; heads larger, the involucre 9-20 mm high.
    4. Inflorescence a raceme, rarely spiciform, no heads long-pedunculate; corolla glabrous within; involucre 12-20 mm high, the terminal head often much larger; leaves scabrous-pubescent, the margins harshly ciliate .....3. *L. ligulistylis*.<sup>2</sup>
    4. Inflorescence spicate, rarely racemose, the heads short-pedunculate or sessile; corolla pilose within; involucre 9-15 mm high; leaves scabrous to glabrous, the margins not harsh ..... 4. *L. aspera*.<sup>2</sup>
1. Pappus plumose, the lateral cilia 15 or more times the diameter of the bristle.
  5. Heads campanulate, the bracts rounded, glabrous with scarious margins; a rare hybrid of 4 and 6..... 5. *L. X Gladewitzii*.
  5. Heads cylindrical; involucre bracts mucronate to acuminate, the margins ciliate.
    6. Inflorescence racemose, the heads 15-60 flowered; bracts mucronate; leaves not crowded, more lax, weakly punctate, not ciliate, 9-22 cm long, 3-7 mm wide; dry prairies, southern Wisconsin..... 6. *L. cylindracea*.
    6. Inflorescence a dense to loose spike, the heads 3-8 flowered; bracts acuminate; leaves crowded, rigid, conspicuously punctate, ciliate, 6-15 cm long, 1-2 mm wide; prairies of Pierce and St. Croix counties ..... 7. *L. punctata*.

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<sup>1</sup>Plants intermediate between 1 and 2 are known from SE Wisconsin.

<sup>2</sup>Plants intermediate between 3 and 4 are known from NW Wisconsin.

Tribe VIII. Vernonieae: 1

Tribe VIII. VERNONIEAE — ironweed tribe

(Source: Johnson and Iltis 1963)

45. VERNONIA — ironweed

1. V. fasciculata — ironweed.

Tribe IX. Cynareae: 1

Tribe IX. CARDUEAE (CYNAREAE) — thistle tribe

(Source: Johnson and Iltis 1963)

1. Achenes attached by the base to the receptacle; florets all alike; bracts entire, sometimes hooked or spiny, not laciniate at tip; pappus various, usually more than 5 mm long.
  2. Leaves broadly rounded at base, unarmed; involucrel bracts terminated by a hook (Burdocks) ...  
.....46. ARCTIUM.
  2. Leaves lanceolate to ovate, prickly, the bases decurrent or not; involucrel bract each terminated by a rounded or flattened straight spine or merely mucronate (Thistles).
    3. Involucrel bracts with needle-like spiny tips or merely mucronate, often with a glutinous ridge on back; pappus plumose.....48. CIRSIUM.
    3. Involucrel bracts with flattened spiny tips, not glutinous; pappus barbellate to capillary.
      4. Leaves and stem wings glabrous or nearly so; pappus capillary; receptacle bristly.....  
..... 47. CARDUUS.
      4. Leaves and stem wings densely cottony-velutinous; pappus barbellate; receptacle fleshy, not bristly..... 49. ONOPORDUM.
1. Achenes obliquely attached to the receptacle; marginal florets often enlarged and ray-like; bracts often deeply cleft on margins of tip (laciniate), the tip occasionally spiny; pappus mostly less than 3 mm long or lacking ..... 50. CENTAUREA.

46. ARCTIUM — burdock

1. Heads 1-1.6 cm high, (1.5-) 2-2.5 cm wide, subsessile or short pedunculate, in a racemose inflorescence; common weed..... 1. A. minus.
1. Heads 1.5-2.5 cm high, 1.5-2.5 cm wide, long pedunculate, in a corymbose inflorescence; rare weeds.
  2. Heads 1.5-1.7 cm high, 1.5-2.1 cm wide, the bracts densely cottony-pubescent .....  
.....2. A. tomentosum.
  2. Heads ca 2.5 cm high, 3-3.5 cm wide, the bracts glabrous.....3. A. Lappa.

47. CARDUUS — plumeless thistle

1. Involucre 2.8-3 cm high, the heads solitary; peduncles wingless immediately beneath the head.....  
.....1. C. nutans var. leiophyllus.
1. Involucre 1.5-1.7 cm high, the heads clustered; peduncles winged immediately beneath head.....  
..... 2. C. acanthoides.

