

*The Jepson Manual: Vascular Plants of California, Second Edition*  
**Supplement II**  
**December 2014**

In the pages that follow are treatments that have been revised since the publication of the *Jepson eFlora*, Revision 1 (July 2013).

The information in these revisions is intended to supersede that in the second edition of *The Jepson Manual* (2012).

The revised treatments, as well as errata and other small changes not noted here, are included in the *Jepson eFlora* (<http://ucjeps.berkeley.edu/IJM.html>).

For a list of errata and small changes in treatments that are not included here, please see:  
[http://ucjeps.berkeley.edu/JM12\\_errata.html](http://ucjeps.berkeley.edu/JM12_errata.html)

Citation for the entire *Jepson eFlora*: Jepson Flora Project (eds.) [year] *Jepson eFlora*,  
<http://ucjeps.berkeley.edu/IJM.html> [accessed on month, day, year]

Citation for an individual treatment in this supplement: [Author of taxon treatment] 2014. [Taxon name], Revision 2, in Jepson Flora Project (eds.) *Jepson eFlora*, [URL for treatment]. Accessed on [month, day, year].



## Summary of changes made in Revision 2 of the *Jepson eFlora*, December 2014

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### PTERIDACEAE

#### \*Pteridaceae key to genera:

All of the CA members of *Cheilanthes* transferred to *Myriopteris*

#### \**Cheilanthes*:

*Cheilanthes clevelandii* D. C. Eaton changed to *Myriopteris clevelandii* (D. C. Eaton) Grusz & Windham, as native  
*Cheilanthes cooperae* D. C. Eaton changed to *Myriopteris cooperae* (D. C. Eaton) Grusz & Windham, as native  
*Cheilanthes covillei* Maxon changed to *Myriopteris covillei* (Maxon) Á. Löve & D. Löve, as native  
*Cheilanthes feei* T. Moore changed to *Myriopteris gracilis* Fée, as native  
*Cheilanthes gracillima* D. C. Eaton changed to *Myriopteris gracillima* (D. C. Eaton) J. Sm., as native  
*Cheilanthes intertexta* (Maxon) Maxon changed to *Myriopteris intertexta* (Maxon) Grusz & Windham, as native  
*Cheilanthes newberryi* (D. C. Eaton) Domin changed to *Myriopteris newberryi* (D. C. Eaton) Grusz & Windham, as native  
*Cheilanthes parryi* (D. C. Eaton) Domin changed to *Myriopteris parryi* (D. C. Eaton) Grusz & Windham, as native  
*Cheilanthes viscida* Davenp. changed to *Myriopteris viscida* (Davenp.) Grusz & Windham, as native  
*Cheilanthes wootonii* Maxon changed to *Myriopteris wootonii* (Maxon) Grusz & Windham, as native

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### ADOXACEAE

#### \**Viburnum*:

One native species removed, replaced with a naturalized one, due to misidentification of the sole voucher specimen; one naturalized species added

*Viburnum opulus* L. added, as naturalized, replacing *Viburnum edule* (Michx.) Raf.

*Viburnum rigidum* Vent. added, as naturalized

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### ASTERACEAE

#### \*Asteraceae key to genera:

One species of *Pallenis*, a genus not otherwise represented in CA, added as naturalized in the state. New keys for Group 1 (*Volutaria*), Group 2 (*Volutaria*), Group 4 (*Volutaria*), Group 11 (*Pallenis*), and Group 15 (*Dittrichia*).

#### \**Dittrichia*:

One naturalized species added

*Dittrichia viscosa* (L.) Greuter added, as naturalized

#### \**Lagophylla*:

One newly described species added

*Lagophylla diabolensis* B. G. Baldwin added, as native

#### \**Pallenis*:

One naturalized species added

*Pallenis maritima* (L.) Greuter added, as naturalized

#### \**Volutaria*:

One naturalized species added

*Volutaria canariensis* Wagenitz added, as naturalized

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### BORAGINACEAE

#### \*Boraginaceae key to genera:

One species of *Wigandia*, a genus not otherwise represented in CA, added as naturalized in the state

#### \**Hydrophyllum*:

One var. raised to species, with a new epithet

*Hydrophyllum capitatum* Douglas ex Benth. var. *alpinum* S. Watson changed to *Hydrophyllum alpestre* A. Nelson & P. B. Kenn.

#### \**Wigandia*:

One naturalized species added

*Wigandia urens* (Ruiz & Pav.) Kunth added, as naturalized

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CACTACEAE

**\*Cylindropuntia:**

One newly described species added; circumscription of one out-of-state var. expanded to include as synonym one var. previously recognized in CA; one species changed from hybrid to non-hybrid

*Cylindropuntia acanthocarpa* (Engelm. & J. M. Bigelow) F. M. Knuth var. *acanthocarpa* becomes the accepted name for *Cylindropuntia acanthocarpa* (Engelm. & J. M. Bigelow) F. M. Knuth var. *coloradensis* (L. D. Benson) Pinkava, with the latter as a synonym  
*Cylindropuntia chuckwallensis* M.A. Baker & M.A. Cloud-Hughes newly described, added, as native  
*Cylindropuntia ×fosbergii* (C. B. Wolf) Rebman, M. A. changed to *Cylindropuntia fosbergii* (C. B. Wolf) Rebman, M. A. Baker & Pinkava

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ERICACEAE

**\*Pyrola:**

Three additional, cryptic taxa recognized, including one species newly described

*Pyrola aphylla* Sm. added, as native  
*Pyrola crypta* Jolles newly described, added, as native  
*Pyrola dentata* Sm. added, as native

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FAGACEAE

**\*Quercus:**

One waif species added  
*Quercus robur* L. added, as waif

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MONTIACEAE

**\*Calandrinia:**

Members of one species in western North America, including CA, segregated from remainder of the same species, in Central and South America, under a new name

*Calandrinia ciliata* (Ruiz & Pav.) DC. replaced by *Calandrinia menziesii* (Hook.) Torr. & A.Gray added, as native

**\*Calyptridium:**

One var. raised to species

*Calyptridium parryi* A. Gray var. *arizonicum* J. T. Howell changed to *Calyptridium arizonicum* (J. T. Howell) M. G. Simpson, M. Silveira, & Guiliams, as native

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MYRSINACEAE

**\*Myrsinaceae:**

All CA members of Myrsinaceae (i.e., those in *Anagallis*, *Glaux*, and *Trientalis*) transferred to *Lysimachia*

*Anagallis arvensis* L. changed to *Lysimachia arvensis* (L.) U. Manns & Anderb., as naturalized  
*Anagallis minima* (L.) E. H. L. Krause changed to *Lysimachia minima* (L.) U. Manns & Anderb., as native  
*Anagallis monelli* L. changed to *Lysimachia monelli* (L.) U. Manns & Anderb., as waif  
*Glaux maritima* L. changed to *Lysimachia maritima* (L.) Galasso, Banfi, & Soldano, as native  
*Trientalis europaea* L. changed to *Lysimachia europaea* (L.) U. Manns & Anderb., as native  
*Trientalis latifolia* Hook. changed to *Lysimachia latifolia* (Hook.) Cholewa, as native

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POLEMONIACEAE

**\*Polemonium:**

One newly described species and one newly named var. (based on species name previously treated as a synonym) added; one subsp. no longer recognized and so deleted

*Polemonium eddyense* Stubbs newly described, added, as native

*Polemonium occidentale* Greene subsp. *occidentale* no longer recognized, treated as synonym of

*Polemonium occidentale* Greene

*Polemonium pulcherrimum* Hook. var. *shastense* (Eastw.) Stubbs recognized, added, as native

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POLYGONACEAE

**\*Chorizanthe:**

One newly described species added, as native

*Chorizanthe minutiflora* R. Morgan, Styer, & Reveal newly described, added, as native

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ROSACEAE

**\*Rosa:**

Two additional vars., of one subsp., recognized

*Rosa woodsii* Lindl. var. *glabrata* (Parish) D. Cole added, as native, and as belonging to *Rosa woodsii* Lindl. subsp. *gratissima* (Greene) W. H. Lewis & Ertter

*Rosa woodsii* Lindl. var. *gratissima* (Greene) D. Cole added, as native, and as belonging to *Rosa woodsii* Lindl. subsp. *gratissima* (Greene) W. H. Lewis & Ertter

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CYPERACEAE

**\*Cyperaceae:**

One species of *Eriophorum* segregated, along with one newly described species, to the newly described genus *Calliscirpus*

*Calliscirpus brachytrix* C.N. Gilmour, J.R. Starr, & Naczi newly described, added, as native

*Eriophorum crinigerum* (A. Gray) Beetle changed to *Calliscirpus criniger* (A. Gray) C.N. Gilmour, J.R. Starr, & Naczi, as native

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POACEAE

**\*Agrostis:**

One newly described, native species added

*Agrostis lacuna-vernalis* P.M. Peterson & Soreng newly described, added, as native

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## PTERIDACEAE BRAKE FAMILY

Ruth E.B. Kirkpatrick, Alan R. Smith &amp; Thomas Lemieux, except as noted

Perennial herb, in soil or on or among rocks; rhizome creeping to erect, scaly. **Leaf:** generally all  $\pm$  alike (or of 2 kinds, fertile, sterile), generally  $< 50$  cm, often  $< 25$  cm; stipe generally thin, wiry, often dark,  $\times$ -section with vascular strands generally 1–3, less often many in circle; blade generally pinnate or  $\pm$  palmate-pinnate (see *Adiantum*), often  $\geq 2$ -compound, abaxially often with glands,  $\pm$  powdery exudate, hairs, or scales; segments round, oblong, fan-shaped, or other, veins generally free. **Sporangia:** in sori or not, marginal, submarginal, or along veins, covered by recurved, often modified segment margins (false indusia) or not; true indusia 0; spores spheric, sides flat or not, scar with 3 radiating branches.  $\pm 40$  genera, 500 species: worldwide, especially dry areas. [Windham 1993 FNANM 2:122–186] CA members of *Cheilanthes* moved to the distantly related *Myriopteris*; *Pellaea breweri* to be moved as well, from a to-be-redefined *Pellaea*; traditional, often untenable limits of genera outside CA also being clarified using molecular phylogenetics. —Scientific Editors: Alan R. Smith, Thomas J. Rosatti.

1. Leaves of 2 kinds, fertile more erect, with longer stipes, longer, narrower segments than sterile ..... **CRYPTOGRAMMA**  
 1' Leaves of  $\pm 1$  kind (in *Aspidotis densa* fertile, sterile  $\pm$  dissimilar)
2. Leaf segment margin generally not recurved,  $\pm$  unmodified, not covering sporangia; sporangia along veins
3. Leaf 1-pinnate; leaf adaxially glabrous or with scales
4. Pinna adaxially with stellate scales, margins shallowly (not deeply) pinnately lobed or dissected or not ..... **ASTROLEPIS**  
 4' Pinna adaxially glabrous, margins  $\pm$  wavy, not lobed or dissected ..... *Pellaea bridgesii*
- 3' Leaf either 1-pinnate with pinnae pinnately dissected or leaf generally more divided; leaf adaxially glabrous, glandular, or  $\pm$  covered with exudate, scales 0
5. Sporangia along veins for outer 1/3–2/3; leaf segments narrowed at base ..... **ARGYROCHOSMA (2)**  
 5' Sporangia along veins  $\pm$  throughout (best seen on immature, fertile leaf); leaf segments not narrowed at base .....  
 ..... **PENTAGRAMMA**
- 2' Leaf segment margin generally recurved at least partly, often modified, generally covering sporangia at least partly; sporangia at or near vein tips, so appearing marginal
6. Sporangia borne on and covered by highly modified, recurved part of segment margin (false indusium); segments fan-shaped or oblong, thin-textured ..... **ADIANTUM**
- 6' Sporangia borne on unmodified segment surface, generally covered at least partly by modified or unmodified, recurved part of segment margin (false indusium); segments lanceolate, round, or other, generally thick-textured
7. Leaf generally  $> 40$  cm, stipe green to brown,  $\pm$  thick ..... **PTERIS**
- 7' Leaf generally  $< 40$  cm, if larger, stipe  $\pm$  black and wiry (except in *Pellaea andromedifolia*)
8. Leaf abaxially with scales, hairs, or glands ..... **MYRIOPTERIS**
- 8' Leaf abaxially glabrous or covered with colored exudate, scales 0
9. Leaf abaxially densely covered with white or yellow exudate, adaxially sparsely dotted with same ..... **NOTHOLAENA**
- 9' Leaf without exudate (except some species of *Pellaea* and abaxially in *Argyrochosma limitanea*)
10. Sterile leaf segments  $\pm$  sessile, connected by blade tissue or not, toothed or not; false indusium wide, scarious ..... **ASPIDOTIS**
- 10' Sterile leaf segments (and fertile) stalked (except *Pellaea breweri*), not connected by blade tissue, not toothed; false indusium 0 or narrow or wide, scarious, not scarious, or  $\pm$  scarious at margin
11. Sporangia along veins for outer 1/3–2/3; rhizome scales without dark mid-stripe; false indusium 0 .....  
 ..... **ARGYROCHOSMA (2)**
- 11' Sporangia along veins only at tips; rhizome scales often with dark mid-stripe; false indusium present (except *Pellaea bridgesii*) ..... **PELLAEA**

## MYRIOPTERIS

Plant in soil or rock crevices; rhizome short- to long-creeping[-decumbent], generally many-branched, scales generally lance-linear, pale to dark, mid-stripe dark or not. **Leaf:** < 75 cm, young leaf tip hooked or coiled; stipe cylindric, red-brown to ± black; blade generally 2–3-pinnate, generally oblong to narrowly triangular; segments generally small, ± flat or abaxially concave (from recurved margins). **Sporangia:** along margin, in discrete patches to continuous, partly to completely covered by recurved margin (generally not recurved in *Myriopteris cooperae*). ± 47 species: New World, especially w North America, primarily Mexico, 1 sp. in southern Africa, generally dry areas, especially sheltered in or near rocks. (Greek: myriad fern, from much divided leaf blades) [Grusz & Windham 2013 PhytoKeys 32: 49–64, doi: 10.3897/phytokeys.32.6733] Includes all CA members of *Cheilanthes* as treated in TJM2 (2012).

1. Leaf blade with scales, nonglandular; young leaf tip hooked
  2. Rhizome scales loosely appressed, 1-colored; sporangia 32-spored; rhizome long-creeping, leaves scattered ..... *M. wootonii*
  - 2' Rhizome scales strongly appressed, 1- or 2-colored; sporangia 64-spored; rhizome ± short-creeping, leaves clustered
    3. Rhizome scales 1- or 2-colored, dark brown or black, some with narrow light brown margin; scales on abaxial leaf ± > 1 mm wide, obscuring surface, exceeding margin ..... *M. covillei*
    - 3' Rhizome scales 2-colored, with dark mid-stripe, light margins; scales on abaxial leaf ± < 1 mm wide, not obscuring surface, ± exceeding margin
      4. Leaf blade scales linear, 2–3(5) cells wide; leaf 2–3 pinnate, segments ± round to generally oblong ..... *M. gracillima*
      - 4' Leaf blade scales lance-ovate, > 5 cells wide; leaf 3–4 pinnate, segments ± round
        5. 2-colored rhizome scales with well-defined, dark mid-stripe and light brown margins 1/2 to = width of mid-stripe; leaf gray-green, segments round to ± cordate ..... *M. clevelandii*
        - 5' 2-colored rhizome scales with well-defined, dark mid-stripe and light brown margins much narrower than mid-stripe; leaf dark green, segments ± round ..... *M. intertexta*
- 1' Leaf blade without scales, glandular or not; young leaf tip hooked or coiled
  6. Rhizome scales with dark mid-stripe; young leaf tip coiled
    7. Hairs on leaf segment adaxially sparse, generally not intertwined; dark mid-stripe of rhizome scales not thread-like, > 0.1 mm wide at base; pinna stalk ± 0–1 mm; pinnule stalk ± green adaxially, ± brown abaxially ..... *M. gracilis*
    - 7' Hairs on leaf segment adaxially dense, intertwined; dark mid-stripe of rhizome scales thread-like, < 0.1 mm wide at base; pinna stalk 1–2(5) mm; pinnule stalk generally ± brown adaxially, abaxially ..... *M. parryi*
  - 6' Rhizome scales without dark mid-stripe; young leaf tip hooked or coiled
    8. Leaf surface with ± clear, sticky exudate, generally with short glandular hairs and sessile glands ..... *M. viscida*
    - 8' Leaf surface without sticky exudate, with short or long, glandular or nonglandular hairs
      9. Rhizome scales of 1 kind, tan to red-brown ± throughout; leaf segment abaxial surfaces visible through ± sparse, untangled, glandular and nonglandular hairs; young leaf tip coiled; rhizome short-creeping ..... *M. cooperae*
      - 9' Rhizome scales of 2 kinds, some maroon with a tan, curly, hair-like tip, others tan ± throughout, narrower; leaf segment abaxial surfaces not visible through dense, tangled, nonglandular hairs; young leaf tip hooked; rhizome short- to long-creeping ..... *M. newberryi*

**M. clevelandii** (D. C. Eaton) Grusz & Windham CLEVELAND'S LIP FERN

## NATIVE

Rhizome short to long-creeping, sparsely branched; scales red-brown or brown, with a dark mid-stripe. **Leaf:** 15–30(40+) cm, 3–5(8+) cm wide, gray-green; stipe < 2(3) mm wide, scales lance-linear, ± gray to red-brown; blade 3–4-pinnate; segments small, round to ± cordate, abaxially concave, ± completely covered by scales, nonglandular hairs, adaxially glabrous. **Sporangia:** generally obscured by recurved segment margin or by scales, hairs. Rocky, exposed areas; 200–1000 m. N ChI, PR; Baja California. [*Cheilanthes clevelandii* D. C. Eaton] N ChI plants more robust, with more highly dissected segment scales.

**M. cooperae** (D. C. Eaton) Grusz & Windham COOPER'S LIP FERN**NATIVE**

Rhizome short-creeping; scales lanceolate, tan to red-brown  $\pm$  throughout. **Leaf:** 6–25(32+) cm, 3–6(8+) cm wide, pale green; scales 0; hairs  $\pm$  sparse, untangled, glandular and nonglandular; stipe < 2 mm wide; blade 2–3-pinnate; segments generally 1–3 mm  $\pm$  oblong,  $\pm$  flat. **Sporangia:** submarginal, not obscured by hairs; segment margins unmodified, not (rarely  $\pm$ ) recurved; spores tan.  $2n=60$ . Generally in limestone crevices; 100–800 m. NCoRI, CaR, SN, SnFrB, SCoRO, SCo (Slover Mtn, San Bernardino Co.), TR. [*Cheilanthes cooperae* D. C. Eaton]

**M. covillei** (Maxon) Á. Löve & D. Löve COVILLE'S LIP FERN**NATIVE**

Rhizome short-creeping; scales dark brown or black, some with narrow light brown margin. **Leaf:** 8–22(30+) cm, 2–4(6) cm wide, dark green; stipe < 2 mm wide, scales lance-linear,  $\pm$  white to red-brown; blade 3–4-pinnate; segments small,  $\pm$  round, adaxially glabrous, abaxially concave, obscured by scales exceeding margin, scales originating from axes, > 2 mm,  $\pm$  > 1 mm wide,  $\pm$  entire, covering generally more highly dissected scales. **Sporangia:** obscured by recurved segment margin, scales.  $2n=60$ . Crevices, bases of rocks, sun or shade; 600–2400 m. NCoR, SN, ScV (Sutter Buttes), SnFrB, SCoR, TR, PR, SNE, DMtns; to Utah, Arizona, Baja California. [*Cheilanthes covillei* Maxon] Hybrids, presumed sterile, occasionally with *Myriopteris intertexta*, *Myriopteris newberryi* (*Myriopteris*  $\times$  *fibrillosa* (Davenp.) Grusz & Windham), *Myriopteris parryi* (*Myriopteris*  $\times$  *parishii* (Davenp.) Grusz & Windham) in southern California.

**M. gracilis** Fée SLENDER LIP FERN**NATIVE**

Rhizome short-creeping; scales light to red-brown, generally with dark mid-stripe. **Leaf:** 6–15(18) cm, 1.5–3 cm wide, pale green, scales 0; stipe  $\pm$  1 mm wide, hairs < 2 mm, pale or tan with  $\pm$  orange constrictions; blade generally 3-pinnate; segments small,  $\pm$  round, abaxially concave, hairs generally not intertwined, long,  $\pm$  white to  $\pm$  brown, sparse adaxially, dense abaxially. **Sporangia:** 32-spored, partly obscured by hairs, less so by segment margin.  $n=2n=90$ . Generally limestone crevices, slopes, cliffs; 1200–3000 m. TR, W&I, DMtns; to British Columbia, Montana, central United States, Mexico. [*Cheilanthes feei* T. Moore] Apogamous.

**M. gracillima** (D. C. Eaton) J. Sm. LACE LIP FERN**NATIVE**

Rhizome short-creeping; scales light brown, with dark (sometimes red-brown) mid-stripe. **Leaf:** 6–18(30) cm, 1–2(3) cm wide, dark green; stipe  $\pm$  1 mm wide, scales lance-linear, ciliate at base; blade 2–3-pinnate, linear-oblong, generally 3–5  $\times$  longer than wide, axes with long, narrow scales; segments small,  $\pm$  round to generally oblong, abaxially concave, with dense, deeply dissected, long-ciliate scales, adaxially with similar scales or glabrous. **Sporangia:** on young leaves often entirely obscured by scales, recurved segment margin. Generally granite cliffs, crevices; 400–3200 m. NW, CaR, SN, CW, GB; to British Columbia, Montana, Utah. [*Cheilanthes gracillima* D. C. Eaton] Hybridizes with *Myriopteris intertexta*.

**M. intertexta** (Maxon) Grusz & Windham COASTAL LIP FERN**NATIVE**

Rhizome short-creeping; scales pale with red-brown to  $\pm$  black mid-stripe  $\pm$  to margin or not. **Leaf:** 6–14(20) cm, 1.5–3 cm wide, dark green; stipe < 1 mm wide, scales lanceolate, ciliate at base, pale; blade 3-pinnate; segments small,  $\pm$  round, abaxially concave, with pale to red-brown scales, scales < 1 mm wide, ciliate at base, covering more deeply dissected scales, barely exceeding segment margin, adaxially glabrous or with deeply dissected scales; young leaf tip hooked. **Sporangia:** generally obscured by scales, recurved segment margin. Crevices, bases of rocks; 300–2800 m. NCoRO, NCoRH, SNH, SnFrB, SCoR, MP, W&I; Oregon, Nevada. [*Cheilanthes intertexta* (Maxon) Maxon] Hybridizes with *Myriopteris covillei*, *Myriopteris gracillima*. Allotetraploid hybrid of *Myriopteris covillei* and *Myriopteris gracillima*.

**M. newberryi** (D. C. Eaton) Grusz & Windham NEWBERRY'S LIP FERN

**NATIVE**

Rhizome short- to long-creeping; scales of 2 kinds, maroon with a tan, curly, hair-like tip, and tan  $\pm$  throughout, narrower. **Leaf:** 15–20(30) cm, 2–4 cm wide; scales 0; hairs generally dense, long, tangled or matted, nonglandular,  $\pm$  white to tan; stipe < 1 mm wide; segments small,  $\pm$  round,  $\pm$  flat, adaxially  $\pm$  gray-green from dense, generally white hairs, abaxially tan from dense (surface not visible), tan hairs. **Sporangia:** 32- or 64-spored,  $\pm$  visible at segment margin.  $2n=60$ . Dry, rock outcrops; 100–800 m. SW; Baja California. [*Cheilanthes newberryi* (D. C. Eaton) Domin] Hybrids uncommon with *Myriopteris covillei* (*Myriopteris*  $\times$  *fibrillosa*).

**M. parryi** (D. C. Eaton) Grusz & Windham PARRY'S LIP FERN

**NATIVE**

Rhizome short-creeping, > 6 cm; scales medium brown, most with dark, thread-like mid-stripe. **Leaf:** 6–15(25) cm, 1–2(3) cm wide; scales 0; stipe < 1 mm wide, hairs short to long, bent, appressed to  $\pm$  spreading, glandular and not, pale; segments small,  $\pm$  round,  $\pm$  flat, hairs 4+ mm, tangled, generally nonglandular, dense both surfaces, adaxially silver-white, abaxially tan to brown or golden. **Sporangia:**  $\pm$  visible through hairs at segment margin; spores  $\pm$  black.  $2n=60$ . Limestone, granite crevices, rocks; 100–1500 m. PR, SNE, D; to Utah, Arizona, Mexico. [*Cheilanthes parryi* (D. C. Eaton) Domin]

**M. viscida** (Davenp.) Grusz & Windham VISCID LACE FERN

**NATIVE**

Rhizome short-creeping; scales red-brown, dark mid-stripe 0. **Leaf:** 10–15(25) cm, 2(3) cm wide, pale to dull green; stipe < 1 mm wide, scales sparse, at base, gland stalks 0–0.3 mm; segments small,  $\pm$  oblong,  $\pm$  flat, both surfaces covered with  $\pm$  clear, sticky exudate from glands; young leaf tip coiled. **Sporangia:** visible at recurved segment margins; spores  $\pm$  brown. Limestone, granite crevices, rocks; 100–1600 m. e edge SnBr, e PR (including SnJt), DMoj, w edge DSon; Baja California. [*Cheilanthes viscida* Davenp.]

**M. wootonii** (Maxon) Grusz & Windham WOOTON'S LIP FERN

**NATIVE**

Rhizome long-creeping; scales tan to brown, dark mid-stripe 0. **Leaf:** 10–20 cm, 2–3 cm wide; stipe 1–2 mm wide; blade 3–4-pinnate; segments small,  $\pm$  round, abaxially concave, densely covered with ciliate, lance-linear scales, adaxially glabrous. **Sporangia:** 32-spored, generally obscured by dense, overlapped scales.  $n=2n=90$ . Rocky outcrops; 1600–1800 m. DMtns (Providence, New York mtns); to western Oklahoma, northern Mexico. [*Cheilanthes wootonii* Maxon] Apogamous. {CNPS list}



**ADOXACEAE MUSKROOT FAMILY**  
**Charles D. Bell**

[Perennial herb], subshrub to tree; hairs often stellate or glandular. **Leaf:** generally opposite, simple or compound, generally toothed; stipules generally 0. **Flower:** generally bisexual; calyx teeth or lobes [2]5; corolla small, radial, rotate, lobes [3–4]5; stamens [4]5, epipetalous; ovary ± inferior, chambers 1 or 3–5, 1-ovuled; styles ± 0 or 3–5. **Fruit:** drupe. 5 genera, 200 species: especially northern temperate, also South America, southeastern Asia, tropical Africa. [Backlund & Bremer 1997 Plant Syst Evol 207:225–254] Incl in Caprifoliaceae in TJM (1993), and possibly in future. —Scientific Editors: Thomas J. Rosatti, Bruce G. Baldwin.

**VIBURNUM**  
**Thomas J. Rosatti & Charles D. Bell**

Shrub, slender, generally hairy, also ± glandular, especially in inflorescence, generally deciduous. **Leaf:** simple, entire to lobed. **Inflorescence:** compound cyme, umbel-like, generally terminal, rounded or ± flat-topped, generally with oblanceolate bracts, marginal flowers larger, sterile or all flowers ± alike; peduncles 1.5–4 cm; rays generally 7. **Flower:** ovary chambers 1 (2 abort), ovule pendent; style short, stigma lobes 3. **Fruit:** drupe, drupe-like. **Seed:** 1. ± 250 species: northern temperate, subtropics. (Latin: for pliable branches used in binding) [Clement et al. 2014 Amer J Bot 101:1029–1049] *Viburnum rigidum* naturalized in SnFrB (Tilden Park); material previously identified as *Viburnum edule* belongs instead to *Viburnum opulus*.