48. CIRSIUM — thistle

1. Involucral bracts distinctly spine-tipped (at least the outer and middle), the spine usually more than 2 mm long, but when very short the larger involucre 20 mm or more in diameter.
2. Leaves scabrous-hispid or crisped-hispid and also sometimes silky-pubescent above, more or less cobwebby and sometimes crisped-hispid or tomentose beneath.
  3. Leaves scabrous-hispid above, sparsely to densely cobwebby beneath, the cauline conspicuously decurrent<sup>3</sup>, involucral bracts herbaceous, spreading, gradually tapered into elongate spiny tips, lacking a dorsal glutinous ridge; common introduced weed .....1. C. vulgare.
  3. Leaves crisped-hispid with multicellular hairs and also sometimes sparingly silky-pubescent above, not decurrent, the stems not winged; involucral bracts not herbaceous, appressed, with a dorsal glutinous ridge.
  4. Leaves crisped-hispid on both surfaces, green; involucral bracts with an erect apical spine; involucre 30-50 mm high; stem 3-5 dm tall, from persistent basal rosettes; dry or mesic prairies, rare.....2. C. pumilum.
  4. Leaves crisped-hispid above, white-tomentose beneath; involucral bracts with an abruptly spreading apical spine; involucre 25-35 mm high; stem mostly 6-15 dm tall, the basal rosettes not persistent.
    5. All leaves deeply lobed (except in juvenile forms), the lobes linear-acuminate, terminating in stout spines, the thickish margins involute; involucral spines 3-7 mm long; plants mostly of open places ..... 3. C. discolor<sup>4,5</sup>
    5. Leaves shallowly lobed, irregularly dentate, serrate or entire, with small, weak spines, the margins thin, not involute, the lower leaves (and those of juvenile forms) sometimes deeply lobed, then lobes wide, broadly acute; involucral spines 2.5-4.5 mm long; plants mostly of woods ..... 4. C. altissimum<sup>3</sup>
2. Leaves white-tomentose on both surfaces, often more thinly so above, totally lacking hispidity; dorsal glutinous ridge present on involucral bracts.
  6. Leaves not decurrent on stem or only very shortly so (to 1 cm), the lobes lanceolate or deltoid; corollas purple or lavender, rarely white; rare introduced weeds.
    7. Leaves narrowed to the base, rarely clasping; anthers 6.5-11.8 mm, florets 21-36 mm long, achenes 3.5-5 mm long, yellowish brown with apical yellow band ca 1/2 mm wide; involucre 20-27 mm high, the bracts narrow and slender; leaves lobed nearly to midrib, the lobes narrowly triangular, usually less than 7 mm wide at base; plants strongly perennating by root sprouts .....5. C. Flodmanii.
    7. Leaves broadest near the base, partially clasping; anthers 9.4-13.3 mm, florets 27-40 mm long, achenes 5-7 mm long, brown, the yellow apical band lacking or very narrow; involucre 20-35 mm high, the bracts broad and stout; leaves shallowly lobed, the lobes .....<sup>3</sup> See also Carduus acanthoides.

<sup>4</sup>F<sub>1</sub> hybrids with C. muticum have involucral spines averaging 1.3 mm long, intermediate corolla color, and very low fertility.

<sup>5</sup>Cirsium discolor also hybridizes with C. altissimum.

Tribe IX. Cynareae: 3

broadly triangular, usually more than 7 mm wide at base; plants weakly perennating by root sprouts.....6. C. undulatum.

6. Middle cauline leaves conspicuously decurrent, the narrowly linear to oblong lobes very distant, the leaf blade divided nearly to the midrib, the decurrent wing often similarly lobed; corollas cream-colored; plants not conspicuously spinescent; dunes of Lake Michigan ..... 7. C. Pitcheri.
1. Outer and middle involucre bracts with at most a short spine or mucro, this up to 1 mm long (and then involucre about 10 mm in diameter).
8. Biennials (at least monocarpic); florets perfect; plants of moist habitats.
  9. Leaf bases strongly decurrent into prominent wings on stem; heads many, sessile or subsessile, crowded into a dense terminal inflorescence; involucre 9-12 mm high, the bracts neither conspicuously glutinous nor cobwebby; rare, N Wisconsin.....10. C. palustre.
  9. Leaf bases not decurrent; heads solitary or several, pedicellate, not crowded; involucre 22-27 mm high, 12-19 mm wide at base when in flower, cobwebby with prominent glutinous dorsal ridge; wet prairies and sedge meadows, common..... 9. C. muticum<sup>2</sup>
8. Perennials from proliferating underground parts; [imperfectly dioecious;] heads numerous, crowded in 2's to 4's or short pedunculate; involucre 10-20 (-26) mm high, 8-11 mm wide at base when in flower, the bracts usually glabrous and with a narrow dorsal glutinous ridge; very common weed .....11. C. arvense.

49. ONOPORDIUM — cotton or Scotch thistle

1. O. Acanthium

50. CENTAUREA — star thistle, batchelor's button

1. Involucre bracts tipped by long divergent spines; leaf bases conspicuously decurrent on the more or less winged stem; heads yellow; rare.
  2. Central spines of bracts stout, 17-20 mm long, with minute secondary spinules near the terete base ..... 1. C. solstitialis.
  2. Central spines of bracts very slender, 4-6 (-9) mm long, with conspicuous secondary spines near their flattened base .....2. C. melitensis.
1. Involucre bracts variously lacinate, but not spine-tipped; leaf bases not decurrent; heads rose-purple, blue or white.
  3. Leaves, at least lower, pinnatifid with linear-elliptic lobes; involucre bracts longitudinally striate, the black-brown acute appendages fringed with 10-14 delicate white to brown teeth; gray-green perennials with rose-purple (rarely white) florets; common weed .....8. C. maculosa.
  3. Leaves generally not pinnatifid, but repand, toothed, or entire, the lobes broad; involucre bracts not striate, stramineous to brown, variously fringed.
  4. Plants annual; florets blue or rose-purple.

Tribe IX. Cynareae: 4

5. Florets usually deep blue; involucre 10-15 mm high, ovoid to cylindrical, on slender, mostly leafless peduncles; upper leaves linear, flocculose-pubescent, entire; pappus only 2-3 mm long; common in cultivation ..... 3. C. Cyanus.
5. Florets rose-purple; involucre 15-30 mm high, subglobose, on very leafy peduncles pronouncedly inflated at the top; leaves broadly lanceolate to oblong-lanceolate, scabrous-puberulent, subentire to entire; pappus well developed, 6-10 mm long; rare adventive.....9. C. americana.
4. Plants perennial; florets rose-purple.
  6. Involucre yellowish-white or yellowish-green, the outer bracts entire, orbicular, the inner linear-lanceolate with soft plumose tips; pappus capillary, generally 5-11 mm long; involucre 9-12 mm high.....4. C. repens.
  6. Involucre brown to black, the outer bracts lacinate to pectinate, the inner various, but not plumose; pappus of very short bristles or none; involucre (10-) 13-18 mm high.
    7. Outermost involucre bracts deltoid to deltoid-ovate, the dark appendages deeply and regularly cut (pectinate); pappus very short (ca 1 mm) or none.
      8. Outer involucre bracts green, the dark triangular pectinate appendage ca 1-3 mm long, not obscuring the inner bracts .....7. C. vochinensis.
      8. Outer involucre bracts dark brown to nearly black, the dark broadly triangular pectinate appendage 3-4 mm long, obscuring the inner bracts.....6. C. nigra.
    7. Outermost involucre bracts rounded to rounded ovate, the light brown scarious appendages entire or irregularly toothed to lacinate with very fine irregular cilia; pappus none .....5. C. Jacea.