1. Leaves (except distal) 3-lobed, dentate, widely ovate; petiole with a few large glands distally, without nonglandular hairs; inflorescence with marginal flowers larger, sterile ..... *V. opulus*  
 1' Leaves unlobed, coarsely dentate above middle or entire, elliptic or ovate-lanceolate to round or cordate; petiole without glands, with many nonglandular hairs throughout; inflorescence with all flowers ± alike, fertile  
 2. Leaves coarsely dentate above middle, elliptic to round or cordate ..... *V. ellipticum*  
 2' Leaves entire, ovate-lanceolate to -round ..... *V. rigidum*

**V. ellipticum** Hook. OVAL-LEAVED VIBURNUM  
**NATIVE**

**Leaf:** petiole 6–12 mm, without glands, with many nonglandular hairs throughout; blade 2–6 cm, elliptic to round or cordate, unlobed, coarsely dentate above middle. **Inflorescence:** 1–3 cm; all flowers ± alike, fertile. **Flower:** 6–8 mm diam. **Fruit:** 10–12 mm, elliptic, ± red, in age black. Chaparral, yellow-pine forest, generally n-facing slopes; 300–1400 m. NW, n&c SNF, SnFrB; to Washington. Jun–Aug {CNPS list}

**V. opulus** L. CRANBERRYBUSH  
**NATURALIZED**

**Leaf:** petiole 11–29[50] mm, with a few large glands distally, without nonglandular hairs; blade 4–12 cm, ± widely elliptic, 3-lobed, dentate. **Inflorescence:** 1.5–2.6 cm; marginal flowers larger, sterile. **Flower:** marginal 20–35 mm diam, others 4–4.5 mm diam. **Fruit:** 6–12 mm, ovoid, yellow to orange-red. Spring-fed montane riparian/montane meadow habitats; 300–900 m. CaRH; circumboreal. [*Viburnum edule* (Michx.) Raf., misappl.] In addition, may be naturalizing in Klamath Ranges and northern High Sierra Nevada. *Viburnum edule* (Michx.) Raf. differs in several ways, including lack of petiole glands and having all flowers ± alike and fertile. May–Jul

**V. rigidum** Vent.  
**NATURALIZED**

**Leaf:** petiole 5–15(20) mm, without glands, with many nonglandular hairs throughout; blade 3–10 cm, ovate-lanceolate to -round, unlobed, entire. **Inflorescence:** 4–9 cm; all flowers ± alike, fertile. **Flower:** 5–9 mm diam. **Fruit:** 6–8 mm, subspheric, dark blue. Mixed forest; ± 250 m. SnFrB (Tilden Park); native to s Europe. Distinct from *Viburnum tinus* L. based on chloroplast tree (Clement et al., 2014); reported in TJM (2012) as possibly naturalized in Tilden Park, based on plants in flower in October 2001 (*Erter 17810*) that were said on collection label to be "lax" and "occasional" and observed by Rosatti in October 2014 to be lax, yet not in flower and in greater numbers than might be suggested by "occasional". Oct

**ASTERACEAE (Compositae) SUNFLOWER FAMILY**

**David J. Keil, except as noted**

Annual to tree. **Leaf:** basal and/or cauline, alternate, opposite, rarely whorled, simple to 2+ × compound. **Inflorescence:** 1° inflorescence a head, resembling a flower, of several types (see below), 1–many in generally ± cyme-like cluster; each head generally with ± calyx-like involucre of 1–many series of phyllaries (involucral bracts); receptacle of head flat to conic or columnar, paleate (bearing paleae = receptacle bracts) or epaleate; flowers 1–many per head. **Flower:** bisexual, unisexual, or sterile, ± small, of several types (see below); calyx 0 or modified into ± persistent pappus of bristles, scales, and/or awns; corolla radial or bilateral (0), lobes generally (0)3–5; stamens 4–5, filaments generally free, generally fused to corolla at tube/throat junction, anthers generally fused into cylinder around style, anther base generally rounded or cordate (deeply sagittate or with tail-like appendages), tip (= flattened appendage) generally projecting beyond pollen sac; pistil 1, 2-carpeled, ovary inferior, 1-chambered, 1-seeded, placenta basal, style 1, tip generally ± 2-branched (except in some staminate disk flowers), branch tips truncate or generally bearing ± brush-like appendages; stigmas 2, generally on adaxial faces of style branches. **Fruit:** achene (also called a cypsela) (drupe in *Chrysanthemoides*), cylindrical to ovoid, sometimes compressed, generally deciduous with pappus attached. ± 1500 genera, 23000 species: worldwide, many habitats. Flower and head types differ in form and sexual condition. A disk flower has a generally radial corolla, with a cylindrical tube, expanded throat, and generally 5 lobes. Disk flowers are generally bisexual and fertile but occasionally staminate with reduced ovaries. Discoid heads comprise only disk flowers. A radiant head is a variant of a discoid head, with peripheral disk flower corollas expanded, often bilateral. A ray flower corolla is bilateral, generally with a slender tube and flattened petal-like ray (single lip composed of generally 3 lobes). Ray flowers are generally pistillate or sterile (occasionally lacking styles). Radiate heads have peripheral ray flowers and central disk flowers. Disciform heads superficially resemble discoid heads, with pistillate or sterile flowers that lack rays, together with or separate from disk flowers. A ligulate flower is bisexual, with a bilateral, generally ephemeral corolla and 5-lobed ligule. Liguliflorous heads comprise only ligulate flowers. See glossary p. 31 for illustrations of family characteristics. *Echinops sphaerocephalus* L., *Gaillardia aristata* Pursh, *Gaillardia pulchella* Foug., *Hymenoxys loomisii* S.F. Blake, *Tagetes erecta* L., *Thelesperma megapotamicum* (Spreng.) Kuntze are waifs. *Melampodium perfoliatum* Kunth, historic urban waif. *Ageratum conyzoides* L., *Guizotia abyssinica* (L. f.) Cass., *Santolina chamaecyparissus* L., orth. var. are rare or uncommon escapes from cultivation. *Dyssodia papposa*, *Ismelia carinata* (Schousb.) Sch. Bip. [*Chrysanthemum carinatum* Schousb.], *Mantisalca salmantica* (L.) Briq. & Cavill. are historical or extirpated waifs in California. *Inula helenium* L. not documented in California. Taxa of *Aster* in TJM (1993) treated here in *Almutaster*, *Eucephalus*, *Eurybia*, *Ionactis*, *Oreostemma*, *Sericocarpus*, *Symphyotrichum*; *Chamomilla* in *Matricaria*; *Cnicus* in *Centaurea*; *Conyza* in *Erigeron* and *Laennecia*; *Dugaldia* in *Hymenoxys*; *Erechtites* in *Senecio*; *Hymenoclea* in *Ambrosia*; *Lembertia* in *Monolopia*; *Osteospermum ecklonis* in *Dimorphotheca*; *Picris echioides* in *Helminthotheca*; *Prionopsis* in *Grindelia*; *Raillardiopsis* in *Anisocarpus* and *Carlquistia*; *Schkuhria multiflora* in *Bahia*; *Trimorpha* in *Erigeron*; *Venidium* in *Arctotis*; *Whitneya* in *Arnica*. Taxa of *Arida* in TJM2 (2012) treated here in *Leucosyris*. —Scientific Editors: David J. Keil, Bruce G. Baldwin.

**Key to Groups**

1. None of flowers of head with strap-shaped corollas that resemble spreading petals [ligulate flowers 0, ray flowers 0 or rays very short and easily overlooked]; heads discoid, disciform, or radiant
2. Flowers of 2 kinds, in same or different heads
  3. Heads radiant; corollas of outer flowers [bisexual or sterile] conspicuously expanded, often ± bilateral ..... **Group 1**
  - 3' Heads disciform [pistillate or sterile flowers and bisexual or staminate flowers] or unisexual, corollas of pistillate or sterile flowers inconspicuous or 0 ..... **Group 2**
- 2' Flowers of 1 kind [disk flowers] — heads discoid
  4. Receptacle bearing scale-like bracts [paleae] that generally individually subtend disk flowers or bearing hair-like bristles or tooth-like to membranous or bristle-like scales among flowers
    5. Receptacle paleate or bearing tooth-like to membranous scales ..... **Group 3**
    - 5' Receptacle bristly or bearing long, bristle-like scales (free or fused at base) ..... **Group 4**
  - 4' Receptacle epaleate or paleae only marginal and simulating phyllaries (sometimes bearing minute scales or short hairs among flowers)
    6. Pappus 0 or only a low crown ..... **Group 5**
    - 6' Pappus well developed
      7. Pappus of bristles (sometimes with an additional series of shorter bristles or scales) ..... **Group 6**
      - 7' Pappus of flat, ± membranous scales or stiff, ± needle-like awns ..... **Group 7**
- 1' Some or all flowers of head with strap-shaped corollas or corolla lips [ligules or rays] that resemble spreading petals; heads liguliflorous, composed of 2-lipped flowers, or radiate

- 8. Head composed of 1 kind of flower; central flowers sometimes smaller or less mature but all bisexual and with same kind of corolla
  - 9. Head liguliflorous; corolla 1-lipped, the spreading, petal-like ligule tipped by 5 short lobes [ligulate flowers]; corolla readily withering; sap milky ..... **Group 8**
  - 9' Head composed of 2-lipped flowers; outer corolla lip shallowly 3-lobed, spreading, resembling ray of ray flower, inner lip deeply 2-lobed, recurved or coiled; corolla not readily withering; sap clear ..... **Group 9**
- 8' Head radiate, composed of 2 kinds of flowers; outer flowers [ray flowers] pistillate or sterile, corolla bilateral with generally spreading, petal-like lip [ray]; inner flowers [disk flowers] bisexual (staminate) with generally radial, (4)5-lobed tubular corolla
  - 10. Receptacle bearing scale-like bracts [paleae] that generally individually subtend disk flowers (sometimes only a single ring of paleae separate ray and disk flowers)
    - 11. Phyllaries in 1(2) series, each subtending a ray flower ..... **Group 10**
    - 11' Phyllaries in 2+ series, not all subtending ray flowers ..... **Group 11**
  - 10' Receptacle epaleate or bearing minute scales or hairs (rarely long bristles or awn-like projections) among flowers
    - 12. Pappus 0 or only a low crown ..... **Group 12**
    - 12' Pappus well developed on ray or disk fruits (or both)
      - 13. Pappus of flat, ± membranous scales or stiff, ± needle-like awns ..... **Group 13**
      - 14. Rays white to pink, blue, or purple ..... **Group 14**
      - 14' Rays yellow to orange or red ..... **Group 15**

**Group 1: Heads radiant; corollas of outer flowers enlarged, often ± bilateral**

- 1. Phyllaries graduated in 4–8 series
  - 2. Outer flowers fruiting
    - 3. Pappus of bristles; annual, taprooted ..... **LESSINGIA** {G6,7}
    - 3' Pappus a crown of short scales; perennial herb with rhizome ..... *Tanacetum bipinnatum*
  - 2' Outer flowers sterile
    - 4. Distal phyllary margin expanded as a spiny-toothed, fringed, or irregularly toothed appendage ..... **CENTAUREA** {G2,4}
    - 4' Distal phyllary margin entire or minutely spiny-toothed, tapered smoothly to ± flattened spine at tip ..... *Volutaria muricata*
- 1' Phyllaries ± equal or weakly graduated in 1–3 series
  - 5. Fruit 10–15 mm ..... **PALAFXIA** {G7}
  - 5' Fruit 2–9 mm
    - 6. Phyllary margin thin, ± scarious, brown to purple ..... **HYMENOTHRIX** {G7}
    - 6' Phyllary margin not or scarcely scarious, variously colored
      - 7. Leaves opposite ..... *Arnica discoidea*
      - 7' Leaves alternate
        - 8. Pappus scales entire or fringed; leaf entire to ± deeply 1–2-pinnately lobed ..... **CHAENACTIS** {G7}
        - 8' Pappus scales dissected into bristles; leaf sharply dentate or with a few short, sharp lobes ..... **TRICHOPTILIUM** {G6,7}

**Group 2: Heads disciform or unisexual; flowers of 2 kinds or of 1 unisexual kind; corollas of pistillate or sterile flowers inconspicuous**

1. Pistillate and staminate flowers in different heads
2. Pistillate and staminate heads on same plant [monoecious]
  3. Subshrub or shrub (to small tree) ..... **AMBROSIA** (2)
  - 3' Herb
    4. Stem armed with 3-branched spines ..... *Xanthium spinosum*
    - 4' Stem unarmed
      5. Staminate heads well-spaced in long terminal inflorescence; bur 2–10 mm ..... **AMBROSIA** (2)
      - 5' Staminate heads congested; bur 10–30+ mm ..... *Xanthium strumarium*
- 2' Pistillate and staminate heads on different plants [dioecious]
  6. Shrub or erect herb with sticky leaves, not woolly ..... **BACCHARIS** {G6}
  - 6' Herb, sometimes prostrate, not sticky; plant generally ± woolly
    7. Stem from rhizome; leaf rosette withered at flower; cauline leaves long, all except distal-most ± equal **ANAPHALIS** (2) {G6}
    - 7' Stem from persistent leaf rosette or thick, often branched caudex; cauline leaves generally ± reduced, at least distal-most short, 1–3 cm ..... **ANTENNARIA** {G6}
- 1' Pistillate or sterile flowers in same head as staminate or bisexual flowers
  8. Outer flowers without corollas; heads not embedded in woolly hairs
    9. Heads solitary; plant low, stems often spreading or prostrate
      10. Head on slender ± leafless peduncle; outer fruits stalked, not spine-tipped ..... **COTULA**
      - 10' Head sessile near stem base or at branch tips, ± enveloped by sheathing bases of opposite or whorled subtending leaves, overtopped by branches; fruit sessile, spine-tipped ..... **SOLIVA**
    - 9' Heads in raceme- or panicle-like clusters
      11. Annual; fruit smooth or warty, generally winged, glabrous or hairy ..... **DICORIA**
      - 11' Subshrub or shrub; fruit long-soft-hairy, not winged ..... *Euphrosyne acerosa*
  - 8' Outer flowers with (sometimes narrowly cylindric) corollas; heads sometimes embedded in woolly hairs
    12. Outer flowers sterile; head not very small, not embedded in woolly hairs
      13. Cauline leaves generally bladeless, sheathing; basal leaves from creeping rhizome, often appearing after flower stem, long-petioled, palmately lobed ..... **PETASITES** {G14}
      - 13' Cauline leaves with blades, sometimes reduced distally on stem, not sheathing; basal leaves 0 or from taproot, appearing before flower stem, sessile or petioled, entire to 1–2-pinnately lobed
        14. Fertile flowers 1–2 per head ..... **CRUPINA** {G3}
        - 14' Fertile flowers many per head
          15. Leaf spiny ..... *Centaurea benedicta* {G4}
          - 15' Leaf not spiny
            16. Pappus of awns with reflexed barbs; phyllaries in 2 series, unarmed ..... **BIDENS** {G3,11}
            - 16' Pappus 0 or of smooth or minutely rough bristles or narrow scales; phyllaries graduated in 5+ series, often fringed or spine-tipped
              17. Distal phyllary margin expanded as a spiny-margined, fringed, or irregularly toothed appendage **CENTAUREA** {G1,4}
              - 17' Distal phyllary margin entire, tapered smoothly to ± flattened spine at tip ..... *Volutaria canariensis*
    - 12' Outer flowers pistillate [corolla often narrowly cylindric]; heads sometimes very small, embedded in woolly hairs
      18. Phyllaries (or outermost bracts of head) papery, membranous, + or scarious, sometimes green only in proximal 1/2 or in narrow, central band; heads often embedded in woolly hairs
        19. Phyllaries 0 or 1–6, not overlapping, < flowers; outer receptacle paleate; some or all pistillate flowers individually subtended by paleae (which often resemble phyllaries)
        20. Disk flowers bisexual, pappus generally of 13–28+ bristles, ± exserted; inner pistillate flowers with pappus

21. Receptacle  $\pm$  cylindric, height 5–15  $\times$  diam; most pistillate paleae open to folded around pistillate flowers, but not enclosing them, acuminate or bristle-tipped; innermost paleae erect or ascending in fruit; outer fruit  $\pm$  = inner ..... **FILAGO**
- 21' Receptacle mushroom-shaped to obovoid, length 0.4–15  $\times$  width; most pistillate paleae  $\pm$  enclosing pistillate flowers, obtuse to acute; innermost paleae spreading in fruit; outer fruit  $>$  inner ..... **LOGFIA**
- 20' Disk flowers staminate, pappus 0 or 1–12 bristles, included; pistillate flower pappus 0
22. Paleae subtending disk flowers (disk paleae) enlarged, rigid,  $\pm$  spreading, very different from scales subtending pistillate flowers (pistillate paleae)
23. Disk palea tips strongly incurved to hooked inward, acuminate or abruptly pointed, often spine-like; pistillate paleae closed, strongly 3-veined or middle vein obscure, tips generally strongly scarious-winged; receptacle not bristly, generally widest at tip ..... **ANCISTROCARPHUS**
- 23' Disk palea tips erect or spreading,  $\pm$  flat to folded, not spine-like, obtuse; pistillate paleae open, concave, veins obscure, tips not or barely scarious-winged; receptacle bristly, widest at base ..... **HESPEREVAX**
- 22' Disk paleae 0 or scales  $\pm$  gradually reduced, scarious, erect
24. Leaves generally opposite; paleae net-veined, inner edge with scarious wing that is hidden in head; pappus 0 ..... **PSILOCARPHUS**
- 24' Leaves alternate or seeming whorled; paleae parallel-veined, scarious wing visible in head; pappus 0 or generally of 1–12 bristles
25. Phyllaries 4–6, equal, scarious, obovate, rounded, abruptly different from paleae; style on inner edge of fruit; receptacle length  $\pm$  1–2  $\times$  width ..... **MICROPUS**
- 25' Phyllaries 0 or 1–4, unequal, vestigial or  $\pm$  like paleae; style  $\pm$  at fruit tip; receptacle length  $\pm$  3–8  $\times$  width ..... **STYLOCLINE**
- 19' Phyllaries generally many, overlapping, inner often  $\geq$  flowers; receptacle epaleate; pistillate flowers not subtended by bracts
26. Pappus 0 or a minute crown ..... **ARTEMISIA** (3) {G5}
- 26' Pappus of bristles
27. Herbage short-appressed-hairy, glandular, or silky; distal 1/2 of outer phyllaries leathery, scarious margin 0 or narrow ..... **PLUCHEA** (2)
- 27' Herbage  $\pm$  long-hairy (leaf generally densely woolly abaxially); phyllaries thin, membranous, margin scarious distal to middle or throughout, generally wide
28. Shrub or subshrub; stem slender, much-branched ..... **PLECOSTACHYS**
- 28' Herb (if subshrub, stem erect or ascending)
29. Plant with creeping rhizome ..... **ANAPHALIS** (2) {G6}
- 29' Plant taprooted, fibrous-rooted (sometimes from leafy stolons), or with caudex
30. Heads generally in tight groups in generally spike- or narrow, panicle-like cluster (reduced to terminal cluster in small plants); pappus bristles fused at base, falling in ring ..... **GAMOCHAETA**
- 30' Heads in axillary or terminal head-like clusters or in  $\pm$  open, flat-topped to panicle-like clusters; pappus bristles free or  $\pm$  fused at base and falling in groups
31. Heads in dense, hemispheric to  $\pm$  spheric terminal cluster closely subtended by involucre-like ring of leafy bracts, sometimes also in head-like axillary clusters ..... **EUCHITON**
- 31' Heads in axillary clusters or terminal clusters, not closely subtended by involucre-like cluster of leafy bracts
32. Annual, 1–30 cm, low-growing; stems generally prostrate or spreading; head clusters  $\pm$  sessile, axillary or terminal; drying mud, shorelines, other moist habitats ..... **GNAPHALIUM**
- 32' Annual to perennial herb, 15–200 cm; stems generally erect or ascending, head clusters generally terminal, sessile to stalked, often branched; generally dry habitats ..... **PSEUDOGNAPHALIUM**
- 18' Phyllaries generally green ( $\pm$  purple) throughout, sometimes scarious-margined or inner scarious throughout; heads generally not embedded in woolly hairs

33. Pappus well developed
34. Pappus of flattened scales or barbed awns
35. Leaves generally opposite throughout (occasionally distal-most alternate) ..... **LASTHENIA** {G12,13}
- 35' Leaves mostly alternate, sometimes very crowded
36. Plant dotted with sessile resin glands; fruit 3–4-angled ..... **AMBLYOPAPPUS** (2) {G12,13}
- 36' Plant densely woolly; fruit compressed
37. Leaves entire; pappus scales 2; plant densely tufted; GB ..... **EATONELLA** {G13}
- 37' Leaves generally wavy-dentate or shallowly lobed; pappus scales 2–7; plant not densely tufted;  
sSnJV ..... **Monolopia congdonii** {G12,13}
- 34' Pappus of bristles
38. Main phyllaries in 1 series, equal ..... **SENECIO** {G6,15}
- 38' Main phyllaries in 2+ series
39. Subshrub or shrub
40. Stems ± leafless; receptacle paleate; pappus bristles plumose ..... **BEBBIA**
- 40' Stems evidently leafy; receptacle epaleate; pappus bristles ± smooth to barbed
41. Corolla yellow or becoming ± red-purple; leaves generally ± toothed; pistillate flowers 5–18 ..... **HAZARDIA**
- 41' Corolla pink to deep rose; leaves entire; pistillate flowers many ..... **Pluchea sericea**
- 39' Annual or perennial herb
42. Stem thread-like; pistillate flowers 1–5 ..... **PENTACHAETA** (3) {G12,14,15}
- 42' Stem stouter; pistillate flowers several to many
43. Pappus bristles 1–2; leaf palmately lobed or toothed ..... **Perityle emoryi** (2) {G12,13,14}
- 43' Pappus bristles generally many; leaf entire to pinnately lobed
44. Head ± flat, button-like ..... **ERIGERON** (2) {G6,14,15}
- 44' Head generally cylindric, bell-shaped, or ± obconic
45. Disk flower corolla purple; herbage strongly scented; anther bases short-tailed ..... **PLUCHEA** (2)
- 45' Disk flower corolla cream or yellow; herbage not strongly scented; anther bases not tailed
46. Disk corolla 9–13 mm ..... **Pyrrocoma carthamoides** var. **cusickii**
- 46' Disk corolla 3–5 mm
47. Leaf not clasping, entire, toothed, or shallowly few-lobed ..... **ERIGERON** (2) {G6,14,15}
- 47' Leaf clasping, regularly dentate or spreading-lobed ..... **LAENNECIA**
- 33' Pappus 0 or reduced to a minute crown
48. Phyllary margins widely scarious or transparent
49. Delicate annual; pistillate corollas thread-like ..... **PENTACHAETA** (3) {G12,14,15}
- 49' Perennial herb or stout annual; pistillate corollas short, wider than thread-like
50. Heads in spikes, racemes, or panicles ..... **ARTEMISIA** (3) {G5}
- 50' Heads 1 or few to many in ± flat-topped clusters
51. Involucre generally 3–5 mm diam, phyllaries generally 12–20; pappus 0 ..... **SPHAEROMERIA**
- 51' Involucre 5–22 mm diam, phyllaries generally 30–60; pappus crown-like, 0.1–0.5+ mm ..... **TANACETUM** {G12}
- 48' Phyllary margins generally not scarious or transparent
52. Ovary of disk flower much reduced; style tip truncate or tack-shaped
53. Leaf ovate to widely triangular, generally ± basal or proximal cauline, green adaxially, white  
abaxially; inflorescence open; corolla white; fruit bearing stalked glands ..... **ADENOCAULON**
- 53' Leaf linear to (ob)ovate or ± round, basal and cauline or all cauline, faces ± alike, generally green to  
gray on 1 or both faces; inflorescence ± dense; corolla ± pale yellow, yellow-white, or ± pink; fruit not glandular
54. Anthers fused ..... **ARTEMISIA** (3) {G5}
- 54' Anthers ± free or only weakly fused
55. Annual; leaf 1–2-pinnately divided ..... **Euphrosyne nevadensis**
- 55' Perennial herb or subshrub; leaf generally entire ..... **IVA**

- 52' Ovary of disk flower well developed; style tip  $\pm$  branched
56. Leaf wide, palmately lobed or toothed ..... *Perityle emoryi* (2) {G12,13,14}
- 56' Leaf linear to narrowly oblanceolate, entire or pinnately toothed to lobed
57. Plant not glandular, not strongly scented
58. Leaves opposite ..... *Lasthenia microglossa*
- 58' Leaves alternate ..... **PENTACHAETA** (3) {G12,14,15}
- 57' Plant glandular,  $\pm$  strongly scented
59. Pappus present ..... **AMBLYOPAPPUS** (2) {G12,13}
- 59' Pappus 0
60. Fruit of pistillate flower compressed front-to-back ..... **HEMIZONELLA** {G10}
- 60' Fruit of pistillate flower compressed side-to-side or  $\pm$  3-angled in  $\times$ -section ..... **MADIA** {G10}

**Group 4: Heads discoid; receptacle bristly or bearing long, bristle-like scales (free or  $\pm$  fused at base)**

1. Leaves not spiny
2. Phyllaries spine-tipped
3. Phyllary tip-spines hooked ..... **ARCTIUM**
- 3' Phyllary tip-spines not hooked
4. Phyllary tip fringed with spines or slender teeth ..... **CENTAUREA** (2) {G1,2}
- 4' Phyllary tip entire or minutely spiny-toothed, tapered to spine ..... **VOLUTARIA**
- 2' Phyllaries not spine-tipped
5. Phyllary tips (at least inner)  $\pm$  prominently expanded,  $\pm$  fringed with short spines or irregular teeth .. **CENTAUREA** (2) {G1,2}
- 5' Phyllary tips not expanded or fringed
6. Proximal leaves linear to oblong or oblanceolate, often lobed or divided; attachment scar of fruit lateral ..... **ACROPTILON**
- 6' Proximal leaves lanceolate to triangular, sharply dentate; attachment scar of fruit basal ..... **SAUSSUREA** {G6}
- 1' Leaves spiny or spiny-toothed
7. Corolla yellow to orange-red
8. Pappus of many, unequal, narrow scales in several series (sometimes 0), generally 0 on outer fruits; flowers all fertile; fruit 4-angled ..... **CARTHAMUS** {G3,5}
- 8' Pappus of 20 stiff bristles or awns in 2 series, on all fruits; outer flowers sterile [corolla 3-lobed; ovary vestigial]; fruit cylindrical, 20-ribbed ..... *Centaurea benedicta* {G2}
- 7' Corolla white to blue, red, or purple
9. Pappus of long-plumose bristles
10. Largest leaves toothed to deeply lobed; involucre body 1–6 cm diam; receptacle generally not fleshy; phyllaries linear to ovate ..... **CIRSIUM**
- 10' Largest leaves often  $\pm$  compound; involucre body 4–15 cm diam; receptacle fleshy; phyllaries ovate ..... **CYNARA**
- 9' Pappus of  $\pm$  rough or barbed bristles or slender scales
11. Stem spiny-winged ..... **CARDUUS**
- 11' Stem not spiny-winged
12. Leaf not blotched along veins; heads not long-peduncled; pappus of many, unequal, narrow scales in several series ..... [*Carthamus leucocaulos*]
- 12' Leaf white-blotched along veins; heads long-peduncled; pappus of many long bristles, deciduous in a ring ..... **SILYBUM**

**Group 11: Heads radiate; phyllary series 2 or more, none or only some individually subtending ray flowers; receptacle paleate, generally ± throughout (only between ray and disk flowers in *Rigiopappus*)**

1. Rays white to pink or purple
2. Disk corollas white or pink
  3. Leaves finely dissected, aromatic; heads many in flat-topped clusters; rays ovate to round ..... **ACHILLEA**
  - 3' Leaves entire or toothed, not aromatic; heads solitary or in small cymes; rays narrowly linear ..... **ECLIPTA**
- 2' Disk corollas yellow
  4. Leaves entire or toothed
    5. Leaves opposite, ± ovate ..... **GALINSOGA**
    - 5' Leaves alternate, linear or lance-linear to narrowly oblanceolate ..... **RIGIOPAPPUS** (2) {G12,13}
  - 4' Leaves pinnately lobed or dissected to compound
    6. Phyllaries in 2 very different series [inner ± membranous]
      7. Leaves pinnate; leaflets flat, serrate; rays short, inconspicuous ..... *Bidens pilosa*
      - 7' Leaves 1–3-pinnately dissected, segments narrowly linear, entire; rays long, conspicuous ..... **COSMOS**
    - 6' Phyllaries graduated in 2–several series, unequal, margins scarious or transparent
      8. Fruit initially hairy, densely tomentose in age ..... **LASIOSPERMUM**
      - 8' Fruit glabrous
        9. Base of corolla narrow ..... **ANTHEMIS**
        - 9' Base of corolla wide, enclosing fruit tip ..... **CHAMAEMELUM**
- 1' Rays yellow to orange (sometimes multi-colored)
  10. Paleae flat, linear to ovate, not folded around disk ovaries
    11. Phyllaries ± alike, in 2+ series
      12. Phyllaries graduated in several series, unequal, margins scarious or transparent — pappus crown-like, generally 0.2–0.3 mm ..... **[COTA]**
      - 12' Phyllaries not strongly graduated, ± equal, margins not scarious or transparent (except inner phyllaries of *Rigiopappus*)
        13. Leaves oblong to ovate, entire to pinnately lobed; pappus scales awn-tipped ..... **[GAILLARDIA]** {G13}
        - 13' Leaves linear, entire; pappus scales stiff, tapered ..... **RIGIOPAPPUS** (2) {G12,13}
    - 11' Phyllaries in 2 very different series, outer with leaf-like texture, inner ± membranous
      14. Pappus of awns with reflexed barbs ..... **BIDENS** {G2,3}
      - 14' Pappus 0 or of flat scales
        15. Leaves alternate or all basal; ray flowers fertile ..... **LEPTOSYNE**
        - 15' Leaves opposite; ray flowers sterile ..... **COREOPSIS**
  - 10' Paleae each folded around a disk flower ovary
    16. Ray flowers fruiting [style present, ovary well developed]
      17. Annual; disk fruit compressed, winged ..... *Verbesina encelioides* subsp. *exauriculata*
      - 17' Perennial herb or subshrub; disk fruit compressed or 3–4-angled, not winged
        18. Leaves mostly ± basal, cauline 0 or few; pappus 0 ..... **BALSAMORHIZA**
        - 18' Leaves basal and cauline; pappus of scales or 0
          19. Disk corolla ± 5 mm; cauline leaves many ..... **PALLENIS**
          - 19' Disk corolla 8–12 mm; cauline leaves few ..... **WYETHIA**
    - 16' Ray flowers sterile [style generally 0, ovary vestigial]
      20. Fruit strongly compressed, margin ± thin
        21. Fruit margin ciliate
          22. Subshrub or shrub ..... **ENCELIA**
          - 22' Annual or perennial herb (sometimes with woody caudex)
            23. Leaves all ± basal, gray or silvery, entire ..... **ENCELIOPSIS** (2)



- 23' Leaves mostly cauline, green, entire or toothed ..... *Geraea canescens*
- 21' Fruit margin not ciliate
  - 24. Leaves all ± basal, silvery or gray; fruit margin corky ..... **ENCELIOPSIS** (2)
  - 24' Leaves basal and cauline or all cauline, green; fruit margin thin or winged
    - 25. Perennial herb; leaves basal and cauline, entire ..... **HELIANTHELLA**
    - 25' Subshrub; leaves cauline, some often toothed ..... *Verbesina dissita*
- 20' Fruit weakly compressed or not, margin generally not thin
  - 26. Receptacle widely cylindrical to conic or ± spheric; disk corollas yellow-green or dark brown-purple
    - 27. Involucre at early flower 8–16 mm diam; fruit compressed, ciliate abaxially — phyllary series unequal, outer >> inner ..... **RATIBIDA**
    - 27' Involucre at early flower 15–30+ mm diam; fruit not compressed, not ciliate abaxially ..... **RUDBECKIA**
- 26' Receptacle generally flat to convex, if conic, disk corollas yellow or yellow-orange
  - 28. Pappus 0 ..... **HELIOMERIS**
  - 28' Pappus present
    - 29. Herb (subshrub); pappus scales generally readily deciduous ..... **HELIANTHUS**
    - 29' Subshrub or shrub; pappus scales persistent or readily deciduous (if subshrub, pappus persistent)
      - 30. Leaf oblong or narrowly lanceolate to ovate or triangular, base obtuse or rounded to truncate or cordate ..... **BAHIOPSIS**
      - 30' Leaf elliptic to widely obovate, base tapered, wedge-shaped ..... **VIGUIERA**

**Group 15: Heads radiate; rays yellow to red; receptacle epaleate; pappus of bristles**

- 1. Leaves opposite at least proximally
  - 2. Leaves and phyllaries dotted or streaked with embedded, translucent oil glands, strongly scented
    - 3. Leaves sharply toothed to pinnately dissected; phyllaries in 2 series ..... **ADENOPHYLLUM** (3) {G13}
    - 3' Leaves linear, entire, base bristly-ciliate; phyllaries 8, in 1 series ..... **PECTIS** {G12,13}
  - 2' Leaves and phyllaries without embedded oil glands, not or faintly scented
    - 4. Trailing fleshy perennial herb; pappus bristles 1–5; coastal saline habitats ..... **JAUMEA**
    - 4' Erect annual or perennial herb, not fleshy; pappus bristles many; inland
      - 5. Perennial herb, generally from rhizome; involucre generally 8–20 mm; pappus bristles >> 2 mm, free ..... **ARNICA** {G6}
      - 5' Annual; involucre 5–7 mm; pappus bristles 1–2 mm, fused at base ..... **SYNTRICHOPAPPUS** (2) {G14}
- 1' Leaves alternate throughout
  - 6. Annual or biennial
    - 7. Phyllary tip with a prominent tack-shaped gland; disk flowers staminate ..... **BENTOA**
    - 7' Phyllary tip without a prominent tack-shaped gland; disk flowers bisexual
      - 8. Ray fruit pappus 0 [disk fruit pappus present]
        - 9. Phyllaries in 1 series, fused at base ..... **CROCIDIUM** (2)
        - 9' Phyllaries in 2–several series, free ..... **HETEROTHECA** (2)
      - 8' Ray [and disk] fruits with pappus
        - 10. Main phyllaries unequal, in 2–several series
          - 11. Pappus bristles flat, deciduous; involucre gummy-resinous ..... **GRINDELIA** (3) {G6,7,13}
          - 11' Pappus bristles generally ± cylindrical or flattened only at base, generally persistent; involucre not gummy-resinous
            - 12. Pappus double, outer of short scales, inner of 8–16+ bristles ..... **PULICARIA** (3)
            - 12' Pappus single or, if double, of bristles throughout
              - 13. Fruit distally long-tapered; rays 1–1.5+ mm ..... **TRACYINA** {G14}
              - 13' Fruit not distally long-tapered; rays ≤ 12 mm
                - 14. Leaves serrate to 1–2-pinnately lobed ..... *Xanthisma gracile*

- 14' Leaves entire to finely toothed
15. Plant sticky-glandular, strongly aromatic; heads many in dense raceme- or ± panicle-like clusters ..... *Dittrichia graveolens*
- 15' Plant not glandular, not aromatic; heads solitary or few in open, ± flat-topped cluster ..... **PENTACHAETA** (2) {G2,12,14}
- 10' Main phyllaries ± equal, in 1–3 series
16. Phyllary margins evidently scarious
17. Rays 3–12 mm; pappus single, of 5–20 bristles ..... **PENTACHAETA** (2) {G2,12,14}
- 17' Rays 1.5–2 mm; pappus double, outer of short scales, inner of 8–16+ bristles ..... **PULICARIA** (3)
- 16' Phyllary margins not or only slightly scarious (except alternate phyllaries in *Syntrichopappus*)
18. Receptacle conic; phyllaries fused at base ..... **CROCIDIUM** (2)
- 18' Receptacle ± flat; phyllaries free
19. Phyllaries generally 5, ± enfolding ray fruits ..... **SYNTRICHOPAPPUS** (2) {G14}
- 19' Phyllaries generally 8, 13, or 21, not enfolding ray fruits
20. Plant with short, button-like caudex, with many fleshy-fibrous, unbranched roots ..... **SENECIO** (7) {G2,6}
- 20' Plant tap- or fibrous rooted, without fleshy-fibrous, unbranched roots
21. Phyllary tips black ..... **SENECIO** (7) {G2,6}
- 21' Phyllary tips green
22. Rays 7–15+ mm; biennial ..... **PACKERA** (2) {G6}
- 22' Rays ≤ 3 mm; slender annual ..... **SENECIO** (7) {G2,6}
- 6' Perennial herb to shrub
23. Shrub or subshrub
24. Outer phyllaries with an embedded, translucent oil gland near tip; plant strongly pungent-scented ..... **ADENOPHYLLUM** (3) {G13}
- 24' Outer phyllaries without oil glands; plant scented or not
25. Main phyllaries in 1 series, equal (often a few, generally much shorter, outer phyllaries present) ..... **SENECIO** (7) {G2,6}
- 25' Main phyllaries in 2–7 series, often graduated, often unequal
26. Pappus bristles flattened; phyllaries ± ovate
27. Phyllary tips recurved to coiled; involucre gummy; ray flowers 20–60 ..... **GRINDELIA** (3) {G6,7,13}
- 27' Phyllary tips ± appressed; involucre ± resinous but not gummy; ray flowers 1–14
28. Rays 5–14, >> involucre; disk flowers 30–80, fruiting ..... *Acamptopappus shockleyi* {G13}
- 28' Rays 1–2, barely > involucre; disk flowers 3–7, staminate ..... **AMHIPAPPUS** {G13}
- 26' Pappus bristles ± cylindrical; phyllaries generally linear to narrowly lanceolate
29. Woody stems ± prostrate, plant cushion-forming
30. Leaves 1-veined, linear, of uniform size throughout ..... **NESTOTUS** (2)
- 30' Leaves 3-veined, narrowly elliptic to oblanceolate, distal reduced ..... **STENOTUS** (2)
- 29' Woody stems generally erect or ascending
31. Phyllaries graduated in 2–4 series, bases loose to tightly appressed, tips weakly thickened or not, green or straw-colored, not tomentose; proximal leaves entire or toothed
32. Proximal leaves toothed; style branches of disk flowers linear; fruit ± 2 mm ..... *Dittrichia viscosa*
- 32' Proximal leaves entire; style branches of disk flowers lanceolate to awl-shaped; fruit 2–8 mm .... **ERICAMERIA** {G6}
- 31' Phyllaries strongly graduated in 5–7 series, bases tightly appressed, straw-colored, tips clearly thickened, green (sometimes phyllaries densely tomentose); leaves often toothed
33. Distal leaves generally not much reduced ..... **HAZARDIA** {G6}
- 33' Distal leaves reduced to scale-like bracts ..... **XANTHISMA** (2)
- 23' Herb
34. Outer phyllaries with an embedded, translucent oil gland near tip; plant strongly pungent-scented **ADENOPHYLLUM** (3) {G13}
- 34' Outer phyllaries without oil glands; plant scented or not

35. Main phyllaries in 1 series, equal [often with a few, very short, outer phyllaries]
36. Stem from an abruptly shortened, button-like caudex, with many fleshy-fibrous, unbranched roots .. **SENECIO** (7) {G2,6}
- 36' Stem from a taproot, caudex, or rhizome, never with an abruptly shortened, button-like caudex
37. Leaves  $\pm$  equal,  $\pm$  evenly distributed along stem or crowded distally at flower ..... **SENECIO** (7) {G2,6}
- 37' Leaves reduced distally; proximal leaves prominent, generally persistent
38. Stem from thin taproot, caudex, or rhizome; roots fibrous, branched; leaf  $\pm$  entire to pinnately lobed, marginal teeth not hard, not translucent ..... **PACKERA** (2) {G6}
- 38' Stem from thick, creeping or erect rhizome; roots fleshy, unbranched; leaf dentate to minutely dentate, marginal teeth hard, translucent — leaf tapered to winged petiole ..... **SENECIO** (7) {G2,6}
- 39' Phyllaries in 2+ series,  $\pm$  equal to strongly graduated
39. Disk pappus double, outer of very short bristles or scales
40. Stem simple, erect; phyllaries  $\pm$  equal — fruit 2-ribbed ..... **ERIGERON** {G2,6,14}
- 40' Stem generally branched, prostrate to erect; phyllaries generally  $\pm$  unequal
41. Rays 3–12 mm; disk fruit 1.5–4 mm,  $\pm$  flat; pappus 3–7 mm ..... **HETEROTHECA** (2)
- 41' Rays 1.5–2.5 mm; disk fruit  $\pm$  1 mm,  $\pm$  cylindrical or fusiform; pappus 2–3 mm
42. Outer pappus of bristles, 1.5 mm; anther base appendages 0 ..... **EUTHAMIA** (2)
- 42' Outer pappus a crown of  $\pm$  fused scales, < 0.4 mm; anther base appendages bristle-like ..... **PULICARIA** (3)
- 39' Disk pappus single
43. Pappus bristles flat, deciduous; involucre strongly gummy-resinous, especially in bud ..... **GRINDELIA** (3) {G6,7,13}
- 43' Pappus bristles  $\pm$  cylindrical, generally persistent; involucre not strongly gummy-resinous
44. Leaf toothed or lobed
45. Heads generally small, in racemes or panicles, often clustered on 1 side of branches ..... **SOLIDAGO** (2)
- 45' Heads generally not small, not in 1-sided clusters
46. Basal rosette well developed
47. Plant with stout taproot; stems, leaves glabrous or tomentose to woolly and/or stalked-glandular; fruit 3–4 angled ..... **PYRROCOMA** (2)
- 47' Plant with branched caudex, taprooted; stems, leaves stalked-glandular, sticky, otherwise glabrous; fruit not 3–4 angled ..... **TONESTUS** (2)
- 46' Basal rosette 0 or poorly developed
48. Fruit 2–3 mm, obconic; leaf teeth or lobes bristle- or minutely spine-tipped ..... **XANTHISMA** (2)
- 48' Fruit 3–10 mm,  $\pm$  cylindrical or compressed; leaf margin not bristle- or minutely spine-tipped
49. Fruit 5–10 mm, glabrous; phyllaries in 4–5 series, strongly graduated ..... *Hazardia whitneyi*
- 49' Fruit 2.5–6 mm, hairy; phyllaries in 3–4 series,  $\pm$  equal or weakly graduated ..... **TONESTUS** (2)
- 44' Leaf entire
50. Phyllaries in vertical ranks; disk flowers staminate ..... **PETRADORIA**
- 50' Phyllaries not in vertical ranks; disk flowers fruiting
51. Heads small, in clusters at branch tips; inflorescence leafy, panicle-like or  $\pm$  flat-topped; stem erect from rhizome; fruit  $\pm$  1 mm ..... **EUTHAMIA** (2)
- 51' Heads small to large, 1–several; inflorescence various; stem from taproot, caudex, or rhizome; fruit generally  $\gg$  1 mm
52. Plant with stout taproot — basal rosette well developed ..... **PYRROCOMA** (2)
- 52' Plant with  $\pm$  branched caudex or rhizome
53. Plant densely long-stalked-glandular ..... *Tonestus lyallii*
- 53' Plant glandless or short-stalked-glandular
54. Rays 1–6 mm; cauline leaves distributed well up stem ..... **SOLIDAGO** (2)
- 54' Rays 7–12 mm; cauline leaves generally only at stem base
55. Leaves 1-veined, linear to oblanceolate, of uniform size throughout ..... **NESTOTUS** (2)
- 55' Leaves 3-veined, narrowly elliptic to oblanceolate, distal reduced ..... **STENOTUS** (2)

**DITTRICHIA**  
**Thomas J. Rosatti**

Annual or subshrub, sticky-glandular; odor strong, considered unpleasant by most people. **Leaf:** basal and cauline, alternate, sessile. **Inflorescence:** heads radiate, many, in dense raceme- or ± panicle-like clusters; involucre ± ovoid, ± bell-shaped when pressed; phyllaries graduated in 3–4 series, reflexed in fruit; receptacle flat, pitted, epaleate. **Ray flower:** (6)10–18; corolla yellow, ray 3-lobed, not or barely or clearly exceeding phyllaries. **Disk flower:** 9–14 or 25–40; corolla 4–5-lobed, yellow; anther base tailed, tip acute; style tips linear. **Fruit:** ellipsoid to ± cylindric, abruptly narrowed below pappus, glandular-hairy; pappus of barbed bristles, in 1 row, fused at base. 2 species: western Europe, Mediterranean, southwestern Asia; introduced, naturalized elsewhere. (M. Dittrich, German student of Asteraceae, b. 1934) [Preston 2006 FNANM 19:473] *Dittrichia viscosa* added, as naturalized.

1. Ray 2–5(7) mm, not or barely exceeding phyllaries; annual ..... *D. graveolens*  
 1' Ray 8–12 mm, clearly exceeding phyllaries; subshrub ..... *D. viscosa*

**D. graveolens** (L.) Greuter STINKWORT  
**NATURALIZED**

Plant erect, 2–10 dm. **Stem:** generally 1, from base, much-branched, not woody. **Leaf:** cauline 1–5 cm, 1–4 mm wide, linear to linear-oblongate, teeth 0–few. **Inflorescence:** peduncle 0–5 mm; involucre 4–7 mm. **Ray flower:** (6)10–12. **Disk flower:** 9–14; corolla ± 4.5 mm. **Fruit:** ± 2 mm; pappus bristles 25–30, 3–4(5) mm.  $2n=18, 20+$ . Disturbed areas; < 700 m. n SNF, GV, CCo, SnFrB, SCo, expected elsewhere; native to western Europe, Mediterranean, southwestern Asia, introduced, possibly naturalized in New York, Connecticut, New Jersey, Europe, Asia, Africa, South America, Australia. Increasingly problematic, potentially threatening to agriculture, livestock, wildlands; possibly causing contact dermatitis. Sep–Nov {Weed listed by Cal-IPCI}

**D. viscosa** (L.) Greuter FALSE YELLOWHEAD  
**NATURALIZED**

Plant erect, 4–13 dm. **Stem:** generally 1–many, from near base, branched, woody. **Leaf:** cauline 4–6 cm, 6–13 mm wide, lanceolate to oblanceolate, teeth few–many on proximal, ± 0 on distal. **Inflorescence:** peduncle 7–12 mm; involucre 6–8 mm. **Ray flower:** 12–18. **Disk flower:** 25–40; corolla 6–7.5 mm. **Fruit:** ± 2 mm; pappus bristles 15–20, 4–6 mm.  $2n=18$ . roadsides, disturbed places, creeksides; ± 43 m. CCo/ScV (sw of I-80/I-680 interchange), expected elsewhere; native to Mediterranean Basin. In North America, collected in ballast on east coast in late 1800s but then not again until 2014, in California, where it is reportedly scheduled for eradication; in Australia, on list of 28 most threatening non-native plants, even though considered only to be in early stages of establishment there. Sep–Nov

**LAGOPHYLLA HARE-LEAF**  
**Bruce G. Baldwin**

Annual 1–10(15) dm. **Stem:** ± erect. **Leaf:** mostly cauline, proximal opposite, most alternate, ± sessile; blade narrowly elliptic to linear or proximal oblanceolate to spoon-shaped, entire or proximal sometimes toothed, coarse-, soft-, or silky-hairy or strigose, all or distal sometimes also stalked-glandular. **Inflorescence:** heads radiate, in tight groups or ± panicle-like clusters; involucre 3–6+ mm diam, ± hemispheric or obovoid to obconic, sometimes subtended by calyx-like set of bracts; phyllaries 5 in 1 series, linear to oblanceolate, each wholly enveloping a subtended ray ovary, spreading and falling with fruit, on angles coarsely long-straight-hairy to minutely coarse-hairy or scabrous; receptacle flat to convex, densely bristly; paleae in ring between ray and disk flowers, fused or free, scarious. **Ray flower:** 5; corolla yellow, ray fan-shaped, deeply lobed, abaxially often red- to purple-veined. **Disk flower:** 6, staminate; corolla yellow, tube < throat, lobes deltate; anthers ± dark purple, tips triangular-ovate to ± rounded; style glabrous proximal to undivided, awl-shaped, short-hairy tip. **Fruit:** ray fruit ± compressed front-to-back, glabrous, black, tip beakless, pappus 0; disk fruit 0, pappus 0. 5 species: California, to Washington, Montana, Nevada. (Greek: hare leaf, for soft-hairy leaves) [Baldwin 2013 Madroño 60:249–254] Easily overlooked; leaves wither early, heads close at mid-day. *Lagophylla diabolensis* newly described, added as native.

1. Ray 3–6 mm; leaves ± gray, distal stalked-glandular abaxially, glands generally ± white or yellow, sometimes golden-brown; stem glandless; heads in tight groups or open, panicle-like clusters; calyx-like bracts subtending involucre 2–5; phyllaries on angles coarsely long-straight-hairy ..... *L. ramosissima*
- 1' Ray (4)7–13 mm; leaves green or gray-green, distal glandless or stalked-glandular, glands yellow, golden, ± white, or purple; stem glandless or distally stalked-glandular; heads in panicle-like clusters; calyx-like bracts subtending involucre 0 or 2–5; phyllaries on angles scabrous or minutely coarsely hairy to coarsely long-straight-hairy
2. Main stem axis obvious; distal leaves stalked-glandular, glands yellow or golden; calyx-like bracts subtending involucre 3–5; involucre obconic; phyllaries on angles minutely coarsely hairy to coarsely long-straight-hairy, hairs 0.3–1+ mm, ± widely spreading or curved toward phyllary tip ..... *L. glandulosa*
- 2' Main stem axis often not obvious, ± zigzag; distal leaves glandless or stalked-glandular, most glands purple, some yellow or ± white; calyx-like bracts subtending involucre 0 or 2–3; involucre ± hemispheric to obovoid; phyllaries on angles ± minutely coarsely hairy or scabrous or coarsely long-straight-hairy, hairs 0.1–1+ mm, ± curved toward phyllary tip
3. Phyllaries 4–5 mm, on angles coarsely long-straight-hairy, hairs 0.5–1+ mm; fruit shiny ..... *L. minor*
- 3' Phyllaries 4–6.5 mm, on angles ± minutely coarsely hairy to scabrous, hairs 0.1–0.6 mm; fruit dull
4. Proximal leaves linear to lance- or oblance-linear, entire, distal leaves sparsely stalked-glandular; stems yellow-brown; phyllaries 4–5 mm; rays 4–9 mm ..... *L. diabolensis*
- 4' Proximal leaves oblanceolate to spoon-shaped, entire to toothed, distal leaves often glandless; stems yellow-brown to dark purplish; phyllaries 6–6.5 mm; rays 4–13 mm ..... *L. dichotoma*

***L. diabolensis* B.G. Baldwin**  
**NATIVE**

Plant 1–10 dm; self-sterile. **Stem:** distally sparsely stalked-glandular; main axis obvious or not, distally ± zigzag. **Leaf:** green, proximal generally glandless, distal stalked-glandular, most glands purple, some yellow or ± white. **Inflorescence:** heads in panicle-like clusters; calyx-like bracts subtending involucre 0 or 2–3; involucre ± hemispheric to obovoid; phyllaries 4–5 mm, on angles ± minutely coarsely hairy to scabrous, hairs 0.1–0.6 mm, ± curved toward phyllary tip. **Ray flower:** ray 4–9 mm. **Fruit:** dull, striate.  $2n=14$ . Grassy openings in woodland; 350–1070 m. SCoRI (Diablo Range). Included previously in *Lagophylla dichotoma* Benth.; distinct based on morphological and molecular data (Baldwin 2013). Apr–Jul {CNPS list}

**L. dichotoma** Benth.**NATIVE**

Plant 1–6 dm; self-sterile. **Stem:** distally often glandless, sometimes sparsely stalked-glandular; main axis often not obvious, ± zigzag. **Leaf:** green, proximal glandless, distal often glandless, sometimes stalked-glandular, most glands purple, some yellow or ± white. **Inflorescence:** heads in panicle-like clusters; calyx-like bracts subtending involucre 0 or 2–3; involucre ± hemispheric to obovoid; phyllaries 6–6.5 mm, on angles ± minutely coarse-hairy to scabrous, hairs 0.1–0.6 mm, ± curved toward phyllary tip. **Ray flower:** ray 4–13 mm. **Fruit:** dull, striate. Grassland, openings in woodland; 50–400 m. c&s SNF, e ScV (extirpated), e SnJV. Apr–May {CNPS list}

**L. glandulosa** A. Gray**NATIVE**

Plant 1–10(15) dm; ± self-incompatible. **Stem:** distally generally sparsely to densely stalked-glandular (nonglandular); main axis obvious. **Leaf:** green or gray-green, all or distal stalked-glandular, glands yellow or golden. **Inflorescence:** heads in panicle-like clusters; calyx-like bracts subtending involucre 3–5; involucre obconic; phyllaries 5–7 mm, on angles minutely coarsely hairy to coarsely long-straight-hairy, hairs ± widely spreading or curved toward phyllary tip, 0.3–1+ mm. **Ray flower:** ray 7–13 mm. **Fruit:** glossy, not striate.  $2n=14$ . Grassland, openings in chaparral, woodland; 10–900 m. c NCoRO (e edge), c NCoRI, CaRF, SNF (rare s), n GV. May–Nov

**L. minor** (D.D. Keck) D.D. Keck**NATIVE**

Plant 8–30+ cm; self-incompatible. **Stem:** glandless or distally sparsely glandular; main axis not obvious, ± zigzag. **Leaf:** green, proximal generally glandless, distal glandless or stalked-glandular, most glands purple, some yellow. **Inflorescence:** heads in panicle-like clusters; calyx-like bracts subtending involucre 0; involucre ± hemispheric to obovoid; phyllaries 4–5 mm, on angles coarsely long-straight-hairy, hairs 0.5–1+ mm, ± curved toward phyllary tip. **Ray flower:** ray 7–13 mm. **Fruit:** shiny, not striate.  $2n=14$ . Openings in chaparral, woodland, on serpentine; 70–900 m. NCoRI, n SNF (El Dorado Co.). Apr–Jun

**L. ramosissima** Nutt.**NATIVE**

Plant 1–10(15) dm; self-compatible. **Stem:** glandless; main axis obvious or not (± zigzag). **Leaf:** ± gray, most glandless, distal stalked-glandular abaxially, glands generally ± white or yellow, sometimes golden-brown. **Inflorescence:** heads tightly grouped or in open, panicle-like clusters; calyx-like bracts subtending involucre 2–5; involucre obconic to obovoid; phyllaries 4–7 mm, on angles coarsely long-spreading-hairy, hairs ± widely spreading to curved toward phyllary tip, 0.5–1+ mm. **Ray flower:** ray 3–6 mm. **Fruit:** dull to ± shiny, weakly striate.  $2n=14$ . Grassland, openings in scrub, woodland, forest; < 1800 m. CA-FP (except NCo, ChI, SnJt), MP; to Washington, Montana, Nevada. [*Lagophylla ramosissima* subsp. *congesta* (Greene) D.D. Keck] Apr–Oct

**PALLENIS**

[Annual], perennial herb, subshrub. **Stem:** decumbent to ascending [erect], branched. **Leaf:** basal and cauline, alternate, simple, hairy. **Inflorescence:** heads radiate, generally 1, peduncled; involucre widely bell-shaped, phyllaries in 2 series, outer with leaf-like tips; receptacle flat, paleae folded, keeled, acuminate. **Ray flower:** 15–60+, fertile; ray oblong, 3-toothed, [white to] yellow. **Disk flower:** many; corolla yellow, tube expanded, wider than narrowly cylindrical throat, lobes narrow, sharply triangular; anther base long-tailed, tip sharply triangular, acuminate; style with distal collar of hairs, branches very short, appendages widely obtuse. **Fruit:** pappus of scales; ray fruits obovoid, ± triangular, compressed front-to-back, lateral angles sometimes winged; disk fruits obovoid, compressed-triangular, ascending-hairy. 6 species: Mediterranean, southwestern Asia. (Latin: garment, for long outer phyllaries) [Riefner & Greuter 2012 J Bot Res Inst Texas 6: 621–629] Often included in *Asteriscus*. *Pallenis maritima* added, as naturalized.

**P. maritima** (L.) Greuter GOLD COIN  
**NATURALIZED**

Plant mounded; herbage with long, soft, ascending to spreading hairs. **Stem:** 1–3+ dm. **Leaf:** 2–5 cm, oblanceolate or spoon-shaped, tapered to petiole, tip rounded. **Inflorescence:** heads 3–4 cm diameter; peduncle 1–3 cm, leafy-bracted; outer phyllaries 10–16 mm, >> inner. **Ray flower:** 15–30; rays 10–15 mm. **Disk flower:** corolla ± 5 mm, lobes 1–1.5 mm. **Fruit:** ± 1.5 mm, densely ascending-hairy; pappus scales 1–1.5 mm.  $2n=12$ . Rocky shores, sea bluffs, escaped from cultivation; <= 5 m. SCo; Mediterranean region. Often sold as *Asteriscus maritimus* (L.) Less. Feb–Jun

## VOLUTARIA

Annual. **Stem:** erect, openly branched. **Leaf:** basal and proximal cauline winged-petioled, mid and distal cauline sessile; entire to dentate or pinnately divided, long-soft hairy, minutely glandular. **Inflorescence:** heads disciform or radiant, long-peduncled, 1 or in few-headed cyme-like cluster; involucre ovoid, phyllaries many, graduated in 5+ series, appressed, ovate to lanceolate, entire or minutely spiny-toothed, acute, tapered smoothly to an ascending to reflexed,  $\pm$  flattened spine at tip; receptacle flat, epaleate, bristly. **Flower:** corolla white or pink to purple [blue, yellow, or orange]; outer flowers sterile, corolla enlarged and spreading or inconspicuous and erect, lobes 5(6), linear; inner flowers bisexual, tube slender, throat narrowly cylindrical, lobes linear-oblong, anther bases tailed, tips lanceolate, style tip with  $\pm$  hairy node and short, linear terminal segment. **Fruit:**  $\pm$  barrel-shaped or obconic, weakly compressed, 10-ribbed, tip with prominent collar, attachment scar lateral within cavity with hard rim; pappus persistent, of several series of narrow scales, white to tan. 16 species: Mediterranean, western Asia, Atlantic islands, northeastern Africa. (Latin: having twist, for spirally coiled corolla lobes of original sp.) [Keil 2006 FNANM 19:174–175] *Volutaria canariensis* added, as naturalized.