Tribe X. LACTUCEAE (CICHORIEAE) — lettuce tribe

(Source: Johnson and Iltis 1963)

1. Pappus absent.....60. LAPSANA.
1. Pappus present.
  2. Pappus of numerous simple hairlike (capillary) bristles only.
    3. Achenes flattened or compressed.
      4. Achenes beaked or unbeaked, but enlarged at the tip; heads blue or yellow, with relatively few florets .....56. LACTUCA.
      4. Achenes not beaked, not enlarged at the tip; heads yellow with many florets..... 55. SONCHUS.
    3. Achenes cylindrical, fusiform, or terete, not flattened.
      5. Stems branched or unbranched and leafy or subscapose; achenes truncate or tapered, rarely short-beaked; pappus pale yellow, red-brown, tannish or white; involucre bracts uni- or biseriate.
        6. Perennials; cauline leaves lanceolate to palmately lobed, or unlobed and dentate to entire; inflorescences branched racemes, panicles of cylindrical drooping heads, or corymbs with erect campanulate heads; pappus tawny to brown, not pure snowy white; main involucre bracts biseriate.
          7. Leaves lanceolate to palmately lobed; heads cylindrical, nodding; corolla pink, purplish to yellow or white; pappus pale yellow to red-brown; plants sometimes tomentose, not glandular..... 51. PRENANTHES.
          7. Leaves spatulate to oblanceolate, not lobed; heads campanulate, erect; corolla yellow to red-orange; pappus tannish; plants usually glandular-pubescent .....52. HIERACIUM.
        6. Annuals or biennials with well developed, usually pinnatifid basal leaves; inflorescences open corymbs or panicles of yellow campanulate heads; pappus white; main involucre bracts uniseriate ..... 53. CREPIS.
      5. Plants scapose; achenes beaked, or tapered and the beak lacking; pappus white; involucre bracts in more than one series.
        8. Achenes tuberculate-muricate above with a long filiform beak; heads many flowered on hollow scapes; leaves variously runcinate-pinnatifid .....54. TARAXACUM.
        8. Achenes not tuberculate-muricate above, slightly tapered, but not beaked; heads many flowered on solid scapes; leaves grasslike, the margins pubescent ..... 58. MICROSERIS.
  2. Pappus of plumose bristles, scales mixed with bristles, or scales only.

- 9. Pappus of plumose (feathery) bristles only.
  - 10. Plants scapose, scaly bracted above; leaves basal, coarsely dentate .....61. LEONTODON.
  - 10. Plants leafy stemmed, branched, not scaly-bracted above; leaves cauline, grasslike .....62. TRAGOPOGON.
- 9. Pappus of scales mixed with bristles or scales only.
  - 11. Pappus of 5 to numerous outer scales alternating with 5 to numerous scabrous hairs; plants scapose or sub-scapose, branched or not branched; corolla yellow .....59. KRIGIA.
  - 11. Pappus of numerous minute scales; plants profusely branched; corolla blue, rarely pink or white .....57. CICHORIUM.

51. PRENANTHES — white lettuce

- 1. Inflorescence an open panicle; leaves, at least the lower, long-petiolate, broadly ovate, deltoid to sagittate, or hastate.
  - 2. Basal leaves deeply palmately lobed; plants glabrous or nearly so; involucre bracts purplish; pappus rich red-brown; very common throughout .....1. P. alba.
  - 2. Basal leaves coarsely and irregularly dentate; plants pubescent in inflorescence; involucre bracts green; pappus pale yellow to brown; rare, S Wisconsin .....2. P. crepidinea.
- 1. Inflorescence a dense, strict, elongate racemose panicle (thyrses); leaves, at least the lower, spatulate, the rounded blades gradually attenuate into the petiole; uncommon species of prairies.
  - 3. Leaves of inflorescence with broad sessile auriculate bases; florets 8-13 mm long, white to purplish; leaves and stem glabrous and glaucous except in the uppermost inflorescence; S and W Wisconsin..... 3. P. racemosa.
  - 3. Leaves of inflorescence lanceolate, with attenuate narrow bases; florets (8-) 11-15 (-19) mm long, yellow; stem, at least the upper parts, and leaves scabrous, not glaucous; S Wisconsin .....4. P. aspera.

52. HIERACIUM — hawkweed

- 1. Plants scapose; leaves clustered at base, linear to spatulate or oblanceolate, sessile, pilose or glabrous, entire; heads red-orange or yellow; hairs less than 1 cm long or absent; introduced weeds.
  - 2. Florets bright red-orange; involucre densely covered with black-glandular and eglandular hairs; leaves spatulate to oblanceolate, with rusty-red pubescence; stolons present.....1. H. aurantiacum.
- 2. Florets yellow; leaves oblanceolate to spatulate.

- 3. Leaves narrowly oblanceolate to spatulate, essentially glabrous, stolons lacking, short rhizomes present; peduncles minutely white-stellate..... 2. H. piloselloides (H. florentinum).
- 3. Leaves oblanceolate with tawny-white hairs on both surfaces; stolons erect or arching with abundant fine pubescence; rhizomes lacking or inconspicuous; peduncles glandular hirsute ..... 3. H. caespitosum.
- 1. Plants not scapose; leaves not clustered at base, or if so, then plants with abundant hairs 7-20 mm long; leaves lanceolate to elliptic or spatulate, petioled or sessile-clasping, pilose to glabrous, the margins dentate to denticulate or subentire; rhizomes and stolons lacking (except H. vulgatum); North American natives (except H. vulgatum).
- 4. Leaves chiefly basal, abruptly reduced upward; plants, except the inflorescence, densely long-pilose, the hairs (7-) 10-20 mm long; peduncles with yellow-orange gland-tipped hairs; prairies, S and central Wisconsin.....8. H. longipilum.
- 4. Leaves often cauline; plants with hairs to 3 mm long or glabrous; peduncles glabrous, scabrous, stellate or appressed-pubescent, sometimes glandular.
- 5. Leaves broadly elliptic, tapering to long and villous petioles, coarsely dentate; involucre 6-8 mm high, the hairs stellate; stem glabrous [or hairy the length]; rare introduced weed . ..... 4. H. vulgatum.
- 5. Leaves various, tapering to shorter petioles or sessile, toothed to subentire; involucre 5-13 mm high, glabrous to glandular; stem glabrous or hairy; common.
- 6. Leaves spatulate, the upper sessile, the lower petioled, subentire; involucre (and peduncles) black-glandular, 5-8 mm high; stem setose ..... 7. H. scabrum<sup>6</sup>
- 6. Leaves lanceolate to oblanceolate, sessile, toothed; involucre (and peduncles) rarely glandular, 8-13 mm high; stem glabrous to villous-hispid or setose below.
- 7. Lower leaf surface or margin pilose to glabrous, never scabrous; peduncles stellate, not scabrous; stems glabrous to setose below ..... 5. H. kalmii.<sup>1</sup>
- 7. Lower leaf surface and especially margin scabrous; peduncles scabrous and stellate; stem glabrous to pilose below..... 6. H. scabriusculum.<sup>1</sup>

53. CREPIS — hawk's beard

- 1. Achene not beaked; plants glabrous to hispidulous, at least above, not setose.
- 2. Ligules yellow; inner surface of inner series of bracts microscopically appressed-puberulent; common, NW Wisconsin..... 1. C. tectorum.
- 2. Ligules yellow, minutely tipped with red; inner surface of inner series of bracts glabrous; rare... .....2. C. capillaris.
- 1. Achene slenderly beaked; stem and involucre strongly setose with stiff yellow bristles; rare.....3. C. setosa.

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<sup>6</sup>Hybrids between species 5, 6 and 7 are not uncommon.

54. TARAXACUM — dandelion

1. Mature achenes reddish to deep brown or purplish; leaves generally deeply lobed or cut to midrib...  
..... 1. T. erythrospermum.
1. Mature achenes tan to olivaceous, not red; leaves various, deeply lobed to entire.....  
..... 2. T. officinale.

55. SONCHUS — sow thistle

1. Perennials with underground horizontal rootstocks; heads large, the involucre 12-20 mm high; leaf bases auriculate, more or less clasping the stem, the rounded auricles small and inconspicuous; achenes 5-nerved; terminal leaf lobe elongate-triangular to oblong.
  2. Peduncles and involucre glandular..... 1. S. arvensis.
  2. Peduncles and involucre glabrous ..... 2. S. arvensis var. glabrescens (S. uliginosus).
1. Annuals with elongate taproots; heads smaller, mostly 9-12 (-14) mm high; leaf bases auriculate-clasping, the acute or rounded auricles large and conspicuous; achenes 3- to 5-nerved; terminal leaf lobe triangular.
  3. Auriculate leaf bases acute, the leaf margins sparsely prickly; achenes striate with 5 weak nerves; terminal leaf lobe sharply equilaterally triangular, cut nearly to midrib .....  
.....3. S. oleraceus.
  3. Auriculate leaf bases rounded, the leaf margins abundantly spinulose-dentate; achenes 3-nerved; leaves mostly unlobed, or if lobed, terminal leaf lobe broadly or irregularly triangular, the leaf cut about halfway to midrib.....4. S. asper.