1. Heads disciform; corollas of sterile flowers inconspicuous, not ray-like,  $\leq$  disk corollas, white or rose, lobes erect ..... *V. canariensis*  
 1' Heads radiant; corollas of sterile flowers conspicuous, ray-like,  $\gg$  disk corollas, pink-purple or lavender, lobes spreading ..... *V. muricata*

**V. canariensis** Wagenitz CANARY ISLANDS KNAPWEED  
 NATURALIZED

**Stem:**  $\leq$  15 dm. **Leaf:** proximal oblanceolate, 1–2-pinnately lobed or divided, lobes  $\pm$  dentate, middle similar but smaller, distal linear, entire or  $\pm$  dentate, faces with soft, jointed hairs or becoming  $\pm$  glabrous, minutely gland-dotted. **Inflorescence:** heads solitary or generally in small cyme-like clusters; peduncle 2–10 cm, distally leafless, thinly cobwebby, glandular-puberulent; involucre 10–15 mm, 5–6 mm diameter, phyllaries in 5–7 series, entire, finely soft hairy, lanceolate, white-margined, with wide, flat spine tips 1.5–2 mm, inner with membranous, spineless tips. **Flower:** corolla of sterile flower  $\pm$  10 mm, included in involucre; corolla of fertile flower 5.5–6 mm,  $\pm$  white, tube  $\pm$  2.5 mm, throat  $\pm$  1.5 mm, lobes 1.5–2 mm. **Fruit:** 3–3.5 mm, pale gray-brown, ascending-hairy, faces not pitted; pappus scales unequal,  $\leq$  3 mm, minutely fringed, outer  $<$  inner. Disturbed ground, seasonally flooded sites; 150–250 m. w DSon (vicinity of Borrego Springs); Canary Islands. Apr–Jun

**V. muricata** (L.) Maire MOROCCO KNAPWEED  
 NATURALIZED

**Stem:**  $\leq$  5 dm. **Leaf:** proximal oblanceolate,  $\pm$  dentate to deeply lobed, distal smaller, linear,  $\pm$  entire or lobed, faces with soft, jointed hairs, minutely gland-dotted. **Inflorescence:** heads generally solitary; peduncle 5–15 cm, distally leafless, finely cobwebby-tomentose, especially near tips; involucre 15–18 mm, 10–15 mm diam, phyllaries in 5–7 series, minutely spiny-toothed, finely cobwebby-hairy, outer and middle ovate, dark-margined, with spine tip 3–5 mm, inner lanceolate, with flattened,  $\pm$  spineless tips. **Flower:** corolla of sterile flower 25–30+ mm, exerted from involucre; corolla of fertile flower 13–14 mm, tube 5–6 mm, throat 2–4 mm, lobes 5–6 mm. **Fruit:**  $\pm$  3 mm, pale gray-brown, glabrous, faces pitted; pappus scales unequal, 1–2.5 mm, irregularly toothed, outer  $<$  inner.  $2n=24$ . Disturbed sites;  $<$  100 m. SCo; southwestern Europe, northwestern Africa. [*Centaurea muricata* L.; *Cyanopsis muricata* (L.) Dostál] Probable escape from cultivation; becoming problem weed on immediate coast. Mar–May



## BORAGINACEAE BORAGE or WATERLEAF FAMILY

Ronald B. Kelley, Robert Patterson, Richard R. Halse & Timothy C. Messick, family description, key to genera; treatment of genera by Ronald B. Kelley, except as noted

Annual to shrub or small tree, or non-green root parasite, often bristly or sharp-hairy. **Stem:** prostrate to erect. **Leaf:** basal and/or cauline, generally simple, generally alternate. **Inflorescence:** generally cymes, or panicle-, raceme-, head-, or spike-like, generally coiled in flower (often described as scorpioid), generally elongating in fruit, or flowers 1–2 per axil. **Flower:** bisexual, generally radial; sepals (4)5(10), fused at least at base, or free; corolla (4)5(10)-lobed, salverform, funnel-shaped, rotate, or bell-shaped, generally without scales at tube base, with 0 or 5 appendages at tube top, alternate stamens; stamens epipetalous; ovary generally superior, entire to 4-lobed, style 1(2), entire or 2-lobed or -branched. **Fruit:** valvate or circumscissile capsule or nutlets 1–4, free (fused), smooth to roughened, prickly or bristly or not. ± 120 genera, ± 2300 species: tropics, temperate, especially western North America, Mediterranean; some cultivated (*Borago*, *Heliotropium*, *Echium*, *Myosotis*, *Nemophila*, *Phacelia*, *Symphytum*, *Wigandia*). Many genera may be TOXIC from pyrrolizidine alkaloids or accumulated nitrates. [Olmstead et al. 2000 Molec Phylogen Evol 16:96–112] Recently treated to include Hydrophyllaceae, Lennoaceae. *Wigandia urens* added, as naturalized. —Scientific Editors: Ronald B. Kelley, Robert Patterson, Thomas J. Rosatti, Bruce G. Baldwin, David J. Keil.

1. Plants non-green, parasitic ..... **PHOLISMA**  
 1' Plants green, non-parasitic
2. Ovary deeply (2)4-lobed, style base generally ± hidden within lobes; fruit 1–4 free nutlets
3. Nutlets spreading
4. Corolla blue to red-purple; nutlet ± spheric or disk-shaped, prickles barbed; biennial, perennial herb ..... **CYNOGLOSSUM**  
 4' Corolla white; nutlet generally compressed, prickles straight or hooked at tip, not barbed; annual
5. Calyx lobes in fruit unequal, upper 2 >> others, partly fused, arched over 1 nutlet, with 5–10 stout spines each with hooked bristles; nutlets 2 ..... **HARPAGONELLA**  
 5' Calyx lobes in fruit ± equal or, if unequal, upper 2 > others, free, not arched over 1 nutlet, without spines but with hooked or straight prickles; nutlets generally 4 ..... **PECTOCARYA**
- 3' Nutlets ± erect
6. Corolla rotate; anthers 5–8 mm, closely appressed to style, separating in age ..... **BORAGO**  
 6' Corolla salverform, funnel-shaped, or ± tubular (except *Symphytum*); anthers < 5 mm, generally not closely appressed to style
7. Flowers 1–2 per leaf axil; calyx lobes with 1–2 teeth in fruit ..... **ASPERUGO**  
 7' Flowers 1 per distal leaf axil or in 1–many dense to elongate cymes, variously arranged; calyx lobes without teeth in fruit
8. Nutlet scar ± flat to strong-convex, with thick rim
9. Corolla appendages ovate to oblong, generally distal to anthers; corolla throat ± expanded distal to tube or tube and throat not differentiated ..... **ANCHUSA**  
 9' Corolla appendages lance-linear to lanceolate, at same level as anthers; corolla throat expanded distal to tube ..... **SYMPHYTUM**
- 8' Nutlet scar flat, curved, or grooved, without thick rim
10. Receptacle ± flat; nutlet scar generally basal (except *Mertensia*)
11. Shrub, 1–3+ m ..... **ECHIUM (2)**  
 11' Annual, biennial, perennial herb
12. Corolla white to yellow
13. Corolla tube > lobes; inflorescence bracts throughout ..... **LITHOSPERMUM**  
 13' Corolla tube << lobes; inflorescence bracts at base or to middle ..... [*Myosotis verna*]
- 12' Corolla generally blue to purple (white to yellow)
14. Corolla ± bilateral ..... **ECHIUM (2)**  
 14' Corolla radial
15. Corolla often ± cylindric or bell-shaped, blue, generally pink in bud ..... **MERTENSIA**  
 15' Corolla salverform or wide-funnel-shaped, generally blue, white, or yellow ..... **MYOSOTIS**

- 10' Receptacle ± conic or elongate; nutlet scar generally lateral
16. Nutlet margin prickles generally barbed
17. Perennial herb (biennial); pedicel recurved to reflexed in fruit; receptacle ± 1/2 nutlet ..... **HACKELIA**
- 17' Annual; pedicel erect in fruit; receptacle ± = nutlet ..... **LAPPULA**
- 16' Nutlet margin prickles 0 or not barbed
18. Corolla tube, limb orange or yellow (red-orange)
19. Annual ..... **AMSINCKIA**
- 19' Perennial herb ..... *Cryptantha confertiflora*
- 18' Corolla tube, limb white to cream-yellow
20. Nutlet adaxially grooved distal to scar, scar raised or generally not ..... **CRYPTANTHA**
- 20' Nutlet adaxially keeled distal to scar; scar generally raised ..... **PLAGIOBOTHRYIS**
- 2' Ovary entire or shallow-lobed, style base visible; fruit generally a capsule (4 initially fused nutlets in Heliotropium, Tiquilia)
21. Shrub, small tree
22. Leaf blade < 6 cm wide; stamens included; stigmas not lobed; seeds 2–15 ..... **ERIODICTYON**
- 22' Leaf blade (3-)10–35 cm wide; stamens exerted; stigmas 2-lobed; seeds >= 200 ..... **WIGANDIA**
- 21' Annual, perennial herb, subshrub
23. Calyx lobes not alike, outer 3 cordate ..... **TRICARDIA**
- 23' Calyx lobes alike or not, not cordate
24. Calyx sinus appendages generally present (0 in *Pholistoma membranaceum*, sometimes 0 in *Nemophila pulchella*); annual
25. Ovary, fruit hairy, not bristly ..... **NEMOPHILA**
- 25' Ovary, fruit bristly-hairy ..... **PHOLISTOMA**
- 24' Calyx sinus appendages 0; annual, perennial herb, subshrub
26. Styles 2, clearly distinct throughout length
27. Plant 1–3 m ..... *Eriodictyon parryi*
- 27' Plant generally < 0.5 m
28. Annual ..... **NAMA** (2)
- 28' Perennial herb
29. Leaves entire; inflorescence not spheric, interrupted by leaf-like bracts ..... *Eriodictyon lobbii*
- 29' Leaves crenate-dentate; inflorescence spheric, not interrupted by leaf-like bracts ..... *Nama rothrockii*
- 26' Styles 0–1, 2-lobed or not, sometimes nearly to base
30. Leaves cauline, opposite ..... **DRAPERIA**
- 30' Leaves basal or, if cauline, at least some alternate
31. Ovary ± lobed; fruit nutlets
32. Style 0 or not lobed; stigma 1 ..... **HELIOTROPIUM**
- 32' Style deeply 2-lobed; stigmas 2 ..... **TIQUILIA**
- 31' Ovary not lobed; fruit a capsule
33. Annual
34. Herbage sticky; ovules on both sides of placenta; 1–2 seeds persistent in fruit ..... **EUCRYPTA**
- 34' Herbage generally not sticky (except *Emmenanthe*, some *Phacelia* species); ovules on 1 side of placenta; seeds not persistent in fruit
35. Stamens generally unequal, attached at different levels ..... **NAMA** (2)
- 35' Stamens generally equal, attached ± at same level
36. Flowers ± subspreading to pendent; corolla persistent, white, yellow, or pink, in age papery ..... **EMMENANTHE**
- 36' Flowers spreading to erect; corolla generally deciduous, blue to purple, occasionally persistent, yellow (purple), in age not papery ..... **PHACELIA** (2)
- 33' Perennial herb

37. Plant with fleshy-fibrous or tuber-like roots or base bulb-like; style ± 2-lobed  
 38. Leaves compound to simple, deep-lobed, sinuses reaching midrib, stamens exserted; seeds 1–3 **HYDROPHYLLUM**  
 38' Leaves simple, entire, toothed, or lobed, sinuses not reaching midrib; stamens included; seeds  
 many ..... **ROMANZOFFIA**  
 37' Plant taprooted, base not bulb-like, tubers 0; style 2-lobed to -branched  
 39. Inflorescence many-flowered; leaves generally lobed to compound, sometimes entire ..... **PHACELIA** (2)  
 39' Inflorescence 1–several-flowered; leaves entire  
 40. Inflorescence 1-flowered; style tip 2-lobed; seeds many ..... **HESPEROCHIRON**  
 40' Inflorescence 1–several-flowered; style cleft ± to base; seeds 2–4 ..... **HOWELLANTHUS**

**HYDROPHYLLUM WATERLEAF**

**Genevieve K. Walden, Robert Patterson & Richard R. Halse**

[Biennial or] perennial herb from rhizomes [taproots]; roots fleshy-fibrous and fibrous [or tuber-like]. **Stem:** suberect to erect, simple or branched, fleshy, or 0 and leaves from rhizomes. **Leaf:** simple, pinnate-[palmate-]lobed, or compound, basal or cauline, alternate, mottled white in shade; petiole widened, proximally purple, bases clasping, persistent, fleshy, juicy; leaflets toothed or lobed, hairy, generally paler abaxially, basal pair free, terminal ± united. **Inflorescence:** generally branched, generally head-like cymes; peduncles proximally purplish, in fruit erect or recurved; pedicels generally elongate, in fruit spreading or recurved. **Flower:** calyx bell-shaped, lobes generally equal, generally ± alike, linear to narrowly oblong or lanceolate, acute to obtuse, glabrous or hairy, generally ciliate, generally ± enlarging in fruit, sinus appendages 0 [present]; corolla lobed to middle, > calyx, bell-shaped, white, cream, ± green, purple, or blue, tube with linear scales at base forming channeled pollinator guide, lobes with nectary gland on midvein, hairy; stamens equal, exserted, filaments at mid-level generally hairy; ovary chamber 1, placentas parietal, style 1, exserted, glabrous, cleft < 1/4, stigmas 2, base persistent, disk proximal to ovary. **Fruit:** capsule, 3–5 mm, spheric; tip generally bristly, loosely enclosed by calyx. **Seed:** 1–4, oblong to spheric, brown or yellow- or red-brown, net-like, fleshy appendages 0.  $2n=18$ . 11 species: North America; some cultivated as ornamentals. (Greek: water leaf) [Constance 1942 Amer Midl Naturalist 27:710–731] *Hydrophyllum capitatum* var. *alpinum* raised to species rank, as *Hydrophyllum alpestre*.

1. Inflorescence near ground, << subtending leaves; anthers << 1 mm ..... ***H. alpestre***  
 1' Inflorescence well above ground, generally >= subtending leaves; anthers 1–2 mm  
 2. Leaf wide-ovate to round; leaflets generally 3–5 ..... ***H. tenuipes***  
 2' Leaf ± oblong; leaflets 7–15  
 3. Leaflets acute to acuminate, teeth generally 4–8 per side ..... ***H. fendleri* var. *albifrons***  
 3' Leaflets obtuse to acute, teeth generally 2–4 per side ..... ***H. occidentale***

***H. alpestre* A. Nelson & P. B. Kenn. ALPINE BREECHES**

**NATIVE**

Plant 10–45 cm; rhizome short. **Stem:** spreading-hairy. **Leaf:** petiole 3–15 cm; blade 4–12 cm, ovate to oblong, leaflets 5–7, lanceolate to obovate, obtuse or acute, mucronate, entire between coarse teeth or lobes, proximal pair generally distinct, terminal ± merged. **Inflorescence:** near ground, << subtending leaves; peduncle 1–5 cm, in fruit recurved; pedicels 2–5 mm, in fruit to 20 mm, recurved. **Flower:** calyx lobes 3–4 mm; corolla 4–10 mm, lobes 2–6 mm, white to purple or white with lavender marks; anthers << 1 mm; style 7–10 mm. **Seed:** 1–3, 2–3 mm, light brown. Moist slopes, meadows, flats; [700]800–2600[3000] m. CaRH, n SNH, MP, SNE except W&I; to Oregon, Idaho, Utah. [*Hydrophyllum capitatum* Douglas ex Benth. var. *alpinum* S. Watson] *Hydrophyllum capitatum* Douglas ex Benth. var. *alpinum* S. Watson sufficiently divergent to warrant species rank, but the name *Hydrophyllum alpinum* (S. Watson) Greene ex Brand disqualified by rules of nomenclature (see ICPN). Apr–Jul

**H. fendleri** (A. Gray) A. Heller var. **albifrons** (A. Heller) J.F. Macbr. WHITE WATERLEAF

**NATIVE**

Plant 25–90 cm; rhizome short to elongate. **Stem:** with reflexed bristles. **Leaf:** petiole 3–18 cm; blade 6–30 cm, ± oblong, leaflets 7–13[19], lanceolate, acute to acuminate, teeth generally 4–8 per side, proximal 2–3 leaflet pairs generally distinct, distal deep-lobed. **Inflorescence:** well above ground, generally > subtending leaves; peduncle 3–18 cm, in fruit erect; pedicels 2–6 mm, in fruit to 10 mm, spreading. **Flower:** calyx lobes 3–6 mm; corolla [6]7–11 mm, lobes 4–5 mm, white, purple, or white with lavender marks; anthers 1–2 mm; style 9–14 mm. **Seed:** generally 2, 2–3 mm, light brown. Moist, shady, wooded slopes; [300]1100–2000 m. KR; to British Columbia, Idaho. May–Jul

**H. occidentale** (S. Watson) A. Gray WESTERN WATERLEAF

**NATIVE**

Plant 6–60 cm; rhizome short to elongate. **Stem:** short-hairy or with reflexed bristles. **Leaf:** petiole 2–15 cm; blade 5–40 cm, oblong to oblong-ovate, deep-lobed to compound, leaflets 0 or 7–15, oblong, entire or deep-cut, obtuse or acute, teeth generally 2–4 per side, proximal leaflet pairs generally distinct, terminal merged. **Inflorescence:** well above ground, generally > subtending leaves; peduncle 5–30 cm, in fruit erect; pedicels 2–6 mm, in fruit to 10 mm, recurved. **Flower:** calyx lobes 3–4 mm; corolla 6–10 mm, lobes 4–6 mm, white to lavender or white with lavender marks; anthers 1–2 mm; style 7–19 mm. **Seed:** generally 2, ± 3 mm, brown. Moist, shaded slopes, woodland, meadows, streambanks, chaparral, including serpentine soils; [70]-375–3000 m. NW, CaR, SN, ScV, SnFrB; to Oregon, Idaho, Utah, Arizona. Apr–Jul

**H. tenuipes** A. Heller SLENDERFOOT WATERLEAF, PACIFIC WATERLEAF

**NATIVE**

Plant 20–80 cm; rhizome long. **Stem:** with reflexed bristles. **Leaf:** petiole 8–30 cm; blade 7–15 cm, wide-ovate to round; leaflets generally 3–5(9), lobed or not, coarse-serrate to cut, proximal pair(s) generally smaller, distinct, terminal merged or not (or appearing 3-lobed). **Inflorescence:** well above ground, >= subtending leaves; peduncle 2–15 cm, in fruit erect; pedicels 4–12 mm, in fruit to 15 mm, spreading or recurved. **Flower:** calyx lobes 4–7 mm; corolla 5–7 mm, lobes 3–4 mm, cream, ± green [purple or blue]; anthers 1–2 mm; style 9–14 mm. **Seed:** 1(-3), 2.5–3.5 mm, yellow- or red-brown. Moist, shaded, wooded slopes, streambanks; < 1750 m. NCo, KR, NCoRO; to British Columbia. Apr–Jul

**WIGANDIA**  
Genevieve K. Walden

Shrub, tree. **Stem:** erect, branched, densely glandular-hairy. **Leaf:** cauline, alternate, net-veined. **Inflorescence:** panicle-like, generally open, terminal. **Flower:** sepals 5, fused at base, equal, alike, enlarging in fruit; corolla rotate to widely bell-shaped, generally puberulent inside, appendages at tube top 0; stamens attached at same level, equal, exerted, hairy, bases generally wider, with 0 wings, pollen tan; ovary half-inferior, entire, chambers 2, unequal, appearing as 4 by intrusion of the 2 placentas in fruit, styles 2,  $\geq$  corolla throat, enlarging, persisting in fruit, hairy, stigmas green, disk subtending ovary, generally conspicuous. **Fruit:** loculicidal capsule, valves 2 or 4, dehiscent on wetting. **Seed:** many, oblong, angled or compressed, winged due to scarious margins, wind-dispersed.  $\pm$  7 species: (sub)tropical America, Caribbean. (Bishop J. Wigand of Pomerania, 1523–1587) Dermatitis caused by contact with hairs (Reynolds et al. 1989 Contact dermatitis 21(2):65–68). [Leticia et al. 2000 Tree Physiology 20(9):629–632] Presence, density of stinging and glandular hairs influenced by environmental conditions and age of plants; recognition of taxa has been based on characters such as hairs, accrescent styles (Leticia et al. 2000) that may not be genetically based. *Wigandia urens* added, as naturalized.

**W. urens** (Ruiz & Pav.) Kunth STINGING WIGANDIA  
**NATURALIZED**

Plant (1-)2–6(-8) m. **Leaf:** petiole 5–15 cm; blade (5-)10–80 cm, ovate to obovate, toothed. **Flower:** calyx lobes 5–15 mm, 10–20 mm in fruit, lanceolate; corolla 10–15 mm, limb 15–25(-30) mm diam, lavender to purple, tube, throat white to purple; stamens 10–20 mm, filaments generally white, purple in age; styles 10–15 mm. **Fruit:** 10–15 mm, oblong. **Seed:**  $\geq$  200, 0.1–0.3 mm, brown, net-veined.  $n=19,38$ . Open, disturbed areas, slopes,  $\pm$  urban areas, abandoned homesteads; ornamental, cultivated. 0–500 m [ $\leq$  2500 m]. SCo, expected elsewhere; s Mexico, w Medit, s Australia, New Zealand, native to South America. [*Wigandia urens* (Ruiz & Pav.) Kunth var. *caracasana* (Kunth) D.N. Gibson] Usually occurs as persistent ornamental, sometimes forming larger stands from root-sprouts and/or adventitious roots. May form clonal colonies  $\pm$  as in *Eriodictyon*. Jan–Apr(May), Jun–Sep(Nov), possibly year round in cultivation.

## CACTACEAE CACTUS FAMILY

Bruce D. Parfitt, except as noted

Perennial herb, shrub, tree, generally fleshy. **Stem:** cylindric to spheric, or flat; surface smooth, tubercled, or ribbed (grooved); nodal areoles bearing flowers. **Leaf:** generally 0 or early-deciduous, flat to  $\pm$  cylindric. **Spines:** areoles generally with central, radial spines, occasionally with glochids. **Flower:** generally 1 per areole, bisexual [unisexual], sessile, radial [bilateral]; perianth parts generally many [5], scale-like to petal-like; stamens many; ovary inferior [superior], style 1, stigma lobes generally several [many]. **Fruit:** dry to fleshy or juicy, indehiscent to variously dehiscent, spiny, scaly, or naked; tubercled or smooth. **Seed:** generally many, occasionally 0–few.  $\pm$  125 genera,  $\pm$  1800 species: America (especially deserts), Africa; many cultivated, some edible. [Parfitt & Gibson 2004 FNANM 4:92–257] Spines smaller, fewer (0) in shade forms; yellow spines blacken in age. Introduced species increasingly escape cultivation. Hybridization common in some genera. Taxa of *Escobaria* in TJM (1993) moved to *Coryphantha*. —Scientific Editors: Bruce D. Parfitt, Douglas H. Goldman, Bruce G. Baldwin.

## CYLINDROPUNTIA CHOLLA

Marc Baker, Bruce D. Parfitt &amp; Jon Rebman

Shrub or small tree, erect to decumbent, many-branched. **Stem:** regularly segmented, segments generally  $< 50$  cm,  $< 5$  cm diam, cylindric, fleshy, glabrous; ribs generally 0; tubercles generally elongate. **Leaf:** conic to cylindric, deciduous. **Spines:** 1–many per areole,  $< 2$  mm diam, generally needle-shaped, smooth, straight, tip smooth or barbed, epidermis separating as a papery sheath; central spines generally not distinct from radial spines; glochids generally numerous in each areole. **Flower:** lateral to terminal, from distal portion of areole, 1.8–8 cm diam; perianth yellow, yellow-green, orange-yellow, to bronze, pink, or red; ovary glabrous, spines 0–many, glochids many in each areole, scales 0. **Fruit:** indehiscent; spheric or cylindric to obconic, dry or fleshy to leathery in age, green to dark yellow, glabrous, spiny or spines 0. **Seed:** 1.9–7 mm, flattened to  $\pm$  spheric, surface smooth to angular, within an aril, bony and  $\pm$  white when dry. 36 species: America. (Cylindric *Opuntia*) [Baker & Cloud-Hughes 2014 Madroño 61:231–243; Mayer et al. 2011 Madroño 58:106–112] Hybridization common. Young buds of some species used for food, many species for ornament. *Cylindropuntia chuckwallensis* newly described, added as native.

1. Fruit generally spineless or occasionally with few thin, deciduous spines, generally fleshy to leathery in age, occasionally slow-drying
2. Fruit generally bearing flowers; perianth purple-red ..... *C. prolifera*
- 2' Fruit not bearing flowers; perianth white to yellow, green, or red-brown
3. Terminal stem segment  $> 3 \times$  longer than wide
4. Stem decumbent to erect, spines appearing sparse, spines of stem areoles generally  $\pm$  equal, tubercles generally  $< 20$  mm, oval; coastal,  $< 250$  m ..... *C. californica* var. *californica* (2)
- 4' Stem erect, spines rather dense or if appearing sparse then tubercles generally  $> 20$  mm, elliptic to elongate, spines of stem areoles generally with 1–3 longer central; inland, generally  $> 700$  m ..... *C. californica* var. *parkeri* (2)
- 3' Terminal stem segment generally  $< 3 \times$  longer than wide
5. Tubercle length  $\pm =$  width ..... *C. bigelovii*
- 5' Tubercle length  $\pm 2 \times$  width
6. Spines 7–10 per tubercle; fruit  $< 2.5$  cm; seed 0 or irregularly shaped,  $< 3$  mm ..... *C. fosbergii*
- 6' Spines 9–16 per tubercle; fruit 2.5–3.5 cm; seed  $\pm$  spheric,  $\pm 3$  mm ..... *C. munzii*
- 1' Fruit generally spiny, generally dry at maturity
7. Stem  $< 1$  cm diam, tubercle generally  $< 1$  mm high ..... *C. ramosissima*
- 7' Stem  $> 1.5$  cm diam, tubercle  $> 3$  mm high
8. Terminal stem segment generally  $< 1$  dm, tubercle length  $< 2 \times$  width
9. Generally erect shrubs with 1 to few ascending to erect main trunks, distance between trunk nodes (main branches) generally  $\geq 10$  cm, with 1–2 branches per trunk node; inner perianth parts yellow-green filaments green to pale yellow; styles pale yellow-green ..... *C. echinocarpa*
- 9' Generally low shrubs with several decumbent to ascending main trunks, distance between trunk nodes generally  $< 5$  cm, with  $\geq 3$  branches per trunk node; inner perianth parts pale to dark pink-purple, occasionally pale yellow-green; filaments generally tinged pink-purple; style generally tinged pale to dark pink-purple ..... *C. chuckwallensis*

- 8' Terminal stem segment generally > 1 dm, tubercle length > 3 × width
10. Stem generally branched only distally; trunk generally 1; inner perianth parts generally yellow ..... *C. acanthocarpa* var. *acanthocarpa*
- 10' Stem generally branched near base; trunks several to many; inner perianth parts yellow-green, yellow, bronze, to red
11. Filaments red to magenta; perianth parts yellow, bronze, to red; e DSon (extreme se San Diego Co., sw Imperial Co.) ..... *C. wolfii*
- 11' Filaments green to yellow; perianth parts yellow to yellow-green; sw SnJV (Cuyama Valley), s SCoRO (Cuyama River Canyon), s SCo, PR, DSon
12. Stem decumbent to erect, spines appearing sparse, tubercles generally < 20 mm, oval; coastal, < 250 m ..... *C. californica* var. *californica* (2)
- 12' Stem erect, spines rather dense or if appearing sparse then tubercles generally > 20 mm, elliptic to elongate; inland, generally > 250 m
13. Spines generally not prominent, not obscuring young stem segments; stem segments 14–43 cm, tubercles 16–35 mm ..... *C. californica* var. *parkeri* (2)
- 13' Spines prominent, obscuring young stem segments; stem segments 10–26 cm, tubercles 11–25 mm ..... *C. ganderi*

***C. acanthocarpa*** (Engelm. & J.M. Bigelow) F.M. Knuth var. ***acanthocarpa*** BUCKHORN CHOLLA  
NATIVE

Plant < 4 m. **Stem:** trunk generally 1; main branches spreading to erect, few to several, generally long; terminal segments < 50 cm, 2–2.5 cm diam, firmly attached; tubercles 20–40 mm, < 7 mm high. **Spines:** 12–21, < 5 cm, pale yellow- to red-brown, sheath pale yellow-brown. **Flower:** inner perianth < 3.5 cm, yellow, tinted purple to brown-red; filaments purple-red. **Fruit:** dry, proximal tubercles >> distal; base acute; spiny. **Seed:** < 6 mm, generally fertile.  $2n=22$ . Creosote-bush scrub, Joshua-tree woodland; < 1600 m. D; Nevada, Arizona. [*Cylindropuntia acanthocarpa* (Engelm. & J.M. Bigelow) F.M. Knuth var. *coloradensis* L.D. Benson] *Cylindropuntia ×deserta* (Griffiths) Pinkava is probably *Cylindropuntia acanthocarpa* × *Cylindropuntia echinocarpa*. May–Jun

***C. bigelovii*** (Engelm.) F.M. Knuth TEDDY-BEAR CHOLLA  
NATIVE

Plant 1–2 m. **Stem:** trunk generally 1; main branches few, short, spreading; terminal segments generally < 15 cm, 3–5 cm diam, easily detached; tubercles 4–11 mm, < 3 mm high. **Spines:** 4–12, < 2.5 cm, pale yellow-brown, dark brown in age, sheath translucent to pale brown. **Flower:** inner perianth < 4 cm, pale yellow or light green to ± white; filaments green. **Fruit:** leathery, yellow, proximal tubercles ± = distal; base obtuse; spines 0–few, thin, early-deciduous. **Seed:** < 4 mm, generally sterile.  $2n=22,33$ . Rocky fans, benches, creosote-bush scrub; < 1000 m. DMoj (Kelso Dunes), DSon; southern Nevada, Arizona, northern Mexico. [*Opuntia bigelovii* Engelm.] Generally reproduces by rooting of detached stem segments. Mar–May

***C. californica*** (Torr. & A. Gray) F.M. Knuth  
NATIVE

**Stem:** trunks several to many; main branches decumbent to erect. **Flower:** inner perianth < 3 cm, yellow to yellow-green, generally with purple tips; filaments green. **Fruit:** leathery to slow-drying, proximal tubercles >> distal; base generally acute; spines 0–many. **Seed:** < 7 mm, generally fertile.  $2n=22$ .