56. LACTUCA — lettuce

1. Mature achenes with distinct filiform beak; leaves variously lobed or entire, the bases sagittate-clasping, or leaves petioled; corollas yellow, blue or purple.
  2. Achenes with short white bristles near summit; lower leaves lobed, the upper entire, with leaf margins, midribs and often lower stems spinulose; [heads ca 1 cm in diam.]; common weed .....  
.....1. L. serriola.
  2. Achenes lacking bristles near summit; leaves lobed to entire, neither margins, midrib nor lower stem spinulose (except in L. ludoviciana).
    3. Mature achenes 1.5-3 mm, the beak 0.5-2 mm long; pappus 9-11 mm long; involucre 13-20 mm high; leaves thickish, mostly entire or the lower runcinate; corollas blue or purple; introduced perennial, rare..... 4. L. pulchella.
    3. Mature achenes 2.5-4 mm, the beak 1-3 mm long; pappus 4-9 mm long; involucre 6-19 mm high; leaves lobed to dentate or rarely entire with sagittate bases.
      4. Achenes 2.5-3.4 mm long, the beak 1-2 mm long; pappus 4-6 mm long; involucre 6-12 mm high; leaves petioled, lobed or the upper unlobed, the margins dentate to entire; corollas yellow; very common .....2. L. canadensis.

Tribe X. Lactuceae: 5

- 4. Achenes 3.4-4 mm long, the beak 2.5-3 mm long; pappus 7-9 mm long; involucre (10-) 14-19 mm high; leaves lobed to dentate, pronouncedly glaucous and rather thick-textured, spinulose on margin and midrib beneath; corollas blue or yellow; prairies .....3. L. ludoviciana.
- 1. Mature achenes with short stout beak or beak lacking; leaves deeply lobed, rarely sessile, the bases not sagittate-clasping; corolla blue to whitish; tall woodland species.
- 5. Pappus white; leaves lyrate-lyobed, petioled; florets blue; S Wisconsin ..... 5. L. floridana.
- 5. Pappus brown or tawny, never white; leaves sessile, the lower lobed, the upper entire; florets very pale bluish to ivory or whitish, inconspicuous; common throughout..... 6. L. biennis.

57. CICHORIUM — chicory

- 1. C. Intybus — chicory, blue sailors.

58. MICROSERIS

- 1. M. cuspidata.

59. KRIGIA — dwarf dandelion

- 1. Plants annual; achene conical; pappus of 5 outer scales alternating with 5 inner scabrous hairs; scape leafless; rare, S Wisconsin..... 1. K. virginica.
- 1. Plants perennial; achene cylindrical; pappus of more numerous scales and scabrous hairs; scape bearing 1-2 reduced sessile leaves; peduncles glabrous or glandular; common throughout ..... 2. K. biflora.

60. LAPSANA — nipplewort

- 1. L. communis.

61. LEONTODON — hawkbit

- 1. L. autumnalis — fall dandelion.

62. TRAGOPOGON — goat's beard

- 1. Ligules pale violet to deep purple; achenes abruptly tapering to beak longer than achene body; involucre bracts 7-11; cultivated and rarely escaped.....1. T. porrifolius.
- 1. Ligules yellow; achenes gradually tapering to a beak longer or shorter than the achene body; common weeds.
- 2. Bracts generally 8 or 9, margined with red or purple, about equal to the corollas; achene beak shorter than body; peduncle slender, not enlarged below the head; leaf tips recurved .....2. T. pratensis.
- 2. Bracts generally 11-13, not margined with red or purple, much longer than corollas; achene beak longer than body; peduncle strongly enlarged (inflated) below the head; leaf tips not recurved .....3. T. dubius.