***C. californica* var. *californica*** SNAKE CHOLLA  
NATIVE

Plant < 1.5 m. **Stem:** terminal segments < 25 cm, 2–4 cm diam, firmly attached; tubercle 7–20 mm, < 5 mm high. **Spines:** 6–15, generally < 2 cm, yellow to orange-brown, sheath translucent white to gold-brown. Coastal-sage scrub, coastal chaparral; < 250 m. s SCo; northern Baja California. [*Opuntia parryi* Engelm. var. *serpentina* (Engelm.) L.D. Benson] Apr–Jul {CNPS list}

**C. californica** var. **parkeri** (J.M. Coult.) Pinkava CANE or VALLEY CHOLLA**NATIVE**

Plant < 3 m. **Stem:** terminal segments generally 16–40 cm, 1.7–4 cm diam, firmly attached; tubercle 16–35 mm, < 7 mm high. **Spines:** 0–20, generally < 3.5 cm, yellow to orange-brown, sheath translucent white to gold-brown. Chaparral, pinyon/juniper woodland; 700–1900 m. sw SnJV (Cuyama Valley), s SCoRO (Cuyama River Canyon), PR, w DSon; northern Baja California. [*Opuntia parryi* Engelm. var. *parryi*] Densely spined forms can be confused with *Cylindropuntia ganderi*. Apr–Jul

**C. chuckwallensis** M.A. Baker & M.A. Cloud-Hughes CHUCKWALLA CHOLLA**NATIVE**

Plant < 1.2 m. **Stem:** trunks several, terminal segments generally 3.3–9.7 cm, 1.7–2.9 cm diam, firmly attached; tubercle 7–16 mm, 4–10 mm high. **Spines:** 6–21, generally < 3.0 cm, generally translucent white, sheath translucent white (pale gold-brown). **Flower:** inner perianth < 3.0 cm, pale to dark pink-purple, occasionally pale yellow-green; filaments generally tinged pink-purple. **Fruit:** dry, proximal tubercles similar to distal; base obtuse; spiny. **Seed:** < 3 mm, generally fertile.  $2n=66$ . Gravelly or rocky soils of hillsides, washes, canyon walls; 400–1600 m. w DSon; Gynodioecious (some plants with only pollen-sterile flowers, others with bisexual flowers). Apr

**C. echinocarpa** (Engelm. & J.M. Bigelow) F.M. Knuth SILVER or GOLDEN CHOLLA**NATIVE**

Plant < 3 m. **Stem:** trunks 1 to few, main branches spreading to curving upwards, few, generally short; terminal segments generally < 10 cm, 2–3 cm diam, firmly attached; tubercle 6–15 mm, < 8 mm high. **Spines:** 9–20, < 4 cm, pale gray to translucent yellow, sheath generally same color. **Flower:** inner perianth < 2.5 cm, yellow-green; filaments green to pale yellow. **Fruit:** dry, proximal tubercles  $\pm$  = distal; base obtuse; spines dense distally. **Seed:** < 6 mm, generally fertile.  $2n=22$ . Creosote-bush/white bur-sage, blackbush, saltbush, other desert and GB scrub; 300–1600 m. s SNF, SNE, D; to Utah, Arizona, northern Baja California. [*Opuntia echinocarpa* Engelm. & J.M. Bigelow; *Opuntia wigginsii* L.D. Benson] Mar–Jun {CNPS list}

**C. fosbergii** (C.B. Wolf) Rebman et al. FOSBERG'S or MASON VALLEY CHOLLA**NATIVE**

Plant < 2.5 m. **Stem:** trunk 1; branches generally several, long, generally curving upwards; terminal segments generally < 10 cm, 4–6 cm diam, easily detached; tubercle 10–20 mm, 3–5 mm high. **Spines:** 7–10, < 2.5 cm, pale red-brown, sheath pale yellow-brown. **Flower:** inner perianth < 2.5 cm, pale red-brown; filaments green. **Fruit:** dry to leathery, proximal tubercles  $\pm$  = distal; base generally obtuse; spines 0–few, thin, deciduous. **Seed:** < 3 mm, generally sterile.  $2n=33$ . Valley floors, alluvial fans; 300–450 m. DSon (e San Diego Co.). [*Cylindropuntia*  $\times$  *fosbergii* (C.B. Wolf) Rebman, M.A. Baker & Pinkava] Mar–May {CNPS list}

**C. ganderi** (C.B. Wolf) Rebman & Pinkava GANDER'S CHOLLA**NATIVE**

Plant < 1.7 m. **Stem:** trunks several to many; main branches ascending; terminal segments generally < 25 cm, 2.5–4.4 cm diam, firmly attached; tubercles 11–25 mm, 5–10 mm high. **Spines:** 20–35, < 2.5 cm, pale yellow, light brown in age, sheath yellow-brown to golden. **Flower:** inner perianth < 2.7 cm, yellow to yellow-green, generally red-tipped; filaments green. **Fruit:** dry, proximal tubercles  $\gg$  distal; base generally acute; densely-spined to bur-like. **Seed:** < 5 mm, generally fertile.  $2n=22$ . Desert, chaparral, pinyon/juniper woodland, sandy flats, rocky hillsides, boulder fields; 200–1100 m. se PR, DSon (e San Diego Co., s Riverside Co.). Mar–May

**C. munzii** (C.B. Wolf) Backeb. MUNZ'S CHOLLA**NATIVE**

Plant < 2.4 m. **Stem:** trunk 1; branches several, spreading to curving upwards; terminal segments generally < 10 cm, 3–5 cm diam, generally easily detached; tubercles 10–16 mm, 3–8 mm high. **Spines:** 9–16, < 4 cm, light yellow to pale red-brown, sheath yellow-brown. **Flower:** inner perianth < 2 cm, yellow-green to red-brown; filaments green. **Fruit:** dry, proximal tubercles  $\pm$  = to distal; base obtuse; generally with deciduous spines. **Seed:** generally fertile.  $2n=22$ . Gravelly or sandy soils of washes, canyon walls; 150–600 m. DSon (Chocolate, Chuckwalla mtns, Imperial, Riverside cos.); Baja California. [*Opuntia munzii* C.B. Wolf; *Opuntia*  $\times$  *munzii*] Possible hybrid of *Cylindropuntia bigelovii* and *Cylindropuntia echinocarpa*. Most localities in United States  $\pm$  inaccessible. Mar–May {CNPS list}



**C. prolifera** (Engelm.) F.M. Knuth COAST CHOLLA

**NATIVE**

Plant < 2 m. **Stem:** trunk generally 1, branches few to several, generally curving upwards; terminal segments < 13 cm, 3.5–5 cm diam, easily detached; tubercles 1.2–2.5 cm, 4–9 mm high. **Spines:** 6–14, generally < 2 cm, pale red-brown to dark brown, sheath pale yellow-brown. **Flower:** produced from areoles of older fruit; inner perianth < 2 cm, purple-red; filaments green, generally tinted purple. **Fruit:** fleshy, "chained" (flowers and fruits produced sequentially from areoles of older fruits, forming chain of fruits), green, tubercles 0 to shallow; base obtuse; spines 0. **Seed:** < 4 mm, generally sterile.  $2n=22,33$ . Ocean bluffs, inland coastal scrub; < 450 m. SCo, ChI; Baja California. [*Opuntia prolifera* Engelm.] "Chained" fruit unique in genus in California. Apr–Jul

**C. ramosissima** (Engelm.) F.M. Knuth DIAMOND CHOLLA, PENCIL CACTUS

**NATIVE**

Plant < 1.5 m. **Stem:** trunk 1–several, decumbent to erect, main branches spreading to ascending; terminal segments < 10 cm, 4–8 mm diam, firmly attached; tubercles 4.5–8.5 mm, <= 1 mm high. **Spines:** generally 1, < 6 cm, pink-gray to dark brown, sheath ± white to pale yellow. **Flower:** inner perianth < 6 mm, orange-pink to red-brown; filaments pale green. **Fruit:** dry, proximal tubercles ± = distal; base obtuse to acute, generally continuous with stem; spines dense (0), bur-like. **Seed:** < 5 mm, generally fertile.  $2n=22,44$ . Creosote-bush/white bur-sage, saltbush, other desert scrub; < 1300 m. D; Nevada, Arizona, northern Mexico (Sonora, Baja California). [*Opuntia ramosissima* Engelm.] See *Cylindropuntia echinocarpa*. Apr–Aug

**C. wolfii** (L.D. Benson) M.A. Baker WOLF'S CHOLLA

**NATIVE**

Plant < 2 m. **Stem:** trunk generally several to many, main branches generally long, erect; terminal segments < 40 cm, 2.5–4.2 cm diam, firmly attached; tubercles 15–25 mm, < 9 mm high. **Spines:** 12–22, < 3 cm, pale to dark brown, sheath translucent to pale brown. **Flower:** inner perianth < 3.5 cm, pale purple-brown; filaments red to magenta. **Fruit:** dry, proximal tubercles ± = distal; base obtuse to acute; spines dense. **Seed:** < 6 mm, fertility unknown.  $2n=66$ . Dry places above valley floors; 300–1200 m. se PR, w DSON; northern Baja California. [*Opuntia wolfii* (L.D. Benson) M.A. Baker] Mar–May {CNPS list}

**ERICACEAE HEATH FAMILY**  
**Gary D. Wallace, except as noted**

Perennial herb, shrub, tree. **Stem:** bark often peeling distinctively. **Leaf:** simple or 0, generally cauline, alternate, opposite (whorled), evergreen or deciduous, often leathery, petioled or not; stipules 0. **Inflorescence:** raceme, panicle, cyme, or flowers 1, terminal or axillary, generally bracted; pedicel often with 2 bractlets. **Flower:** generally bisexual, generally radial, bell-shaped, cylindric, or urn-shaped; sepals generally (0)4–5, generally free; petals generally (0)4–5, free or fused; stamens (2–5)8–10, free, filaments rarely appendaged, anthers dehiscing by pores or slits, awns 0 or 2(4), seemingly abaxial, reduced or elongate, generally curved; nectary generally present at ovary base, generally disk-like; ovary superior or inferior, chambers generally 1–5, placentas axile or parietal, ovules 1–many per chamber, style 1, stigma head- to funnel-like or lobed. **Fruit:** capsule, drupe, berry. **Seed:** generally many, winged or not. ± 100 genera, 3000 species: generally worldwide except deserts; some cultivated, especially *Arbutus*, *Arctostaphylos*, *Rhododendron*, *Vaccinium*. [Kron et al. 2002 Bot Rev 68:335–423] Monophyletic only if Empetraceae included, as treated here. *Ledum* included in *Rhododendron*. Non-green plants obtain nutrition from green plants through fungal intermediates. —Scientific Editors: Gary D. Wallace, Thomas J. Rosatti.

**PYROLA WINTERGREEN**  
**Diana D. Jolles**

Perennial subshrub, evergreen, rhizomed. **Leaf:** ± basal, reniform, ovate, ± round, elliptic, or obovate, ± entire to crenate or dentate, generally petioled (if vestigial, lanceolate to deltate, ± not green, sessile). **Inflorescence:** raceme, ± erect, not 1-sided, elongate; scape smooth, glabrous, bracts generally 1–several, deltate or lanceolate; flower bract 1 per flower, < to >> pedicel. **Flower:** radial, ± closed or subradial or bilateral, ± open, parts in 5s, free; petals without tubercles, upper 2 generally forming hood over upturned stamens; stamens 10, filaments generally widened at base, smooth, glabrous, anther generally with tube-like constrictions subtending pores; nectary 0; ovary superior, style ± included and straight or generally exserted and downcurved, stigma peltate, with 5 spreading lobes above a prominent, reflexed collar or generally not peltate, generally with 5 ± erect lobes projecting beyond a delicate, reflexed collar. **Fruit:** capsule, pendent; valves opening base to tip, margins fibrous. **Seed:** ± 1000. ± 30 species: generally circumboreal, high mountains of Central America, Sumatra. (Latin: little pear, ± from leaf shape) [Jolles & Wolfe 2012 Syst Bot 37:468–477; Jolles & Wilson 2014 Taxon 63(4):789–800] *Pyrola aphylla*, *Pyrola dentata* newly recognized, added as native; *Pyrola crypta* newly described, added as native.

1. Flowers radial, ± closed; style ± included, straight, < 2 mm, stigma lobes spreading; anthers < 1.5 mm, ± without tube-like constrictions subtending pores (subg. *Amelia*) ..... *P. minor*
- 1' Flowers subradial to bilateral, ± open; style exserted, downcurved, > 4 mm, stigma lobes ± erect; anthers ≥ 2 mm, with tube-like constrictions subtending pores (subg. *Pyrola*)
2. Flower bract generally >> pedicel
  3. Leaf blades generally vestigial or 0, sessile, ± appressed, ± not green, dull adaxially ..... *P. aphylla* (2)
  - 3' Leaf blades well developed, petioled, spreading, green (chlorophyll present), ± shiny adaxially ..... *P. asarifolia*
  4. Flower bract 1–1.5 × pedicel; sepals 2–3.5 mm, deltate to lanceolate; leaf round to reniform, entire to ± crenate; anthers 2–3 mm ..... subsp. *asarifolia*
  - 4' Flower bract generally > 2 × pedicel; sepals 3–5.8 (generally >> 3.5) mm, lanceolate to lance-oblong; leaf ± round to elliptic, generally minutely mucronate-dentate; anthers 2.5–3.5 mm ..... subsp. *bracteata*
- 2' Flower bract generally ≤ pedicel
  5. Leaf blades generally vestigial or 0, largest lanceolate to deltate, sessile, ± not green, ± 1 cm ..... *P. aphylla* (2)
  - 5' Leaf blades generally present, largest round to obovate, oblanceolate, or elliptic, petioled, green, generally > 1.5 cm
  6. Leaves glaucous, bluish, erect; petiole ± 1/4–1/2 blade; blades entire to serrate ..... *P. dentata*
  - 6' Leaves not glaucous, dark green, spreading; petiole ± ≥ 1/2 blade; blades entire (serrate)
  7. Leaf blade without white mottling on veins adaxially, round, 1–2.5 cm, adaxial veins raised ..... *P. chlorantha*
  - 7' Leaf blade with white mottling on veins adaxially, ovate to obovate to elliptic, 2.5–7 cm; adaxial veins not raised
  8. Sepals 2.2–3.4 mm; flower bract generally > 1/2 pedicel; KR, NCoRO, NCoRH, CaR ..... *P. crypta*
  - 8' Sepals 1.2–2(2.5) mm; flower bract generally ± 1/2 pedicel; NW, CaR, SN, SnFrB, SCoRO, SnBr, PR, SnJt, MP ..... *P. picta*

**P. aphylla** Sm. LEAFLESS WINTERGREEN**NATIVE**

**Leaf:** blade generally vestigial or 0, largest  $\pm 1$  cm, lanceolate to deltate,  $\pm$  not green, adaxially dull, occasionally with  $\pm$  light-color along adaxial veins, often hidden by leaf litter or loose substrate; petiole 0. **Inflorescence:**  $< 6$  dm including scape, often several together; flowers 7–25; flower bract  $0.5\text{--}1.5 \times$  pedicel. **Flower:** bilateral,  $\pm$  open; sepals generally 2–3 mm; petals 5–7.5 mm, cream-white or pink; anthers 2.8–4.5 mm.  $2n=46$ . Mixed conifer forest to *Quercus*, *Arbutus*, or *Pinus* woodland, forested serpentine areas, in deep litter and duff on hillsides of decomposed granite or loose, coarse sand. 500–2500 m. NW, CaR, SNF, SNH, CW, SnBr, PR, MP; to southwest British Columbia, Baja California. Occasionally hybridizes with other species and produces clones with blades expanded to  $\pm 1$  cm wide. Jun–Aug

**P. asarifolia** Michx.**NATIVE**

**Leaf:**  $< 20$  cm, abaxially often purple, adaxially  $\pm$  shiny; petiole  $\pm =$  blade. **Inflorescence:**  $< 6$  dm including scape; flowers  $\pm 10$ ; flower bract generally  $\gg$  pedicel, broadly lanceolate, acuminate. **Flower:** subradial to bilateral,  $\pm$  open; sepals deltate to lanceolate, acute to acuminate; petals 4.8–9 mm, ovate to obovate, pink, pink-purple, or deep red; anthers 2–3.5 mm; style 6–8 mm.

**P. asarifolia** subsp. **asarifolia** BOG WINTERGREEN**NATIVE**

**Leaf:** 3–13 cm, round to reniform; entire to  $\pm$  crenate. **Inflorescence:** scape 1–3.5 dm; flower bract  $1\text{--}1.5 \times$  pedicel. **Flower:** sepals 2–3.5 mm, deltate to lanceolate; petals 4.8–8.6 mm; anthers 2–3 mm.  $2n=46$ . Common. Moist forest, swamps, bogs, streambanks; 30–2800 m. KR, CaRH, SNH, SnBr, MP; to southern Alaska, Montana, eastern North America; eastern Asia. Jun–Jul

**P. asarifolia** subsp. **bracteata** (Hook.) Haber LONG-BRACTED WINTERGREEN**NATIVE**

**Leaf:** 4.5–20 cm,  $\pm$  round to elliptic, generally minutely mucronate-dentate. **Inflorescence:** scape 2–4.5 dm; flower bract generally  $> 2 \times$  pedicel. **Flower:** sepals 3–5.8 (generally  $\gg 3.5$ ) mm, lanceolate to lance-oblong; petals 6–9 mm; anthers 2.5–3.5 mm. Uncommon. Moist to dry forest, mixed conifer forest, coastal prairie; 100–2000 m. NW, n SNH; to southern Alaska, Montana. Jun–Jul

**P. chlorantha** Sw. GREEN-FLOWERED WINTERGREEN**NATIVE**

**Leaf:** generally present,  $< 4$  cm; blade 1–2.5 cm, round, leathery, entire, adaxially dull, dark green, veins raised; petiole  $\pm =$  blade. **Inflorescence:**  $< 3$  dm including scape; flowers 1–10; flower bract  $<$  pedicel, narrowly lanceolate. **Flower:** bilateral,  $\pm$  open; sepals generally  $< 1.8$  mm, deltate; petals 5–9 mm, pale green to white; anthers 2–4 mm.  $2n=46$ . Generally mixed conifer forest; 900–2200 m. Presumed extirpated but once known from NCoRH, SNH (to be sought in SnBr, SNE, DMtns); circumboreal, North America, Eurasia. Occasionally produces clones with highly reduced leaves, appearing to be leafless. Jul–Aug {CNPS list}

**P. crypta** Jolles CRYPTIC WINTERGREEN**NATIVE**

**Leaf:**  $\pm 5\text{--}8$  cm, with 1–many scale-like leaves between; blade 2.9–4.9 cm, obovate to elliptic, dark green, with white mottling on veins adaxially; petiole  $<$  blade. **Inflorescence:** 7–14 cm including scape; flowers 7–16; flower bract generally  $> 1/2$  pedicel. **Flower:** bilateral,  $\pm$  open; sepals 2.2–3.4 mm, lanceolate, tips  $\pm$  recurved; petals 5.3–6.5 mm; anthers 2.5–3.2 mm. Uncommon. Moist to dry mixed conifer forests, often with granite; 500–1900 m. KR, NCoRO, NCoRH, CaR; to Washington. May be confused with *Pyrola picta*. Jul–Aug

**P. dentata** Sm. TOOTHED WINTERGREEN

**NATIVE**

**Leaf:** generally present, 3–13 cm, glaucous, bluish; blade 2–9 cm, round, ovate, elliptic, or oblanceolate, base generally tapered to petiole, entire to serrate; petiole  $\pm$  1/4–1/2 blade. **Inflorescence:** 8–27 cm including scape; flowers 1–20; flower bract  $\leq$  1/2 pedicel. **Flower:** bilateral,  $\pm$  open; sepals 1.1–2.3 mm, deltate; petals 4.1–8 mm; anthers 2.6–4 mm.  $2n=46$ . Mixed conifer forest, mixed conifer and *Quercus* woodland, *Pinus* woodland, forested serpentine and volcanic areas, hillsides of decomposed granite or loose, coarse sand or gravel near rocky outcrops; 55–2900 m. NW, CaR, SN, SnFrB, TR, PR, MP; to southwest British Columbia, Baja California. Occasional hybridization with other species; different morphology in northern, southern California needs study. Jun–Aug

**P. minor** L. LESSER WINTERGREEN

**NATIVE**

**Leaf:**  $<$  5 cm; blade 1.5–4 cm, round to obovate, dull green, entire to obscurely crenate; petiole  $\pm$  = blade. **Inflorescence:**  $<$  2 dm including scape; flowers 3–10; flower bract  $>$  pedicel, lance-oblong, proximal-most generally larger. **Flower:** radial,  $\pm$  closed; sepals 1.5–2 mm, deltate; petals 3.5–5 mm, white to  $\pm$  pink; anthers  $<$  1.5 mm,  $\pm$  without tube-like constrictions subtending pores; style  $\pm$  included, straight, stigma lobes spreading.  $2n=46$ . Uncommon. Moist, mossy or boggy areas, high montane conifer forest; 2400–3000 m. KR, c&s SN, SnBr, SnJt, Wrn; circumboreal, to Alaska, eastern North America; Eurasia. Primarily self-fertilizing, but may hybridize with *Pyrola asarifolia*, *Pyrola rotundifolia*. Jul–Aug

**P. picta** Sm. WHITE-VEINED WINTERGREEN

**NATIVE**

**Leaf:** generally present, 4–15 cm; blade 2.5–7 cm, ovate to obovate to elliptic,  $\pm$  entire, dark green, with white mottling on veins adaxially, occasionally purple abaxially; petiole  $\pm$   $\geq$  1/2 blade. **Inflorescence:**  $<$  3.5 dm including scape; flowers 5–25; flower bract 2–4 mm, generally  $\pm$  1/2 pedicel. **Flower:** bilateral,  $\pm$  open; sepals 1.2–2(2.5) mm, deltate to lanceolate; petals 5–7 mm, greenish, cream-white, or pink; anthers 2.5–3.5 mm.  $2n=46$ . Moist to dry mixed conifer forests, *Pinus* woodlands, volcanic areas, occasionally on decomposed granite; 400–2400 m. NW, CaR, SN, SnFrB, SCoRO, SnBr, PR, SnJt, MP; to British Columbia, New Mexico. Occasional hybridization with other *Pyrola* species (pollen, seeds sometimes abortive), occasional production of clones with highly reduced leaves, appearing leafless. Jun–Aug

**FAGACEAE OAK FAMILY**  
**John M. Tucker, except as noted**

Shrub, tree, evergreen or not; monoecious. **Leaf:** simple, alternate, petioled; margin entire to lobed; stipules small, generally deciduous. **Staminate inflorescence:** catkin or stiff spike, many-flowered. **Pistillate inflorescence:** 1–few-flowered, generally above staminate inflorescence; involucre bracts many, generally overlapping, flat or cylindric. **Staminate flower:** calyx generally 4–6-lobed, minute; petals 0; stamens 4–12+. **Pistillate flower:** calyx generally 6-lobed, minute; petals 0; ovary inferior, style branches generally 3. **Fruit:** 1 nut subtended, partly enclosed by scaly, cup-like involucre or 1–3 nuts subtended, enclosed by spiny, bur-like involucre; mature years 1–2. **Seed:** generally 1. 7 genera, ± 900 species: generally northern hemisphere. [Li et al. 2004 Int J Plant Sci 165:311–324] Wood of *Quercus* critical for pre-20th century ship-building, charcoal for metallurgy; some now supply wood (*Fagus*, *Quercus*), cork (*Quercus suber*), food (*Castanea*, chestnut). *Lithocarpus densiflorus* moved to *Notholithocarpus*. —Scientific Editors: Thomas J. Rosatti, Bruce G. Baldwin.

**QUERCUS OAK**  
**Thomas J. Rosatti & John M. Tucker**

Evergreen or not. **Leaf:** stipules small, generally early-deciduous. **Staminate inflorescence:** catkins, 1–several, pendent, slender, proximal on twig. **Pistillate inflorescence:** in distal leaf axils, short-stalked; flower generally 1. **Staminate flower:** stamens 4–10. **Pistillate flower:** calyx minute, generally 6-lobed; ovary enclosed by involucre. **Fruit:** nut 1, partly enclosed by cup-like involucre (cup) with appressed scales (nut and cup = acorn), remnants of perianth and style persistent as small point at tip; scales tubercled to not; mature in years 1 (on younger stems) or 2 (on older stems).  $2n=24$ . ± 600 species: northern hemisphere, to northern South America, India. (Latin: ancient name for oak) [Manos et al. 1999 Molec Phylogen Evol 12:333–349] Many named hybrids; those (3) treated here form widespread populations; most others occur as single individuals, and some but not all of these are mentioned here, under the first parent treated (alphabetically). Reproduction of many species declining due to habitat degradation or loss as well as disease. *Quercus robur* added, as waif.

1. Acorn cup scales thin, not tubercled, shell hairy to woolly inside, at least at tip; bark dark gray or gray-brown to black
2. Leaf moderately to deeply lobed, lobes 1–4-toothed, teeth generally bristle-tipped; plant deciduous ..... *Q. kelloggii*
- 2' Leaf entire to toothed, teeth abruptly pointed to spine-tipped, not bristle-tipped; plant evergreen
3. Leaf generally adaxially convex, margin rolled under or not, obscuring marginal teeth, blade generally widely elliptic to round; fruit mature in year 1 ..... *Q. agrifolia*
4. Leaf abaxially glabrous to sparsely hairy except vein axils hair-tufted ..... var. *agrifolia*
- 4' Leaf abaxially densely tomentose ..... var. *oxyadenia*
- 3' Leaf adaxially ± flat, margin not rolled under, blade generally lanceolate to oblong; fruit mature in years 1–2
5. Leaf abaxially ± yellow or ± white woolly; fruit mature in year 1 ..... *Q. ilex*
- 5' Leaf abaxially glabrous; fruit mature in year 2
6. Leaf 2–5 cm, abaxially generally ± shiny, yellow-green; nut distally acute to ± obtuse ..... *Q. wislizeni*
7. Shrub 2–4(6) m ..... var. *frutescens*
- 7' Tree generally 10–22 m ..... var. *wislizeni*
- 6' Leaf 3–9(14) cm, abaxially generally ± dull; nut distally obtuse to ± rounded ..... *Q. parvula*
8. Tree < 17 m — s NCo, NCoRI, CW (except SCoRI), WTR ..... var. *shrevei*
- 8' Shrub 1–6 m
9. Leaf margin generally entire; SCoRO (Santa Barbara Co.), n ChI (Santa Cruz Island), e WTR ..... var. *parvula*
- 9' Leaf margin long-tapered dentate; SnFrB (Mount Tamalpais) ..... var. *tamalpaisensis*
- 1' Acorn cup scales generally thick, generally tubercled to ± not, shell glabrous to woolly inside; bark light gray to ± white
10. Acorn nut shell ± woolly inside; fruit mature in year 2; plants evergreen
11. Leaf generally 3–8 cm; acorn cup > 1.5 cm wide; generally tree, > 7 m
12. Leaf adaxially with lateral veins ± not impressed, abaxially golden-puberulent, glabrous in age ..... *Q. chrysolepis*
- 12' Leaf adaxially with lateral veins impressed, abaxially densely tomentose, sparsely tomentose in age — ChI ..... *Q. tomentella*
- 11' Leaf generally 1–3.5 cm; acorn cup < 1.5 cm wide (if > 1.5 cm wide, leaves ≤ 3 cm); generally shrub, < 7 m

13. Twigs rigid; leaf margin wavy, strongly spine-toothed; blade elliptic to round-ovate; plants 2–6 m, erect ..... *Q. palmeri*
- 13' Twigs flexible; leaf margin entire to irregularly serrate, teeth mucronate or spine-tipped; blade oblong or lanceolate to ovate; plants to 5 m, prostrate to erect
14. Leaf margin entire or with few irregular spine-tipped teeth; dry chaparral, 100–1800 m, sw PR ..... *Q. cedrosensis*
- 14' Leaf margin entire to mucro-toothed; montane conifer zone, 900–2800 m, KR, NCoRH, NCoRI, CaRH, SNH, MP ..... *Q. vaccinifolia*
- 10' Acorn nut shell glabrous inside; fruit mature in year 1; plants evergreen or not
15. Leaf lobed ( $\pm$  entire, wavy, or  $\pm$  lobed in *Quercus douglasii*), margins generally without spines; plants deciduous
16. Leaf abaxially glabrous (in youth sometimes sparsely hairy), base strongly cordate, often revolute; fr on axillary peduncle (25-)35–65(-100) mm ..... [*Q. robur*]
- 16' Leaf abaxially fine-hairy, puberulent, fine-tomentose, short-hairy, or densely appressed-stellate-hairy, base wedge-shaped, rounded-gradually tapered, or truncate (subcordate); fr subsessile or rarely on axillary peduncle to 10(-20) mm
17. Leaf shallowly lobed (sinuses generally  $< 1/2$  distance lobe tip to midrib), adaxially generally dull, green to blue-green
18. Leaf adaxially green; acorn cup scales tubercled; ChI ..... *Q.  $\times$ macdonaldii*
- 18' Leaf adaxially blue- or gray-green; acorn cup scales  $\pm$  tubercled; mainland
19. Shrub, tree  $< 3$  m, evergreen to deciduous; leaves 1.5–5 cm, generally irregularly coarsely toothed, adaxially blue- or gray-green ..... *Q.  $\times$ alvordiana* (2)
- 19' Tree, deciduous; leaves 3–6(8) cm,  $\pm$  entire, wavy, or  $\pm$  lobed, adaxially blue-green ..... *Q. douglasii*
- 17' Leaf moderately to deeply lobed (sinuses generally  $> 1/2$  distance lobe tip to midrib), adaxially  $\pm$  shiny, dark green
20. Tree; acorn cup 10–30 mm deep, all scales tubercled; nut 30–50 mm, generally long-conic, distally acute to  $\pm$  obtuse ..... *Q. lobata*
- 20' Shrub to tree; acorn cup 4–9 mm deep, proximal scales  $\pm$  tubercled, distal  $\pm$  not; nut 20–30 mm, ovoid to  $\pm$  spheric, distally rounded ..... *Q. garryana*
21. Tree 8–20 m, generally with 1 trunk; terminal buds 5–12 mm, fusiform, hairs dense,  $\pm$  yellow or  $\pm$  white ..... var. *garryana*
- 21' Shrub to small tree 0.3–5 m, generally with  $> 1$  trunk; terminal buds 2–5 mm, hairs sparse, brown or  $\pm$  red
22. Rays of stellate hairs on leaf abaxially generally 4–6, 0.25–0.5 mm; KR, NCoRH, CCo ..... var. *breweri*
- 22' Rays of stellate hairs on leaf abaxially generally 6–8,  $< 0.3$  mm; KR, NCoRI, CaRH, SN (except c SNH), SnFrB, SCoRO, ne WTR, MP ..... var. *semota*
- 15' Leaf generally entire to toothed, not lobed, teeth with spines or not; plants generally evergreen
23. Leaves 7–11(18) cm, serrate, lateral veins of larger leaves generally 20–28, generally straight and prominent; stipules persistent,  $> 10$  mm, silky-hairy ..... *Q. sadleriana*
- 23' Leaves 1–6 cm, entire to dentate, lateral veins of larger leaves generally  $< 20$ , generally not straight and prominent; stipules early-deciduous,  $< 10$  mm, not silky-hairy
24. Shrub to tree generally  $> 5$  m; leaves 2–6 cm, oblong to obovate, entire or  $\pm$  toothed, adaxially shiny green to dull blue-green
25. Shrub, small tree 5–6(10) m; leaf blade (10)20–35(60) mm, adaxially shiny green to dull blue-green, margin entire, dentate, or wavy-dentate ..... *Q.  $\times$ acutidens* (2)
- 25' Tree 5–25 m; leaf blade (20)30–60(80) mm, adaxially blue-green, dull, margin wavy-dentate to generally entire ..... *Q. engelmannii*
- 24' Shrub to small tree generally  $< 5$  m (*Quercus berberidifolia* sometimes a small tree to 8+ m); leaves 1–5 cm, elliptic to ovate or  $\pm$  round, variously toothed, adaxially shiny to dull green to dull blue-, yellow-, or gray-green
26. Leaf 2-colored, adaxially yellow- to gray-green, abaxially  $\pm$  white, densely fine-tomentose, hairs obscuring lateral veins ..... *Q. cornelius-mulleri*

- 26' Leaf 1–2-colored, adaxially green to gray- or blue-green, abaxially dull light or pale green or gray-green, not densely tomentose, hairs not obscuring lateral veins
27. Leaf generally oblong to obovate, margin wavy to obtuse-toothed; PR ..... *Q. ×acutidens* (2)
- 27' Leaf elliptic to ovate or ± round, margin toothed, teeth abruptly pointed to spine-tipped
28. Acorn cup thin, scales ± tubercled to not; leaf adaxially gray- or blue-green, dull
29. Acorn stalk 10–15 mm, nut cylindric-ovoid to elliptic, 12–23 mm, generally yellow-brown, distally obtuse; leaves oblong to elliptic, generally regularly spine-toothed ..... *Q. turbinella*
- 29' Acorn stalk 0, nut conic-ovoid, 20–40 mm, generally dark brown, distally acute to ± obtuse; leaves oblong to elliptic or obovate, irregularly toothed, teeth blunt to weakly spiny
30. Shrub to small tree < 3 m; leaves 1.5–5 cm, toothed but not spine-toothed, adaxially blue- to gray-green ..... *Q. ×alvordiana* (2)
- 30' Shrub 2–5 m to tree < 7 m; leaves 1.3–2.8 cm, spine-toothed, adaxially gray-green ..... *Q. john-tuckeri*
- 28' Acorn cup thick, scales tubercled; leaf adaxially generally green, ± shiny (dull or not in *Quercus durata*)
31. Leaf adaxially dull, convex, margin often rolled under, obscuring teeth ..... *Q. durata*
32. Leaf adaxially strongly convex, abaxially short-hairy when young; generally on serpentine, NCoR, n SN, s CCo, SnFrB, SCoR ..... var. *durata*
- 32' Leaf adaxially ± convex, abaxially densely short-hairy when young; not on serpentine, se WTR, SnGb (s slope) ..... var. *gabrielensis*
- 31' Leaf adaxially ± shiny, flat to ± wavy, not convex, margin generally not rolled under
33. Leaf abaxially with spreading, 2–6-rayed hairs — SCo, PR, chaparral or coastal-sage scrub, < 200 m ..... *Q. dumosa*
- 33' Leaf abaxially with appressed, 4–10-rayed hairs
34. Leaf base wedge-shaped or generally truncate or rounded; margin mucro- or spine-toothed; widespread on mainland ..... *Q. berberidifolia*
- 34' Leaf base gradually tapered, wedge-shaped, or rounded; margin entire, wavy, or ± toothed, teeth generally mucronate; ChI ..... *Q. pacifica*

***Q. ×acutidens* Torr.****NATIVE**

Shrub to small tree 5–6(10) m, evergreen. **Leaf:** 2–6 cm; petiole 3–7 mm; blade generally oblong to obovate, ± leathery, adaxially shiny green to dull blue-green, abaxially ± densely puberulent, glabrous in age, dull, pale green, tip obtuse to short-toothed, margin entire, dentate, or wavy-dentate. **Fruit:** cup 10–18 mm wide, 6–9 mm deep, bowl-shaped, scales ± tubercled; nut 20–25 mm, oblong to ovoid, distally acute, shell glabrous inside; mature in year 1. Slopes, chaparral, woodland; < 1720 m. PR. Hybrids involving *Quercus cornelius-mulleri*, *Quercus engelmannii*, considered sp. by Torrey. Feb–May

***Q. agrifolia* Née COAST LIVE OAK, ENCINA****NATIVE**

Tree (6)10–25 m, evergreen; top wide; trunk bark furrowed, ± checkered, ± gray. **Leaf:** 2.5–6(9) cm; petiole 4–15 mm; blade generally widely elliptic to round, generally adaxially convex, ± dull green, abaxially glabrous to densely tomentose, dull, pale green, tip rounded to spine-toothed, margin rolled under or not, weakly spine-toothed. **Fruit:** cup 10–16 mm wide, 8–15 mm deep, obconic, scales thin, ± not tubercled, ± glabrous, ± brown; nut 25–35 mm, slender, ovoid, distally acute, shell woolly inside; mature in year 1.

***Q. agrifolia* var. *agrifolia*****NATIVE**

**Leaf:** abaxially glabrous to sparsely hairy except vein axils hair-tufted. Valleys, slopes, mixed-evergreen forest, woodland; < 1440 m. NCoRO, NCoRI, ScV, CW, SW; Baja California. [*Quercus agrifolia* var. *frutescens* Engelm.] Hybridizes with *Quercus kelloggii* (*Quercus ×chasei* McMinn et al.), *Quercus parvula* var. *shrevei*, *Quercus wislizeni*. Mar–Apr

**Q. agrifolia** var. **oxyadenia** (Torr.) J.T. Howell**NATIVE**

**Leaf:** abaxially densely tomentose. Generally granitics; 300–1500 m. SnGb, SnBr, PR; Baja California. Hybridizes with *Quercus kelloggii* (*Quercus* × *ganderi* C.B. Wolf). Mar–Apr

**Q. ×alvordiana** Eastw.**NATIVE**

Shrub to small tree < 3 m, evergreen to deciduous. **Leaf:** 1.5–5 cm; petiole 2–5 mm; blade generally oblong to widely elliptic, adaxially dull, blue- to gray-green, abaxially fine-hairy, dull, pale green, tip obtuse to abruptly pointed, margin generally irregularly coarsely toothed. **Fruit:** cup 10–16 mm wide, 8–10 mm deep, cup- to bowl-shaped, scales ± tubercled, light brown; nut 20–40 mm, generally narrowly ovoid, distally acute, asymmetric or not, shell glabrous inside; mature in year 1. Dry slopes, hills; 180–1300 m. Teh, SCoR, WTR. Hybrids involving *Quercus douglasii*, *Quercus john-tuckeri*, considered sp. by Eastwood. Jan–Mar

**Q. berberidifolia** Liebm. SCRUB OAK**NATIVE**

Shrub 1–3 m or small tree to 8+ m, evergreen. **Leaf:** 1.5–3 cm; petiole 2–4 mm; blade oblong, elliptic, or ± round, adaxially ± flat to wavy, ± shiny, green, abaxially with minute appressed stellate hairs, dull, pale green, tip generally rounded, margin mucro- or spine-toothed. **Fruit:** cup 12–20 mm wide, 5–10 mm deep, hemispheric to bowl-shaped, thick, scales tubercled; nut 10–30 mm, generally ovoid, distally obtuse to rounded, shell glabrous inside; mature in year 1. Dry slopes, chaparral; 100–1800 m. KR, NCoR, CaRH, SNF, Teh, ScV (Sutter Buttes), CW, SW; Baja California. Hybridizes with *Quercus durata*, *Quercus engelmannii*, *Quercus garryana* (*Quercus* × *howellii* J.M. Tucker), *Quercus john-tuckeri*, *Quercus lobata*. Feb–Apr

**Q. cedrosensis** C.H. Mull. CEDROS ISLAND OAK**NATIVE**

Tree to 5 m, decumbent shrub 2–3 m, or prostrate shrub to 2 dm, evergreen; trunk bark flaky, gray; twigs brown, hairy, dark gray in age; buds 1 mm, widely ovoid or subround, light brown, sparsely hairy. **Leaf:** 6–20 (35) mm; petiole 1.5–2.5 mm; blade lanceolate, ovate, oblong, elliptic, or subround, adaxially flat or convex, glossy green, glabrous, abaxially glaucous, glabrous, veins white, base rounded or cordate, tip acute to widely rounded, generally spine-like, margin entire or with few irregular spine-tipped teeth. **Fruit:** stalk ± 0–10 mm; cup 7–12 mm wide, 5–6 mm deep, cup-shaped, scales thickened basally; nut 15–22 mm, narrowly ovoid to fusiform, distally acute to ± obtuse, shell tomentose inside; mature in year 2. Chaparral; 100–1800 m. sw PR (Otay Mtn, San Diego Co.); Baja California. Apr–May {CNPS list}

**Q. chrysolepis** Liebm. MAUL OAK, CANYON LIVE OAK**NATIVE**

Shrub to tree < 35 m, evergreen; trunk bark narrowly furrowed, scaly, pale gray; twigs golden-tomentose, ± glabrous in age. **Leaf:** (1.5)3–6 cm, leathery; petiole 3–10 mm; blade oblong to oblong- or round-ovate, adaxially dark green, abaxially golden-puberulent, glabrous in age, dull, ± gray, tip acute to abruptly pointed, margin entire or spine-toothed. **Fruit:** cup 17–30 mm wide, 5–10 mm deep, saucer- to bowl-shaped, scales thick, ± tubercled to not, golden-tomentose; nut 25–30 mm, 14–20 mm wide, ± ovoid, oblong, or elliptic, distally obtuse to rounded, shell woolly inside; mature in year 2. Canyons, shaded slopes, chaparral, mixed-evergreen forest, woodland; 30–2750 m. CA-FP (except GV), e DMtns; Oregon, Arizona, Baja California. [*Quercus chrysolepis* var. *nana* (Jeps.) Jeps.] Highly variable. Hybridizes with *Quercus palmeri*, *Quercus tomentella*, *Quercus vacciniifolia*. Apr–May

**Q. cornelius-mulleri** Nixon & K.P. Steele MULLER'S OAK**NATIVE**

Shrub 1–2.5 m, evergreen, densely branched; twigs finely tomentose. **Leaf:** 2.5–3.5 cm, leathery; petiole 2–5 mm; blade oblong, ovate, or narrowly obovate, adaxially sparsely puberulent, dull, yellow- to gray-green, abaxially densely fine-tomentose, ± white, midrib yellow, tip acute to rounded, margin entire or 4–6-toothed. **Fruit:** cup 12–20 mm wide, 5–8 mm deep, hemispheric to cup-shaped, scales ± not tubercled, gray-canescens; nut 20–30 mm, elliptic to widely conic, distally obtuse, puberulent, shell glabrous inside; mature in year 1. Slopes, generally granitic soils, chaparral, pinyon woodland; 300–2140 m. s SNH, SnGb (n slope), SnBr (n slope), PR (e slope), s DMtns (Little San Bernardino Mtns), DSon (Eagle Mtns); Baja California. Hybridizes with *Quercus engelmannii* (*Quercus* × *acutidens*), *Quercus lobata* (*Quercus* × *munzii* J.M. Tucker). Feb–Apr



**Q. douglasii** Hook. & Arn. BLUE OAK**NATIVE**

Tree 6–20 m, deciduous; trunk bark checkered into thin scales, ± gray. **Leaf:** 3–6(8) cm; petiole 3–9 mm; blade oblong to obovate, adaxially dull, blue-green, abaxially puberulent, pale blue-green, tip generally rounded, margin ± entire, wavy, or ± lobed. **Fruit:** cup 12–20 mm wide, 6–10 mm deep, cup- to bowl-shaped, scales ± tubercled; nut 20–35 mm, ovoid to subcylindric, distally acute to ± obtuse, shell glabrous inside; mature in year 1. Dry slopes, interior foothills, woodland; < 1590 m. NCoRO, NCoRI, CaRF, SNF, Teh, ScV (Sutter Buttes), SnJV, SnFrB, SCoR, s ChI (Santa Catalina Island), WTR (n slope), MP. Hybridizes with *Quercus garryana* (*Quercus ×eplingii* C.H. Mull.), *Quercus john-tuckeri* (*Quercus ×alvordiana*), *Quercus lobata* (*Quercus ×jolonensis* Sarg.). Apr–May

**Q. dumosa** Nutt. NUTTALL'S SCRUB OAK**NATIVE**

Shrub 1–4 m, generally evergreen; twigs slender, 1–1.5 mm diam, sparsely short-hairy, dark red-brown, glabrous in age. **Leaf:** 1–2.5 cm; petiole < 5 mm; blade oblong, elliptic, or ± round, adaxially ± convex or not, ± shiny, green, abaxially fine-tomentose, in age glabrous, dull, pale green, tip obtuse to abruptly pointed, margin ± wavy or not, ± spine-toothed. **Fruit:** cup 8–15 mm wide, 5–8 mm deep, generally bowl-shaped, scales ± tubercled; nut 10–20 mm, ± slender, generally ovoid, distally acute to obtuse, shell glabrous inside; mature in year 1. Generally sandy soils near coast, sandstone, chaparral, coastal-sage scrub; < 200 m. SCo, PR; Baja California. Hybridizes with *Quercus berberidifolia*, *Quercus douglasii*, *Quercus engelmannii*, *Quercus garryana* (*Quercus ×eplingii* C.H. Mull.), *Quercus lobata* (*Quercus ×kinseliae* (C.H. Mull.) Nixon & C.H. Mull., *Quercus dumosa* var. *kinseliae* C.H. Mull.). Mar–May {CNPS list}

**Q. durata** Jeps. LEATHER OAK**NATIVE**

Shrub to small tree 1–5+ m, evergreen; twigs tomentose, glabrous in age or not. **Leaf:** 1.5–3 cm; petiole < 5 mm; blade oblong to elliptic, adaxially convex, puberulent, dull green, abaxially short-hairy, pale green, tip spiny or abruptly pointed, margin wavy, often rolled under, toothed, teeth spine-tipped or abruptly pointed. **Fruit:** cup 12–18 mm wide, 4–6 mm deep, bowl-shaped, scales tubercled; nut 15–25 mm, ovoid to cylindric, distally obtuse to rounded, shell glabrous inside; mature in year 1. Hybridizes with *Quercus berberidifolia*, *Quercus garryana* (*Quercus ×subconvexa* J.M. Tucker).

**Q. durata** var. **durata****NATIVE**

**Leaf:** adaxially strongly convex; abaxially short-hairy when young; margin rolled under. Chaparral, generally serpentine; 150–1500 m. NCoR, n SN, s CCo, SnFrB, SCoR. Apr–May

**Q. durata** var. **gabrielensis** Nixon & C.H. Mull. SAN GABRIEL OAK**NATIVE**

**Leaf:** adaxially ± convex; abaxially densely short-hairy when young; margin rolled under or not. Chaparral, granitics; 450–1000 m. se WTR, SnGb (s slope). Hybridizes with *Quercus engelmannii* (*Quercus ×grandidentata* Ewan), *Quercus lobata* Née (*Quercus ×townei* Palmer). Apr–May {CNPS list}

**Q. engelmannii** Greene ENGELMANN OAK**NATIVE**

Tree 5–25 m, evergreen; trunk bark narrowly furrowed, scaly, ± gray; young twigs finely tomentose, in age glabrous. **Leaf:** 2–6 cm; petiole 3–7 mm; blade oblong to obovate, adaxially dull blue-green, abaxially soft-hairy, glabrous in age, pale blue-green, tip obtuse to rounded, margin generally entire to wavy-dentate. **Fruit:** cup 10–15 mm wide, 6–8 mm deep, cup- to bowl-shaped, scales ± tubercled; nut 15–25 mm, oblong-cylindric to ovoid, distally obtuse to rounded, shell glabrous inside; mature in year 1. Slopes, foothills, woodland; < 1300 m. SCo, s ChI (1 tree on Santa Catalina Island), SnGb, PR; Baja California. Hybridizes with *Quercus berberidifolia*, *Quercus cornelius-mulleri*. Apr–May {CNPS list}

**Q. garryana** Hook. OREGON OAK**NATIVE**

Shrub to small tree 0.3–5 m or tree 8–20 m, deciduous; trunk bark thin, scaly, ± light gray; twigs short-hairy, ± green, glabrous in age, red-brown. **Leaf:** 5–15 cm; petiole 5–25 mm; blade elliptic to obovate, adaxially shiny, dark green, abaxially short-hairy, dull, light green, tip obtuse to rounded, margin lobes 5–7 per leaf, deep, entire or 2-toothed. **Fruit:** cup 12–25 mm wide, 4–9 mm deep, cup- to bowl-shaped, proximal scales ± tubercled, distal ± not; nut 20–30 mm, ovoid to ± spheric, distally rounded, shell glabrous inside; mature in year 1.

**Q. garryana** var. **breweri** (Engelm.) Jeps.**NATIVE**

Shrub to small tree, spreading, with multiple trunks. **Stem:** terminal buds 3–5 mm, ovoid, hairs sparse, brown or ± red. **Leaf:** blade 5–9 cm, abaxially with erect hairs, rays of stellate hairs generally 4–6, 0.25–0.5 mm. Mtn slopes, conifer forest, maritime chaparral; (150)1400–2000 m. KR, NCoRH, CCo (nw San Luis Obispo Co.); to Oregon. Hybridizes with *Quercus sadleriana*. Apr–Jun

**Q. garryana** var. **garryana****NATIVE**

Tree. **Stem:** terminal buds 5–12 mm, fusiform, hairs dense, ± yellow or ± white. **Leaf:** blade 7–14 cm. Slopes, mixed-evergreen or conifer forest; 90–2140 m. NW, CaRF, SnFrB, SCoRO; to British Columbia. Hybridizes with *Quercus berberidifolia*, *Quercus douglasii*, *Quercus durata*, *Quercus lobata*. Apr–Jun

**Q. garryana** var. **semota** Jeps.**NATIVE**

Shrub to small tree, generally with multiple trunks. **Stem:** terminal buds 2–5 mm. **Leaf:** blade 5–9 cm, abaxially with ± spreading hairs, rays of stellate hairs generally 6–8, < 0.3 mm. Dry slopes, open conifer forest, chaparral; 725–1800 m. KR, NCoRI, CaRH, SN (except c SNH), SnFrB, SCoRO, ne WTR (Sierra Pelona Ridge), MP. Apr–Jun

**Q. ilex** L. HOLLY OAK**NATURALIZED**

Tree to 20 m, evergreen; trunk bark in small plates, gray-black; twigs gray-brown, densely woolly. **Leaf:** 3–8 cm; petiole 10–25 mm; blade lanceolate to ovate, adaxially glossy dark green, abaxially ± yellow or ± white woolly, base generally rounded, tip acute, margin entire to shallowly spine-toothed. **Fruit:** cup 7–15 mm wide, 5–7 mm deep, thin, top- or cup-shaped, scales thin, not tubercled; nut 15–25 mm, ovoid to conic-oblong, distally acute to ± obtuse, shell hairy inside at least at tip; mature in year 1. Escaped from cultivation, canyon slopes, washes near developments; 50–400 m. SW; native to Mediterranean. Reportedly established as naturalized at several locations in southern California. Widely grown as an ornamental in California. Hybrids with *Quercus robur* (*Quercus ×turneri* Willd.) in cultivation, but evidently not in nature despite occurring together; the two species are distantly related. May–Aug

**Q. john-tuckeri** Nixon & C.H. Mull. TUCKER'S OAK**NATIVE**

Shrub 2–5 m to tree < 7 m, evergreen; young twigs finely tomentose. **Leaf:** 1.3–2.8 cm; petiole 1–4 mm; blade oblong, elliptic, or obovate, adaxially dull, gray-green, abaxially fine-hairy, pale gray-green, base rounded to widely wedge-shaped, tip obtuse to rounded, margin irregularly spine-toothed. **Fruit:** cup 10–15 mm wide, 5–7 mm deep, thin, obconic to hemispheric, scales ± tubercled to not; nut 20–30 mm, ovoid to conic, distally acute to ± obtuse, shell glabrous inside; mature in year 1. Slopes on desert borders, chaparral, pinyon/juniper woodland; 900–2090 m. s SN, Teh (e slope), SCoRI, WTR (n slope), SnGb (n slope), sw edge DMoj. Hybridizes with *Quercus berberidifolia*, *Quercus douglasii*. Feb–Apr

**Q. kelloggii** Newb. CALIFORNIA BLACK OAK**NATIVE**

Tree < 35 m, deciduous; trunk bark deeply furrowed, checkered, dark gray-brown to black. **Leaf:** (6)9–20 cm; petiole (3)10–40 mm; blade widely elliptic, obovate, or ± round, adaxially glabrous, bright green, abaxially finely tomentose, ± glabrous in age, pale green, tip generally acute, bristled, margin lobes generally 6 per leaf, with 1–4 coarse, generally bristle-tipped teeth. **Fruit:** cup 16–25 mm wide, 15–25 mm deep, generally cup-shaped, scales thin, not tubercled, glabrous to puberulent; nut 20–35 mm, oblong-ovoid, puberulent, distally obtuse to ± rounded, shell woolly inside; mature in year 2. Slopes, valleys, woodland, conifer forest; 30–2660 m. CA-FP (except GV, SCo, ChI), MP; Oregon, Baja California. Hybridizes with *Quercus agrifolia*, *Quercus parvula* var. *parvula*, *Quercus parvula* var. *shrevei*, *Quercus wislizeni* (*Quercus* × *morehus* Kellogg). Apr–May

**Q. lobata** Née VALLEY OAK, ROBLE**NATIVE**

Tree < 35 m, deciduous; trunk bark thin, scaly, ± light gray. **Leaf:** 5–12 cm; petiole 5–12 mm; blade obovate, adaxially often ± shiny, dark green, abaxially fine-tomentose, dull to pale green, base wedge-shaped, rounded-gradually tapered, or truncate (subcordate), tip obtuse to rounded, margin lobes 6–10 per leaf, deep (sinuses generally > 1/2 distance lobe tip to midrib), obtuse, generally coarsely 2–3-toothed at tip. **Fruit:** cup 14–30 mm wide, 10–30 mm deep, hemispheric, scales tubercled; nut 30–50 mm, 12–20 mm wide, generally long-conic, distally acute to ± obtuse, shell glabrous inside; mature in year 1. Slopes, valleys, savanna; < 1830 m. NCoR, CaRF, SNF, s SNH, Teh, GV, SnFrB, SCoR, nw SCo, ChI (Santa Cruz, Santa Catalina islands), WTR, w SnGb. [*Quercus lobata* var. *turbinata* Jeps.; *Quercus lobata* var. *walteri* Jeps.] Hybridizes with *Quercus berberidifolia*, *Quercus cornelius-mulleri*, *Quercus douglasii*, *Quercus engelmannii*, *Quercus garryana*, *Quercus john-tuckeri*, *Quercus pacifica* (*Quercus* × *macdonaldii*), *Quercus robur*. Mar–Apr

**Q. ×macdonaldii** Greene MACDONALD OAK**NATIVE**

Tree 5–15 m, deciduous; trunk bark scaly, ± gray; twigs tomentose. **Leaf:** 4–7 cm; petiole 3–10 mm; blade oblong to obovate, adaxially glabrous to sparsely hairy, green, ± shiny, abaxially densely appressed-stellate-hairy, ± pale green, tip obtuse to rounded, margin lobes 2–6(8) per leaf, shallow, generally pointed. **Fruit:** cup 10–20 mm wide, 6–10 mm deep, hemispheric, scales tubercled, canescent; nut 20–35 mm, conic-oblong to ovoid, distally acute to ± obtuse, shell glabrous inside; mature in year 1. Slopes, canyons, woodland; < 600 m. ChI (Santa Cruz, Santa Rosa, Santa Catalina islands). Considered a species by Greene but derived from hybrids involving *Quercus pacifica*, *Quercus lobata*, perhaps others; needs study. Mar–May

**Q. pacifica** Nixon & C.H. Mull. ISLAND SCRUB OAK**NATIVE**

Shrub to 2 m (small tree to 5 m), generally evergreen; twigs finely hairy, ± red or ± brown, glabrous in age, gray. **Leaf:** 1.5–4 cm; petiole 2–5 mm; blade obovate or oblong, adaxially green, abaxially light green with minute appressed stellate hairs, in age glabrous, base gradually tapered, wedge-shaped, or rounded, tip generally rounded, margin entire, wavy, or ± toothed, teeth generally mucronate. **Fruit:** cup 8–20 mm wide, 5–15 mm deep, hemispheric to top-shaped, scales moderately to strongly tubercled; nut 20–30 mm, ovoid to cylindrical, distally acute to ± obtuse, shell glabrous inside; mature in year 1. Slopes, ridges, canyons, chaparral, coastal scrub, oak woodland, pine forest; < 610 m. ChI (Santa Cruz, Santa Rosa, Santa Catalina islands). Hybridizes with *Quercus lobata*. Mar–Apr {CNPS list}

**Q. palmeri** (Engelm.) Engelm. PALMER'S OAK**NATIVE**

Shrub 2–6 m, evergreen; twigs spreading, rigid. **Leaf:** 1–3 cm, stiff; petiole 2–5 mm; blade elliptic to round-ovate, adaxially glabrous to sparsely puberulent, ± shiny, olive-green, abaxially densely glandular-puberulent when young, glabrous, pale gray-green in age, tip generally spine-toothed, margin wavy, strongly spine-toothed. **Fruit:** cup 10–25 mm wide, 6–12 mm deep, generally bowl-shaped, rim ± spreading, scales not tubercled, densely hairy; nut 20–30 mm, ± ovoid, distally obtuse to ± rounded, shell densely woolly inside; mature in year 2. Uncommon. Rocky slopes, flats; 300–1600 m. e NCoRI (Colusa Co.), s SNH (e slope), nw SnJV (Alameda, Contra Costa cos.), SnFrB (Alameda Co.), SCoR, WTR, SnGb (n slope), SnBr (n slope), e PR, s edge DMOj, DMtns (Little San Bernardino Mtns); Arizona, Baja California. [*Quercus dunnii* Kellogg, illeg.] Hybridizes with *Quercus chrysolepis*. Apr–May

**Q. parvula** Greene**NATIVE**

Shrub 1–6 m or tree < 30 m, evergreen. **Leaf:** 3–9(14) cm; petiole 2–10(15) mm; blade oblong, lanceolate, or ovate to obovate, adaxially glabrous, olive-green to dark green, abaxially glabrous, generally ± dull, light olive-green, tip obtuse to acute or acuminate, margin spine-toothed (or long-tapered-dentate) to generally entire. **Fruit:** cup 12–15 mm wide, 6–10 mm deep, generally bowl-shaped, scales ± thin, not tubercled; nut (15)30–45 mm, barrel-shaped to ovoid, distally obtuse to ± rounded, puberulent, shell woolly inside; mature in year 2. Including all 3 vars. below, treated as a synonym of *Quercus wislizeni* by Jensen (1997 FNANM 3:452).

**Q. parvula** var. **parvula** SANTA CRUZ ISLAND OAK**NATIVE**

Shrub 1–2 m. **Leaf:** generally entire. Canyons, slopes, chaparral, woodland; < 500 m. SCoRO (Santa Barbara Co.), n ChI (Santa Cruz Island), e WTR. Hybridizes with *Quercus kelloggii*. Mar–May {CNPS list}

**Q. parvula** var. **shrevei** (C.H. Mull.) Nixon SHREVE OAK**NATIVE**

Tree < 30 m. ± moist woodland, forest; < 1190 m. s NCo, NCoRI, CW (except SCoRI), WTR. Hybridizes with *Quercus agrifolia*, *Quercus kelloggii*. Treated as a synonym of *Quercus wislizeni* by Jensen in FNANM 3:452 (1997). Mar–May

**Q. parvula** var. **tamalpaisensis** S.K. Langer TAMALPAIS OAK**NATIVE**

Shrub 1–6 m. **Leaf:** 8–14 cm; petiole 5–15 mm; margin long-tapered-dentate. Understory conifer woodland; 100–750 m. SnFrB (Mount Tamalpais). Mar–Apr {CNPS list}

**Q. robur** L. ENGLISH OAK, PEDUNCULATE OAK**WAIF**

Tree < 30 m, deciduous; trunk bark scaly, light gray. **Leaf:** (5)7–15(20) cm; petiole 3–6 mm; blade obovate to narrow-elliptic or -obovate, adaxially shiny or dull, deep to light green or gray, abaxially glabrous (in youth sometimes sparsely hairy), light green, base strongly cordate, often revolute, tip widely rounded, margin lobes 6–12 per leaf, deep (sinuses 1/3–7/8 distance lobe tip to midrib), rounded, generally coarsely 2-toothed at tip. **Fruit:** cup 13–20 mm wide, 8–10 mm deep, hemispheric to deeply goblet-shaped, scales ± not tubercled; nut 15–30(35) mm, 12–20 mm wide, ellipsoid or oblong, distally obtuse to rounded, shell woolly inside; mature in year 1. Roadsides, pastures, forest margins, woodlands, persisting near old homesites; < 1000 m. s SnFrB (Santa Cruz Mountains). Washington, British Columbia to Prince Edward Island; native to Europe. [*Quercus pedunculata* Ehrh.] Cordate leaf base distinctive, evidently dominant, present in hybrids. Very important in furniture, previously in sailing ships. Hybridizes with *Quercus lobata*; hybridized artificially with *Quercus turbinella*; hybrids with *Quercus ilex* (*Quercus* × *turneri* Willd.) in cultivation but evidently not in nature despite occurring together. Mar–Apr

**Q. sadleriana** R. Br. ter DEER OAK**NATIVE**

Shrub 1–3 m, evergreen; twigs glabrous. **Leaf:** 7–11(18) cm; petiole 10–20 mm; blade elliptic to oblong-obovate, adaxially green, ± shiny, abaxially sparsely fine-appressed-hairy, pale green, lateral veins (of larger leaves) generally 20–28, generally straight and prominent, tip ± acute, margin serrate, teeth 20–32. **Fruit:** cup 10–18 mm wide, 7–9 mm deep, thin, cup-shaped to obconic, scales ± tubercled to not; nut 15–20 mm, elliptic to ± spheric, distally obtuse to rounded, shell glabrous inside; mature in year 1. Open, rocky slopes, ridges, conifer forest; 600–2200 m. KR; southwestern Oregon. Hybridizes with *Quercus garryana* var. *breweri*. Apr–Jun

**Q. tomentella** Engelm. ISLAND OAK**NATIVE**

Tree < 20 m, evergreen; trunk bark furrowed, scaly, gray or red-brown; young twigs tomentose. **Leaf:** 5–8 cm; petiole 5–18 mm; blade oblong to oblong-ovate, adaxially ± finely tomentose, glabrous in age, dark green, abaxially densely tomentose, sparsely tomentose in age, dull, gray-green, tip acute to obtuse, margin entire to crenate or mucro-toothed. **Fruit:** cup 20–30 mm wide, 6–8 mm deep, saucer- to bowl-shaped, scales thick, tubercled; nut 20–35 mm, widely ovoid, distally rounded, shell ± woolly inside; mature in year 2. Canyons, slopes, woodland; < 600 m. ChI; Baja California (Guadalupe Island). Hybridizes with *Quercus chrysolepis*. Apr–May {CNPS list}

**Q. turbinella** Greene SHRUB LIVE OAK**NATIVE**

Shrub 2–5 m to ± tree < 7 m, evergreen; twigs densely fine-tomentose. **Leaf:** 1.5–3 cm; petiole 1–3 mm; blade oblong to elliptic, adaxially dull, gray-green, abaxially with appressed-stellate and glandular, ± yellow hairs, base rounded to subcordate, tip acute to obtuse, margin generally regularly spine-toothed. **Fruit:** stalk 10–15 mm; cup 9–12 mm wide, 4–6 mm deep, ± hemispheric, scales ± tubercled to not, thin; nut 12–23 mm, cylindric-ovoid to elliptic, generally yellow-brown, distally obtuse, shell glabrous inside; mature in year 1. Pinyon/juniper woodland; 1200–2000 m. e DMOj (except DMtns other than New York Mtns); to Colorado, Texas, Baja California. Apr–Jun {CNPS list}

**Q. vacciniifolia** Kellogg HUCKLEBERRY OAK**NATIVE**

Shrub < 1.5 m, prostrate to spreading, evergreen; twigs slender, pliable, glabrous. **Leaf:** 1.5–4 cm; petiole 3–6 mm; blade ± oblong, adaxially glabrous, green, abaxially glabrous, dull, pale green, tip obtuse to acute, margin entire to mucro-toothed. **Fruit:** cup 10–12 mm wide, 4–6 mm deep, thin, generally cup-shaped, scales ± tubercled to not; nut 10–15 mm, ovoid to ± spheric, distally obtuse to rounded; shell thin, subglabrous to sparsely tomentose inside; mature in year 2. Steep slopes, ridges, conifer forest, subalpine; 150–2930 m. KR, NCoRH, NCoRI, CaRH, SNH, MP; Oregon. Hybridizes with *Quercus chrysolepis*. May–Jul

**Q. wislizeni** A. DC. INTERIOR LIVE OAK**NATIVE**

Shrub 2–4(6) m or tree generally 10–22 m, evergreen; trunk bark furrowed, ± checkered, ± gray. **Leaf:** 2–5 cm; petiole 3–15 mm; blade generally oblong to elliptic or lanceolate, adaxially glabrous, shiny, generally dark green, abaxially glabrous, ± shiny, yellow-green, tip generally acute, abruptly pointed, margin entire to spine-toothed, rarely wavy. **Fruit:** cup 12–18 mm wide, 12–16 mm deep, cup-shaped to hemispheric, scales not tubercled, ± thin; nut 20–40 mm, cylindric-ovoid, ovoid, or ± obconic, distally acute to ± obtuse, shell woolly inside; mature in year 2.

**Q. wislizeni** var. **frutescens** Engelm.**NATIVE**

Shrub. **Leaf:** blade 1.8–4 cm. Valleys, chaparral; 90–2000 m. KR, NCoR, CaRH, SNH, Teh, ScV (Sutter Buttes), SnJV, SnFrB, SCoR, SW (except ChI); Baja California. Mar–May

**Q. wislizeni** var. **wislizeni****NATIVE**

Tree. **Leaf:** blade 2–5 cm. Interior canyons, slopes, pine/oak woodland; < 1600 m. NCoR, CaRF, SNF, s SNH, Teh, ScV (Sutter Buttes), SnFrB, SCoR, TR, PR, SNE; Baja California. Hybridizes with *Quercus agrifolia*, *Quercus kelloggii*. Mar–May

## MONTIACEAE MINER'S LETTUCE FAMILY

John M. Miller, except as noted

Annual to perennial herb; generally fleshy. **Stem:** 1–many, generally glabrous. **Leaf:** simple, alternate or opposite. **Inflorescence:** axillary or terminal; cyme, raceme, panicle, umbel, or flower 1. **Flower:** bisexual, radial; sepals generally 2(9), free; petals (1)2–19, free or ± fused; stamens 1–many, epipetalous or not, anthers pink, rose, or yellow; ovary superior, chamber 1, ovules 1–many, placenta basal or free-central; styles (0)1–8, generally fused at base, branched. **Fruit:** capsule, circumscissile or 2–3-valved. **Seed:** 1–many, shiny or ± pebbly or sculptured, black or gray, generally with oil-filled appendage as food for ants. ± 22 genera, ± 230 species: generally temperate America, Asia, Australia, Europe, Kerguelen Is, New Zealand, southern Africa, poorly represented in Europe; some cultivated (*Lewisia*, *Calandrinia*). [Ogburn & Edwards 2009 Amer J Bot 96:391–408] All CA genera previously included in Portulacaceae; details of flowers, seeds require 20× magnification. —Scientific Editor: Thomas J. Rosatti.

## CALANDRINIA

C. Matt Guilliams &amp; John M. Miller

Annual [perennial herb], ± fleshy, ± glabrous or glaucous. **Stem:** several to many, prostrate to ascending [erect], 3–45 cm. **Leaf:** simple, alternate; blade linear to spoon-shaped, flat [cylindric]. **Inflorescence:** raceme or panicle; bracts leaf-like [or scarious]. **Flower:** sepals 2, overlapped, persistent in fruit; petals (3)5(7), ± pink-purple (white); stamens 3–15; stigmas 3. **Fruit:** 3-valved. **Seed:** 6–many, ovate to ± elliptic, generally black, smooth, finely tubercled, or with fine, net-like pattern. 14 species: western America. (J.L. Calandrini, Swiss scientist, 1703–1758) [Hershkovitz 2006 Gayana Bot 63:13–74; Kelley 2003 FNANM 4:459–460] Other taxa in TJM (1993) moved to *Cistanthe*; number of species (150) indicated in TJM (1993) and TJM2 (2012) should have been much smaller. *Calandrinia menziesii* added, as segregated from *Calandrinia ciliata*, which as newly circumscribed does not occur in CA and therefore has been removed.

1. Fruit generally > calyx by 3+ mm; seed finely tubercled ..... *C. breweri*  
 1' Fruit generally not > calyx by 3+ mm; seed with fine, net-like pattern ..... *C. menziesii*

*C. breweri* S. Watson BREWER'S CALANDRINIA

## NATIVE

Annual. **Leaf:** 2–8 cm, ± ovate to spoon-shaped, glabrous to ± ciliate. **Inflorescence:** raceme, elongate; pedicel 6–20 cm, generally curved in fruit. **Flower:** sepals 4–6 mm, glabrous to ± ciliate; petals generally 5, 3–5 mm, dull pink-purple; stamens 3–6. **Seed:** 10–15, 1–2 mm wide, ± elliptic. Sandy to loamy soil, disturbed sites, burns; < 1200 m. NCoR, c SNF, CCo, SnFrB, SCoRO, SCo, WTR; northern Baja California. Feb–May {CNPS list}

*C. menziesii* (Hook.) Torr. & A. Gray RED MAIDS

## NATIVE

Annual. **Leaf:** 1–10 cm, linear to oblanceolate or spoon-shaped, glabrous to ± ciliate. **Inflorescence:** raceme, short to elongate; pedicel 4–25 mm, generally straight in fruit. **Flower:** sepals 2.5–8 mm, glabrous to ± ciliate, often puberulent on abaxial midvein; petals generally 5, 4–15 mm, bright pink-purple (white); stamens 3–15. **Seed:** 10–20, 1–2.5 mm wide, elliptic.  $2n=24$ . Common. Sandy to loamy soil, grassy areas, cultivated fields; < 2200 m. CA-FP, w MP, s SNE, n DMtns (Coso Range); to New Mexico, Baja California, introduced in southern hemisphere. According to Hershkovitz (2006), *Calandrinia menziesii* [*Calandrinia ciliata* var. *menziesii* (Hook.) J.F. Macbr.] is available for plants that have been called *Calandrinia ciliata* (Ruiz & Pav.) DC. in western North America, which are phylogenetically distinct (although not very morphologically distinct) from plants going by this name in Central and South America, where the type for the name was collected. In fact, *Calandrinia menziesii* is most closely related to *Calandrinia breweri*, whereas *Calandrinia ciliata* is most closely related to a species in South America. Feb–May

**CALYPTRIDIDIUM PUSSYPAWS**  
**C. Matt Guilliams & John M. Miller**

Annual, perennial herb, ± fleshy, from taproot or fibrous roots, glabrous. **Stem:** 1—several, generally spreading to ascending. **Leaf:** basal or basal and cauline, simple, oblanceolate to spoon-shaped; basal rosetted. **Inflorescence:** raceme, panicle, or umbel, scapose, bracts generally < sepals, leaf-like or not; flowers generally on 1 side of axis, persistent in fruit or not; pedicels appearing jointed at base with a transverse groove or constriction or not. **Flower:** sepals 2, ovate to reniform, generally scarious or scarious-margined, persistent in fruit; petals 2–4, < sepals, tips adherent, forming cap in fruit (fruit cap), falling as 1 unit; stamens 1–3, anthers pink, rose, or yellow; style included to exerted, stigmas 2. **Fruit:** 2-valved, generally compressed, narrowly oblong to ± round, generally translucent, deciduous or not. **Seed:** 1—many, black, dull, with fine to coarse papillae, to shiny, with papillae 0. 9 species: western North America. (Greek: cap, for petal tips in fruit) [Hershkovitz 2006 *Gayana Bot* 63:13–74; Simpson et al. 2010 *Madroño*: 57:145–160] *Calyptridium parryi* var. *arizonicum* raised to species rank, as *Calyptridium arizonicum*, by Simpson et al. (2010) based on morphological and geographic distinctions.

1. Perennial herb; style thread-like, 2–4 mm, exerted
  2. Inflorescence  $\geq$  2 per rosette; cauline leaves generally present; petals rose to white ..... *C. monospermum*
  - 2' Inflorescence generally 1 per rosette; cauline leaves generally 0; petals white ..... *C. umbellatum*
- 1' Annual; style thread-like or not, generally < 2 mm, generally included
  3. Style 1–2 mm; seeds 1–3, 0.7–0.9 mm; c SN ..... *C. pulchellum*
  - 3' Style < 0.5 mm; seeds  $\geq$  4, 0.4–0.8 mm; widespread, including e slope SNH (for *C. roseum*) but otherwise excluding c SN (except *Calyptridium pygmaeum* is in c&s SNH)
    4. Seed < 0.5 mm, papillae generally 0 or marginal; pedicel 1–3 mm, slender
      5. Petals 4; stamens generally 3 ..... *C. pygmaeum*
      - 5' Petals 2; stamen 1 ..... *C. roseum*
  - 4' Seed  $\geq$  0.5 mm, papillae marginal or throughout (except 0 in *Calyptridium arizonicum*); pedicel < 2 mm, thickened (slender, 1–2 mm in *Calyptridium quadripetalum*)
    6. Petals generally 3; stamen 1; fruit oblong to linear; seeds 4–10, generally from base to above middle of fruit, often in  $\pm$  1 row ..... *C. monandrum*
    - 6' Petals 4; stamens 1–3; fruit widely ovate or lanceolate to elliptic or oblong; seeds 5—many, generally from base to middle of fruit, not in  $\pm$  1 row
      7. Seed papillae coarse, generally throughout; basal leaves generally persistent in fruit; flowers deciduous in fruit; sepals scarious throughout ..... *C. quadripetalum*
      - 7' Seed papillae 0 or  $\pm$  fine, throughout or marginal; basal leaves generally withering in fruit; flowers persistent in fruit to not; sepals generally scarious on margin or becoming scarious throughout
        8. Seed 0.7–0.8 mm, papillae 0; fruit 6–7 mm; w Dson ..... *C. arizonicum*
        - 8' Seed generally 0.5–0.7 mm, papillae throughout or marginal; fruit < 6 mm; sw SnFrB, s SCoRO, TR, SnJt, SNE, DMtns ..... *C. parryi*
    9. Seed papillae throughout; s SCoRO, TR, SnJt ..... var. *parryi*
    - 9' Seed papillae marginal; sw SnFrB, SNE, DMtns
      10. Seed 0.5–0.6 mm; sepals ovate, with generally narrowly scarious margin; 600–1050 m, sw SnFrB ..... var. *hesseae*
      - 10' Seed 0.6–0.7 mm; sepals ovate to reniform, with widely scarious margin or scarious throughout; 1500–2990 m, SNE, DMtns ..... var. *nevadense*

**C. arizonicum** (J. T. Howell) M. G. Simpson, M. Silveira, & Guilliams**NATIVE**

Annual 2–11 cm; taproot slender. **Leaf:** basal and cauline, 1–3 cm, basal generally withering in fruit. **Inflorescence:** axillary, raceme or panicle, open to dense, 1–3.5 cm; bracts ovate to elliptic; pedicel stout,  $\leq 1$  mm, appearing jointed at base or not; flowers persistent in fruit to not. **Flower:** sepals widely reniform, margin scarious. **Fruit:** 6–7 mm, exserted from calyx. **Seed:** 0.7–0.8 mm, shiny, papillae 0. Coarse, well-drained soils in desert scrub, wash; 600–800 m. w DSON (northern Pinyon Mtn area in Anza-Borrego Desert State Park); southern Arizona, northwestern Mexico. [*Calyptridium parryi* A. Gray var. *arizonicum* J. T. Howell; *Cistanthe parryi* var. *arizonica* (J.T. Howell) Kartesz & Gandhi] 2 populations known in California. Mar–Apr {CNPS list}

**C. monandrum** Nutt.**NATIVE**

Annual 1.5–18 cm; taproot slender. **Stem:** spreading to decumbent, leafy. **Leaf:** basal 1–5 cm, narrow-oblong to -spoon-shaped, withering in fruit; cauline 1–2(4) cm. **Inflorescence:** axillary, raceme or panicle, 1–4 cm, generally open; bracts narrowly ovate; flowers  $\pm$  sessile, generally persistent in fruit. **Flower:** sepals 1–2 mm, ovate to deltate, fleshy, narrowly white on margin in flower, scarious throughout in fruit; petals generally 3, 1–3 mm, pink to  $\pm$  red; stamen 1; stigma sessile. **Fruit:** 3–6 mm, oblong to linear, in width generally  $\pm >$  seed. **Seed:** 4–10, 0.5–0.8 mm.  $2n=44$ . Widespread in desert and scrub, open areas, sandy soils, burns; generally  $< 2000$  m. s SN, Teh, SnJV, CW, SW, SNE, D; Nevada, Arizona, northwestern Mexico. [*Cistanthe monandra* (Nutt.) Hershk.] Jan–Jul

**C. monospermum** Greene**NATIVE**

Perennial herb  $< 50$  cm; caudex short, thick; taproot slender to thick. **Stem:** generally spreading to ascending, leafy to not. **Leaf:** basal 1.5–6 cm, rosette 1; cauline generally present, 0.8–3 cm. **Inflorescence:** axillary, umbel,  $\pm$  open (dense in small plants),  $\geq 2$  per rosette, 1–10 cm diam; pedicel  $\pm 0$  to short. **Flower:** sepals 3–8 mm,  $\pm$  round, scarious; petals 4, 3–7 mm, rose to white; stamens 3; style 2–4 mm, thread-like, exserted, falling with fruit cap. **Fruit:** 2–3.5 mm, widely ovate to  $\pm$  round; deciduous or not. **Seed:** 1–4(8).  $2n=44$ . Open areas, sandy or gravelly soils, conifer forest; 300–3970 m. KR, NCoRH, CaR, SN, SnFrB, TR, SnJt, GB; southern Oregon, Nevada, northern Baja California. [*Cistanthe monosperma* (Greene) Hershk.] Hybridizes with *Calyptridium umbellatum* in SN. Apr–Sep

**C. parryi** A. Gray**NATIVE**

Annual 2–11 cm; taproot slender. **Stem:** spreading to ascending, leafy. **Leaf:** basal and cauline, 1–3 cm, basal generally withering in fruit. **Inflorescence:** axillary, raceme or panicle, open to dense, 1–3.5 cm; bracts ovate to elliptic; pedicel stout,  $\leq 1$  mm, generally appearing jointed at base; flowers persistent in fruit to not. **Flower:** sepals 2–4.5 mm, generally unequal (outer  $>$ , wider than inner), round, ovate, or reniform, generally scarious on margin or becoming scarious throughout; petals 4, 1.5–3 mm, generally white; stamens (1)3; style 0.5–1 mm, stigma  $\pm$  sessile. **Fruit:** 3–6 mm, ovate to oblong, deciduous or not. **Seed:** 5–20, 0.5–0.7(0.8) mm, papillae marginal or throughout.  $2n=44$ . [*Cistanthe parryi* (A. Gray) Hershk.] Unnamed var. in Baja California.

**C. parryi** var. **hesseae** J.H. Thomas SANTA CRUZ MOUNTAINS PUSSYPAWS**NATIVE**

**Flower:** sepals ovate, margin generally narrowly scarious. **Fruit:** readily deciduous. **Seed:** 0.5–0.6 mm, papillae marginal. Sandy soils in chaparral, oak woodland, conifer forest; 600–1050 m. sw SnFrB, n SCoR. [*Cistanthe parryi* var. *hesseae* (J.H. Thomas) Kartesz & Gandhi] Apr–Jul {CNPS list}

**C. parryi** var. **nevadense** J.T. Howell**NATIVE**

**Flower:** sepals ovate to reniform, with widely scarious margin or scarious throughout. **Fruit:** deciduous or not. **Seed:** 0.6–0.7 mm, papillae marginal. Mixed desert scrub, pinyon/juniper woodland; 1500–2990 m. SNE, DMtns; western Nevada, Baja California. [*Cistanthe parryi* var. *nevadensis* (J.T. Howell) Kartesz & Gandhi] Apr–Jul



**C. parryi** var. **parryi****NATIVE**

**Flower:** sepals ovate to reniform, margin often scarious. **Fruit:** generally not deciduous. **Seed:** 0.6–0.7 mm, papillate throughout. Open, sandy areas in chaparral, conifer forest; 1400–3500 m. s SCoRO, TR, SnJt. May–Jul

**C. pulchellum** (Eastw.) Hoover MARIPOSA PUSSYPAWS**NATIVE**

Annual 2–7 cm; roots fibrous. **Stem:** spreading to ascending, leafy. **Leaf:** basal 0.5–2 cm, rosette 1; cauline 0.2–1.5 cm. **Inflorescence:** axillary, panicle of head-like clusters of flowers, open, 1–4 cm, generally 2+ per rosette; bracts ovate to deltate; flowers ± sessile, generally persistent in fruit. **Flower:** sepals 3–4 mm, ± reniform to round, scarious; petals 4, ± 3 mm, rose; stamens 3; style 1–2 mm, thread-like, generally included. **Fruit:** 1.5–2.5 mm, ovoid or widely elliptic to ± round. **Seed:** 1–3, 0.7–0.9 mm, shiny. Sandy soils, decomposed granite or metamorphic rocks, chaparral, gray pine, oak woodland; 400–1100 m. c SN (s Mariposa, Madera, n Fresno cos.). [*Cistanthe pulchella* (Eastw.) Hershk.] Apr–Jul {CNPS list}

**C. pygmaeum** Rydb. PYGMY PUSSYPAWS**NATIVE**

Annual 0.5–8 cm; taproot slender or roots fibrous. **Stem:** spreading to erect, leafy. **Leaf:** basal and cauline, 5–1.5 cm, generally persistent in fruit. **Inflorescence:** axillary, raceme or panicle, ± dense, 0.5–3 cm; bracts ovate to ± round; pedicel 1–3 mm; flowers persistent in fruit. **Flower:** sepals 2–4 mm, ovate, fleshy, membranous in age, margin white or not; petals 4, 2–3 mm, white; stamens generally 3; stigma ± sessile. **Fruit:** 3–5 mm, ± ovate to elliptic. **Seed:** 15–30, 0.4–0.5 mm, shiny, papillae 0.  $2n=44$ . Sandy to gravelly soils, conifer forest; 2100–3200 m. c&s SNH, SnBr. [*Cistanthe pygmaea* (Rydb.) Hershk.] Jun–Jul {CNPS list}

**C. quadripetalum** S. Watson FOUR-PETALED PUSSYPAWS**NATIVE**

Annual 1.5–13 cm; taproot slender or roots fibrous. **Stem:** spreading to erect, leafy. **Leaf:** basal and cauline, 0.5–6 cm, generally persistent in fruit. **Inflorescence:** axillary, raceme or panicle, ± dense, 0.5–4 cm; bracts ovate to ± round; pedicel 1–2 mm, slender; flowers deciduous in fruit. **Flower:** sepals 4–6 mm, reniform to round, scarious; petals 4, 2–3 mm, white to pink; stamens 1–3; stigma sessile. **Fruit:** 3–4 mm, lanceolate to ovate. **Seed:** 10–20, 0.5–0.6 mm, dull, papillae generally throughout, coarse.  $2n=44$ . Sandy or gravelly areas, generally serpentine; 400–2000 m. NCoRH, NCoRI. [*Cistanthe quadripetala* (S. Watson) Hershk.] Apr–Jun {CNPS list}

**C. roseum** S. Watson ROSY CALYPTRIDIIUM**NATIVE**

Annual 1.5–10 cm; taproot slender or fibrous. **Stem:** spreading to ascending, leafy. **Leaf:** basal and cauline, 0.5–4 cm, generally persistent in fruit. **Inflorescence:** axillary, raceme or panicle, open, 1–4 cm; bracts ovate to elliptic; pedicel slender, 1–3 mm; flower persistent in fruit to ± not. **Flower:** sepals 2–3 mm, ovate, generally scarious-margined; petals 2, ± 1 mm, white; stamen 1; stigmas ± sessile. **Fruit:** 2–3 mm, ovate to oblong. **Seed:** 10–25, 0.4–0.5 mm, shiny, papillae marginal.  $2n=44$ . Gravelly soils, conifer forest, sagebrush scrub; 1500–3800 m. e slope SNH, n SNE, W&I; to Oregon, Wyoming, Utah. [*Cistanthe rosea* (S. Watson) Hershk.] May–Aug

**C. umbellatum** (Torr.) Greene**NATIVE**

Perennial herb < 6 dm; caudex short, thick; taproot slender to thick. **Stem:** generally spreading to ascending, not leafy. **Leaf:** basal 1.5–7 cm, rosettes generally  $\geq 2$ ; cauline generally 0. **Inflorescence:** terminal, umbel, compound (simple in small plants), 1–7 cm diam, generally 1 per rosette, dense; pedicel ± 0. **Flower:** sepals 3–8 mm, ± round, scarious; petals 4, 3–8 mm, white; stamens 3; style 2–4 mm, thread-like, exserted. **Fruit:** 2–3 mm, widely ovate to ± round, deciduous or not at maturity. **Seed:** 1–8.  $2n=44$ . Open, sandy to rocky soils, conifer forest, alpine; 240–4300 m. KR, NCoRH, CaR, SN, GB; to British Columbia, Montana, Wyoming, Utah. [*Calyptridium umbellatum* var. *caudiciferum* (A. Gray) Jeps.; *Cistanthe umbellata* (Torr.) Hershk.] May–Oct

**MYRSINACEAE MYRSINE FAMILY**  
**Anita F. Cholewa**

Annual, perennial herb, [shrub, tree], glabrous or occasionally hairy, sometimes glandular, resin canals sometimes obvious as dark dots or streaks on stems, leaves, flowers, or fruits. **Leaf:** cauline, simple, alternate, opposite, subopposite, or whorled; stipules 0; petioled or not. **Inflorescence:** axillary, raceme, [panicle, umbel] or flowers 1 [or in whorls]. **Flower:** bisexual, radial; parts in 4s to 9s; calyx deeply lobed, generally green (petal-like); corolla (0) or lobes generally spreading; stamens epipetalous (or not if corolla 0), opposite corolla lobes, filaments united (or free) just distal to point of attachment to corolla, staminodes 0 [present]; ovary superior, 1-chambered, placenta free-central, style 1, stigma generally head-like. **Fruit:** capsule, circumscissile or 5–6-valved [drupe, drupe-like]. **Seed:** [1]–many. ± 35 genera, 800 species: especially tropics, subtropics; some ornamental. [Lens et al. 2005 Syst Bot 30:163–183] Based on molecular evidence, non-rosette terrestrial members of Primulaceae as treated in TJM (1993) removed to Myrsinaceae. Based on phylogenetic research, all California members of Myrsinaceae have been transferred to *Lysimachia* (Manns & Anderberg 2009 Willdenowia 39:49–54 and Cholewa 2014 Phytoneuron 2014–28: 1–2), as reflected in this revised treatment. —Scientific Editor: Thomas J. Rosatti.

**LYSIMACHIA LOOSESTRIFE**

Glabrous, glandular, or hairy. **Leaf:** linear, lanceolate or elliptic to widely ovate, generally entire. **Flower:** parts in 4s to 9s, generally in 5s to 7s; corolla present or not; filaments free or fused at base. **Fruit:** 5–6-valved or circumscissile, ± spheric or ± ovoid. 170 species: generally northern temperate. (Greek: loose dagger)

- 1. Leaves ± whorled near stem tip, with smaller leaves proximal to near tip or not
  - 2. Corolla generally white; pedicels > leaves ..... *L. europaea*
  - 2' Corolla generally pink to rose; pedicels < leaves ..... *L. latifolia*
- 1' Leaves distributed ± evenly along stem, of ± equal size
  - 3. Corolla 0; calyx white, pink, red, or lavender, corolla-like; pedicels ± 0 ..... *L. maritima*
  - 3' Corolla present; calyx green, not corolla-like; pedicels 0–5 cm
    - 4. Calyx > corolla ..... *L. minima*
    - 4' Calyx ≤ corolla
      - 5. Corolla yellow; fruit 5–6-valved; perennial herb
        - 6. Stem creeping; flowers 1 in leaf axils; corolla lobes ovate ..... *L. nummularia*
        - 6' Stem erect; flowers in tight racemes in leaf axils; corolla lobes linear ..... *L. thysiflora*
      - 5' Corolla salmon, pink, red, blue, blue-white; fruit circumscissile; annual or perennial herb
        - 7. Annual; corollas 4–7 mm; pedicels recurved in fruit ..... *L. arvensis*
        - 7' Perennial herb; corollas 5–12 mm; pedicels ascending in fruit ..... [*L. monelli*]

**L. arvensis** (L.) U. Manns & Anderb. SCARLET PIMPERNEL  
**NATURALIZED**

Annual; resin canals ± obvious. **Stem:** ascending to erect, 5–40 cm, freely branched. **Leaf:** opposite or whorled; blade 5–20 mm, ovate to elliptic, distal lanceolate to ovate; petiole 0. **Inflorescence:** flowers 1 in leaf axils; pedicels generally > subtending leaves, recurved in fruit. **Flower:** calyx 3–5 mm, ≤ corolla, divided nearly to base, lobes 5; corolla 4–7 mm, salmon, red, blue, or blue-white, lobes 5; stamens (4)5. **Fruit:** circumscissile, ± spheric. 2n=40. Common. Disturbed places, ocean beaches; generally < 1000 m. CA-FP, D; to eastern North America; native to Europe. TOXIC to livestock, humans. [*Anagallis arvensis* L.; *Anagallis arvensis* L. subsp. *arvensis*] Mar–May

**L. europaea** (L.) U. Manns & Anderb. ARCTIC STARFLOWER**NATIVE**

Perennial herb; resin canals not obvious. **Stem:** erect, 5–20 cm. **Leaf:** mostly in  $\pm 1$  whorl near stem tip, a few alternate, along stem proximal to near tip; blade 15–50 mm, elliptic to obovate, proximal smaller, scale-like; petiole generally 0 proximally on stem, present distally on stem. **Inflorescence:** flowers 1 in few distal-most leaf axils; pedicels  $>$  subtending leaves. **Flower:** calyx lobes (5-)7(-9); corolla 12–16 mm wide, generally white, lobes (5-)7(-9); stamens (5-)7(-9). **Fruit:** 5-valved,  $\pm$  spheric.  $2n=84-160$ . Bogs, wet areas; generally  $< 10$  m. NCo (near Crescent City, Del Norte Co.); to Alaska, western Canada, Idaho. [*Trientalis europaea* L.] May–Jun {CNPS list}

**L. latifolia** (Hook.) Cholewa PACIFIC STARFLOWER**NATIVE**

Perennial herb; resin canals not obvious. **Stem:** erect, 5–30 cm. **Leaf:** in  $\pm 1$  whorl near stem tip (rarely some alternate along stem below); blade 25–90 mm, ovate to obovate (proximal if present generally scale-like); petiole 0 proximally on stem, present distally on stem. **Inflorescence:** flowers 1 in few distal-most leaf axils; pedicels  $<$  subtending leaves. **Flower:** calyx lobes (5-)7(-9); corolla 8–15 mm wide, generally pink to rose, lobes (5-)7(-9); stamens (5-)7(-9). **Fruit:** 5-valved,  $\pm$  spheric. Shaded places, especially woodland;  $< 1400$  m. NW, CaR, n&c SN, ScV, CW; to British Columbia. [*Trientalis latifolia* Hook.] Apr–Jul

**L. maritima** (L.) Galasso, Banfi, & Soldano SEA MILKWORT**NATIVE**

Perennial herb, fleshy, tufted; resin canals  $\pm$  not obvious. **Stem:** prostrate to erect, 5–40 cm. **Leaf:** opposite to subopposite or alternate distally on stem; blade 4–20 mm, linear to oblong; petiole 0. **Inflorescence:** flowers 1 in leaf axils; pedicels  $\pm 0$ . **Flower:** 3–4 mm; calyx corolla-like, lobes 5,  $>>$  tube, white, pink, red, or lavender; corolla 0; stamens 5, not epipetalous. **Fruit:** 5-valved,  $<$  calyx,  $\pm$  ovoid.  $2n=30$ . Coastal salt marshes, saline meadows;  $< 2100$  m. NCo, deltaic GV, CCo, SnFrB, SNE, MP (except Wrm); to British Columbia, Minnesota, eastern coast United States, Eurasia. [*Glaux maritima* L.] May–Jul

**L. minima** (L.) U. Manns & Anderb. CHAFFWEED**NATIVE**

Annual; resin canals generally obvious. **Stem:** decumbent to  $\pm$  erect, 1–10 cm, branched or not. **Leaf:** alternate or proximal-most opposite; blade 2–5 mm, oblanceolate to widely obovate; petiole 0. **Inflorescence:** flowers generally 1 in distal-most leaf axils; pedicels  $\pm 0$ . **Flower:** calyx 1–3 mm,  $>$  corolla, divided  $\pm 3/4$  to base, lobes 4–5; corolla white, pink, or salmon, lobes 4–5; stamens (4)5. **Fruit:** circumscissile,  $\pm$  spheric.  $2n=22$ . Vernal pools, moist places;  $< 950$  m. NW, CaRF, n SNF, GV, CW, SCo, n ChI, PR; to British Columbia, eastern North America, Europe, South America. [*Anagallis minima* (L.) E.H.L. Krause] Mar–May

**L. monelli** (L.) U. Manns & Anderb. FLAXLEAF PIMPERNEL**WAIF**

Perennial herb; resin canals generally obvious. **Stem:** ascending to erect, 10–50 cm, freely branched. **Leaf:** opposite or whorled; blade 10–15 mm, linear-lanceolate to elliptic; petiole 0. **Inflorescence:** flowers generally 1 in distal-most leaf axils; pedicels  $>>$  subtending leaves, ascending in fruit. **Flower:** calyx 4–6 mm,  $<$  corolla, lobes 5; corolla 5–12 mm, orange or blue, occasionally paler shades, lobes 5; stamens (4)5. **Fruit:** circumscissile,  $\pm$  spheric.  $2n=22$ . Dry, disturbed places;  $< 700$  m. KR, CCo, SnFrB, SCoRO, SCo, WTR; Virginia; native to Europe. [*Anagallis monelli* L.] Unabridged synonyms: [*Anagallis linifolia* L.] Escaped but not naturalized in California. Feb–May

**L. nummularia** L. CREEPING-JENNY**NATURALIZED**

Perennial herb; resin canals obvious. **Stem:** creeping, often rooted at nodes, 20–50 cm, branched or not, glabrous or glandular. **Leaf:** opposite; blade 1.5–2.5 cm, ovate to  $\pm$  round; petiole present. **Inflorescence:** flowers 1 in leaf axils; pedicels  $\geq$  subtending leaves. **Flower:** calyx lobes 5, 5–8 mm; corolla yellow, lobes 5, 10–15 mm, ovate, tips sparsely to densely glandular; stamens 5. **Fruit:** rarely produced, 5–6-valved,  $<$  calyx,  $\pm$  ovoid.  $2n=30-43$ . Moist meadows;  $\pm 1000$  m. n SN (Folsom, Sacramento Co.; near Quincy, Plumas Co.); eastern United States; native to Europe. Jun–Aug

**L. thysiflora** L. TUFTED LOOSESTRIFE

**NATIVE**

Perennial herb; resin canals obvious. **Stem:** erect, 30–80 cm, unbranched, glabrous or distally hairy. **Leaf:** opposite, subopposite, or whorled, often smaller and early deciduous proximally on stem; blade 5–12 cm, lanceolate or elliptic; petiole 0 or present.

**Inflorescence:** flowers in tight racemes in leaf axils, peduncles << subtending leaves. **Flower:** calyx lobes 5–7(9), 1–4 mm; corolla yellow, lobes 5–7(9), 3–5 mm, linear; stamens 5–7(9), filaments free or united proximally. **Fruit:** 5–6-valved, >= calyx, ± ovoid.

$2n=40,54$ . Wet places; 800–1300 m. KR, CaR, n SNF (Calaveras Co.), n SNH (Plumas Co.), MP; to Alaska, eastern North America, Eurasia. Jun–Aug {CNPS list}

**POLEMONIACEAE PHLOX FAMILY**  
**Robert Patterson, family description, key to genera**

Annual, perennial herb, shrub, vine. **Leaf:** simple or compound, cauline (or most basal), alternate or opposite; stipules 0.

**Inflorescence:** cymes, heads, clusters, or flower 1; bracts in involucre or not. **Flower:** sepals generally 5, fused at base, translucent membrane generally connecting lobes, torn by fruit; corolla generally 5-lobed, radial or bilateral, salverform to bell-shaped, throat often well defined; stamens generally 5, epipetalous, attached at  $\geq 1$  level, filaments of  $\geq 1$  length, pollen white, yellow, blue, or red; ovary superior, chambers generally 3, style 1, stigmas generally 3. **Fruit:** capsule. **Seed:** 1—many, when wetted swelling or not, gelatinous or not. 26 genera, 314 species: America, northern Europe, northern Asia; some cultivated (*Cantua*, *Cobaea* (cup-and-saucer vine), *Collomia*, *Gilia*, *Ipomopsis*, *Linanthus*, *Phlox*). [Porter & Johnson 2000 *Aliso* 19:55–91] *Leptodactylon* moved to *Linanthus*. — Scientific Editors: Robert Patterson, Thomas J. Rosatti.

**POLEMONIUM**

**Rebecca L. Stubbs, Ruth E. Timme & Dieter H. Wilken**

Annual, perennial herb. **Stem:** decumbent to erect, 10–100 cm, glandular-hairy, hairy, or glabrous. **Leaf:** pinnate-compound, alternate; basal petiole base membranous or not, sheathing or not; cauline sessile above; leaflets entire to divided, glabrous to glandular-hairy. **Inflorescence:** cyme or head. **Flower:** calyx bell-shaped, membranous in age but not separated into membrane and lobes, glandular-hairy; corolla rotate to funnel- or bell-shaped, tube  $\ll$  throat, lobes white to blue or purple; stamens attached at 1 level, filaments hairy at base; ovary generally  $\pm 1$  mm,  $\pm 1$  mm wide. **Fruit:** ovoid to spheric. **Seed:**  $\leq 10$ , generally 1–3 mm, elliptic to ovate,  $\pm$  gelatinous when wet, brown to black.  $\pm 30$  species: America, Eurasia. (Greek: perhaps from Polemon, Athenian philosopher, or polemos, strife or war) [Pritchett 1993 M.S. Thesis, San Francisco State Univ; Stubbs & Patterson 2013 *Madroño* 60:243–248] Perennial herb generally cross-pollinated, annual self-pollinated. *Polemonium eddyense* newly described; *Polemonium pulcherrimum* var. *shastense* newly recognized.

- 1. Annual; flowers 1–2 in axils ..... *P. micranthum*
- 1' Perennial herb; flowers generally clustered at stem tips
- 2. Leaflets 2–5-lobed; inflorescence a dense, rounded head
  - 3. Style included; petiole base generally not membranous ..... *P. eximium*
  - 3' Style slightly or much exserted; petiole base membranous
    - 4. Calyx lobes acuminate; pistil 5–10 mm, style slightly exserted; petioles 1–5 cm ..... *P. chartaceum*
    - 4' Calyx lobes rounded; pistil 10.3–13.8 mm, style much exserted; petioles 0.5–1 cm ..... *P. eddyense*
- 2' Leaflets entire; inflorescence various but not head-like
  - 5. Plant not caespitose, stems generally solitary, erect, 40–100 cm; leaves cauline
    - 6. Corolla lobes generally white to pale pink to rarely purple (often purple on herbarium specimens); leaflets elliptic ..... *P. carneum*
    - 6' Corolla lobes purple to generally blue; leaflets lanceolate ..... *P. occidentale*
  - 5' Plant caespitose, stems clumped or tufted, decumbent to erect, 5–25 cm; leaves  $\pm$  basal
    - 7. Terminal leaflet  $\pm$  fused with adjacent pair; corolla limb 7–15 mm diam; dry, open to shaded areas in montane forest ..... *P. californicum*
    - 7' Terminal leaflet generally free from adjacent pair; corolla limb 5–11 mm diam; subalpine to alpine talus ..... *P. pulcherrimum*
    - 8. Corolla lobes blue to purple; herbage sparsely glandular-hairy ..... var. *pulcherrimum*
    - 8' Corolla lobes white, generally with pink veins or tinge (individual flowers or plants rarely without pink); herbage densely glandular-hairy ..... var. *shastense*

**P. californicum** Eastw.**NATIVE**

Perennial herb, caespitose, soft-hairy; rhizomed. **Stem:** decumbent to erect, 12–25 cm, glandular-hairy. **Leaf:** ± basal, < 15 cm, 1–5 cm wide, cauline reduced or not, glandular-hairy; petioles 2–6 cm, bases not membranous, ± sheathing; leaflets 9–25, 10–25 mm, 5–15 mm wide, elliptic to lanceolate, entire, terminal ± fused with adjacent pair. **Inflorescence:** open cyme, generally same level as highest leaves, 5–25-flowered; pedicel 1–7 mm. **Flower:** calyx 6–8 mm, lobes > tube, acute; corolla bell-shaped, limb 7–15 mm diam, throat 2–3 mm, lobes 3–4 mm, light to dark blue or purple; stamens 5 mm, included; pistil 4–7 mm, style exerted or not. **Fruit:** 2–4 mm, 2–3 mm wide. **Seed:** 6–10, brown.  $2n=36$ . Dry, open to shaded areas in montane forest; 1600–3100 m. KR, CaRH, n&c SNH; to Washington. Self-incompatible. Intergrades with *Polemonium pulcherrimum* at high elevations in SNH. Jun–Aug

**P. carneum** A. Gray OREGON POLEMONIUM**NATIVE**

Perennial herb, ± glabrous; rhizome long, slender. **Stem:** erect, 40–100 cm, glabrous or ± hairy. **Leaf:** cauline, < 20 cm, 3–8 cm wide, not reduced, glabrous; petioles 2–7 cm, bases not membranous, not sheathing; leaflets 9–21, 2–4 cm, 4–15 mm wide, elliptic, entire, terminal generally free. **Inflorescence:** open cyme, 4–11-flowered; pedicel 4–13 mm. **Flower:** calyx 8–10 mm, lobes < tube, acute; corolla rotate to bell-shaped, limb 12–20 mm diam, throat 5–7 mm, lobes 8–10 mm, generally white to pale pink to rarely purple (often purple on herbarium specimens); stamens 5–10 mm, included; pistil 7–12 mm, ovary ± 2 mm, ± 1 mm wide, style included. **Fruit:** 4–8 mm, 3–6 mm wide. **Seed:** <= 6, dark brown to black. Moist to dry, open areas; < 1800 m. NW, CCo, SnFrB; to Washington. Apr–Jun {CNPS list}

**P. chartaceum** H. Mason MASON'S SKY PILOT**NATIVE**

Perennial herb, caespitose, hairy; rhizome short. **Stem:** erect, < 20 cm, hairy, ± purple. **Leaf:** basal 3–7 cm, 3–6 mm wide, hairy, cauline reduced; petioles 1–5 cm, bases membranous, sheathing; leaflets 15–25, < 4 mm, deeply 3–5-lobed. **Inflorescence:** head, many-flowered; pedicel 1–6 mm. **Flower:** calyx 5–7 mm, lobes < tube, acuminate; corolla funnel-shaped, limb 5–12 mm diam, throat 4–7 mm, lobes 3–5 mm, blue to purple; stamens 6–9 mm, ± exerted; pistil 5–10 mm, style slightly exerted. **Fruit:** ± 4 mm, ± 3 mm wide. **Seed:** <= 6, brown.  $2n=18$ . Rocky slopes, talus; 2600–4200 m. SNE (Sweetwater Mountains, White Mountains). Morphology, molecular data support segregation of KR plants as *Polemonium eddyense*. Jul–Aug {CNPS list}

**P. eddyense** Stubbs MOUNT EDDY SKY PILOT**NATIVE**

Perennial herb, caespitose, densely glandular-hairy; rhizome short. **Stem:** erect, 6.5–11 cm, occasionally with a slight reddish tinge. **Leaf:** basal 1.4–4.6 cm, 3–6 mm wide, cauline reduced; petioles 0.5–1 cm, bases membranous, sheathing; leaflets 16–26, 1–6 mm, 2–5-lobed. **Inflorescence:** head, many-flowered; pedicel 3–6 mm. **Flower:** calyx 4.5–7.5 mm, lobes < tube, rounded; corolla funnel-shaped, limb 9.5–15.7 mm diam, throat 2–8 mm, yellow, lobes 3.5–6 mm, violet; stamens 5.6–10.2 mm, exerted; pistil 10.3–13.8 mm, style much exerted. **Fruit:** 4.5–5 mm, 3–3.5 mm wide. **Seed:** 7–9, dark brown.  $2n=18$ . Serpentine soils; 2649–2750 m. KR (Mount Eddy). Morphology, molecular data support segregation from *Polemonium chartaceum*. Jul–Aug {CNPS list}

**P. eximium** Greene**NATIVE**

Perennial herb, caespitose, hairy; rhizomed. **Stem:** erect, 10–40 cm, glandular-hairy to hairy. **Leaf:** basal 4–13 cm, 4–9 mm wide, glandular-hairy, cauline reduced; petioles 2–6 cm, bases generally not membranous, sheathing; leaflets 20–35, 3–6 mm, deeply 3–5-lobed. **Inflorescence:** head, many-flowered; pedicel 1–3 mm. **Flower:** calyx 6–8 mm, lobes < tube; corolla funnel-shaped, limb 9–15 mm diam, throat 6–11 mm, lobes ± 5 mm, blue to purple; stamens ± 5 mm, included; pistil 4–7 mm, style included. **Fruit:** ± 5 mm, 3 mm wide. **Seed:** <= 6, brown.  $2n=18$ . Rocky outcrops, talus; 3000–4200 m. c&s SNH. Jun–Aug

**P. micranthum** Benth.**NATIVE**

Annual, soft-hairy. **Stem:** decumbent to erect, 5–25 cm, glandular-hairy. **Leaf:** basal and cauline, < 5 cm, 5–11 mm wide, cauline not reduced, soft-glandular-hairy; petioles 5–13 mm, bases not membranous, not sheathing; leaflets 5–15, 2–7 mm, 1–3 mm wide, entire, lanceolate, entire, terminal fused to adjacent pair. **Inflorescence:** flowers 1–2 in axils; pedicel 3–25 mm. **Flower:** calyx 3–9 mm, lobes > tube, acute; corolla bell-shaped, limb 3–5 mm diam, throat ± 1 mm, lobes 1–2 mm, light blue to white; stamens ± 1 mm, included; pistil 1.5 mm, style included. **Fruit:** 3–4 mm, 3 mm wide. **Seed:** ≤ 6, dark brown.  $2n=18$ . Open, seasonally wet areas, generally among shrubs; 600–1800 m. KR, CaRH, n SNH, s SnJV, se SCoRO, n WTR, MP; to British Columbia, Montana; South America. Apr–Jun

**P. occidentale** Greene**NATIVE**

Perennial herb, generally glabrous; rhizome short, thin. **Stem:** erect, 40–100 cm, glabrous at base, glandular-hairy above. **Leaf:** cauline, 6–40 cm, 1–9 cm wide, reduced upward, glabrous; petioles 2–4 cm, bases not membranous, not sheathing; leaflets 15–23, 8–45 mm, 4–15 mm wide, lanceolate, entire, terminal fused to adjacent pair or not. **Inflorescence:** open to dense cyme, 10–35 flowered; pedicel 1–3 mm. **Flower:** calyx 4–5 mm, lobes > tube, acute; corolla bell-shaped, limb 10–17 mm diam, throat 3–6 mm, lobes 5–8 mm, purple to generally blue; stamens 7–9 mm, included; pistil 12–15 mm, ovary < 1 mm wide, style exerted. **Fruit:** 3–5 mm, 2–4 mm wide. **Seed:** ≤ 10, dark brown. Moist areas, meadows, streambanks; 900–3300 m. KR, CaRH, SN, SnBr, SNE, Wrn; to British Columbia, Colorado. [*Polemonium occidentale* subsp. *occidentale*] Subspecies no longer tenable. Jun–Sep

**P. pulcherrimum** Hook.**NATIVE**

Perennial herb, caespitose, hairy; rhizome short. **Stem:** erect, 5–20 cm. **Leaf:** basal < 6 cm, 5–10 mm wide, cauline much reduced, glandular-hairy; petioles 5–13 mm, bases not membranous, sheathing; leaflets 9–22, 3–4 mm, 2–4 mm wide, ovate to round, entire, terminal generally free from adjacent pair. **Inflorescence:** dense, 4–5 flowered, generally above leaves; pedicel 2–5 mm. **Flower:** calyx 4–5 mm, lobes ± = tube, acute; corolla rotate to bell-shaped, limb 5–11 mm diam, throat ± 3 mm, lobes ± 4 mm; stamens 3–5 mm, included; pistil 5–6 mm, ovary < 1.5 mm, < 1 mm wide, style included. **Fruit:** 3–4 mm, ± 2 mm wide. **Seed:** ≤ 3, dark brown to black.  $2n=18$ .

**P. pulcherrimum** var. **pulcherrimum****NATIVE**

Plant generally 10–20 cm; herbage sparsely glandular-hairy. **Flower:** corolla lobes blue to purple. Talus; 2400–3700 m. KR, NCoRH, CaRH, n&c SNH, MP, n SNE; to Alaska. Jun–Sep

**P. pulcherrimum** var. **shastense** (Eastw.) Stubbs**NATIVE**

Plant 7–18 cm; herbage densely glandular-hairy. **Flower:** corolla lobes white, generally with pink veins or tinge (individual flowers or plants rarely without pink). Volcanic talus; 2590–3170 m. KR, CaRH, MP. Morphology, molecular data support segregation from *Polemonium pulcherrimum* var. *pilosum* (Greenm.) Brand of Washington.

BUCKWHEAT FAMILY  
**Mihai Costea, except as noted**

Annual to shrub [tree]. **Stem:** nodes swollen or not. **Leaf:** simple, basal or cauline, generally alternate; ocreae present or 0, generally scarious, persistent or not. **Inflorescence:** flower clusters in axillary to terminal cyme-, panicle-, raceme-, spike-, umbel- or head-like arrangements, entire inflorescence or main inflorescence branches generally subtended by bracts ("inflorescence bracts"); peduncles present or 0; flower clusters in Eriogoneae-Eriogonoideae subtended by involucre of  $\geq 1$  free or  $\pm$  fused, sometimes awn-tipped bracts ("involucre bracts") or, in Polygonoideae and rarely in Eriogonoideae, not (if bracts completely fused, involucre "tubular"); pedicels in Eriogoneae each often subtended by 2 free, transparent, linear bractlets or in Polygonoideae all subtended by 2+ fused, membranous, wide bractlets. **Flower:** generally bisexual, small, 1–200 per node; perianth parts 2–6, generally in 2 whorls, free or basally fused, generally petal-like, often  $\pm$  concave adaxially, often darker at midvein, often turning  $\pm$  red or  $\pm$  brown in age; stamens [1]3 or 6–9 in 2 whorls; ovary superior, 1-chambered, ovule 1, styles 1–3. **Fruit:** achenes, included in or exerted from perianth, generally 3-angled, ovoid or elliptic, generally glabrous. 48 genera,  $\pm$  1200 species: worldwide, especially northern temperate; some cultivated for food (*Coccoloba*, sea-grape; *Fagopyrum*, *Rheum*, *Rumex*) or ornamental (*Antigonon*, lovechain; *Coccoloba*; *Muehlenbeckia*; *Persicaria*; *Polygonum*), a few timbered (*Coccoloba*; *Triplaris*). Several (*Emex*; *Fallopia*; *Persicaria*; *Polygonum*; *Rumex*) are weeds. [Freeman & Reveal 2005 FNANM 5:216–601] Treatment of genera in Eriogonoideae based on monographic work of James L. Reveal. Involucre number throughout is number (1–many) per ultimate grouping, at tips of ultimate branches; flower number is per flower cluster or involucre, unless otherwise stated. *Fagopyrum esculentum* Moench not naturalized, considered an historical waif (or garden weed  $\pm$  presently), therefore not treated. —Scientific Editors: Thomas J. Rosatti, Bruce G. Balwin.

**CHORIZANTHE SPINEFLOWER**  
**James L. Reveal & Thomas J. Rosatti**

Annual [perennial herb], prostrate to erect, generally hairy. **Leaf:** basal or cauline, alternate, linear to narrow, awns 0; ocreae 0. **Inflorescence:** terminal, generally cyme- or head-like, hairy [(glabrous)]; peduncles 0; involucre generally 1–6, tubular, 3–6-ribbed, teeth 3, 5, or 6, awned. **Flower:** 1(2), glabrous or hairy; perianth white, yellow, red, maroon, or purple, lobes (5)6, entire, notched or lobed to fringed; stamens generally 3, 6, or 9. **Fruit:** generally brown or black, generally elliptic, glabrous; embryo straight or curved.  $\pm$  50 species: temperate western North America; southwestern South America. (Greek: divided flower, for perianth lobes) [Morgan et al. 2014 Phytoneuron 2014–63: 1–9] Involucre length measurements including teeth and awns unless otherwise specified. *Chorizanthe minutiflora* newly described, added.

1. Involucre 3–5-toothed or -ribbed
  2. Involucre teeth (4)5
    3. Involucre awns straight; flower glabrous; stamens fused to perianth tube base — s SCoRI (Caliente Range), w DMoj ..... *C. spinosa*
    - 3' Involucre awns hooked; flower hairy; stamens fused to perianth tube top
      4. Involucre bell-shaped, tube 2–2.5 mm, abaxial tooth not longer, not wider than others; flower white to rose, 1.5–1.8(2) mm; c&n California ..... *C. polygonoides* var. *polygonoides* (2)
      - 4' Involucre cylindric, tube 3–4.5 mm, abaxial tooth longer, wider than others; flower yellow, 1.5–2.5 mm; sw SnJV, n edge TR, GB, w DMoj ..... *C. watsonii*
  - 2' Involucre teeth 3
    5. Involucre cylindric, markedly transversely ridged; stamens 6 — D ..... *C. corrugata*
    - 5' Involucre urn- to bell-shaped, not markedly transversely ridged; stamens 9
      6. Plant prostrate; involucre bell-shaped; abaxial tooth 1.8–2 mm, awn hooked; s SCo ..... *C. orcuttiana*
      - 6' Plant erect; involucre urn-shaped; abaxial tooth 5–10 mm, awn straight; SNE, D ..... *C. rigida*
  - 1' Involucre 6–toothed or -ribbed
    7. Involucre teeth with scarious margins
      8. Involucre teeth scarious margins continuous across sinuses
        9. Perianth lobes obcordate to 2-lobed — NCoRI, CaRF, SNF, e SnFrB ..... *C. stellulata* (2)
        - 9' Perianth lobes entire
          10. Involucre hairy, 3–5 mm; flower 3.5–4(4.5) mm; SCoR ..... *C. douglasii*
          - 10' Involucre tomentose to  $\pm$  glabrous, 3–4 mm; flower (1.5)2.5–3 mm; more widespread in CA-FP ..... *C. membranacea*



- 8' Involucre teeth scarious margins not continuous across sinuses
11. Involucre awns straight
12. Involucres 3–4 in small bracted clusters; perianth lobes alike — NCoRI, CaRF, SNF, e SnFrB ..... *C. stellulata* (2)
- 12' Involucres 1; perianth lobes not alike
13. Flower (3)3.5–4.5 mm, hairy generally throughout; plant generally spreading to decumbent; c NCo ..... *C. howellii*
- 13' Flower (4)5–6 mm, hairy on lower 1/2; plant erect to spreading; n CCo ..... *C. valida* (2)
- 11' Involucre awns hooked
14. Flower glabrous; perianth lobes entire, tube yellow — CCo, w SnFrB, w SCoRO ..... *C. diffusa*
- 14' Flower hairy; perianth lobes 2-lobed, jagged, or short-pointed, tube white
15. Involucre tube 2.5–4 mm, thinly hairy; flower 2.5–4 mm ..... *C. robusta*
16. Involucre lobes rose-pink; plant erect; s SnFrB ..... var. *hartwegii*
- 16' Involucre lobes white; plant spreading or decumbent; n-c CCo, sw SnFrB ..... var. *robusta*
- 15' Involucre tube 1–2.5(3) mm, densely hairy; flower 2–3 mm
17. Perianth lobes awned ..... *C. cuspidata* var. *cuspidata* (2)
- 17' Perianth lobes minutely jagged
18. Involucre teeth margins  $\pm$  pink; involucre tube 1.5–2(2.5) mm; flower 2–3 mm; stamens 3 or 6–9 ..... *C. angustifolia* (2)
- 18' Involucre teeth margins white ( $\pm$  pink) or dark  $\pm$  pink to purple; involucre tube 2–2.5(3) mm; flower 2–3.5 mm; stamens 9 ..... *C. pungens*
19. Involucre teeth margins dark  $\pm$  pink to purple; plant  $\pm$  ascending to erect; 90–500 m ..... var. *hartwegiana*
- 19' Involucre teeth margins white ( $\pm$  pink); plant prostrate to  $\pm$  ascending; 0–65 m ..... var. *pungens*
- 7' Involucre teeth without scarious margins (except *Chorizanthe fimbriata*, *Chorizanthe procumbens*)
20. Involucre teeth of unequal, not of equal or alternating, lengths, abaxial tooth  $\gg$  others
21. Abaxial awn hooked ..... *C. clevelandii*
- 21' Abaxial awn straight
22. Outer perianth lobes entire or  $\pm$  2-lobed, inner jagged; stamens 9; SCoRO ..... *C. rectispina*
- 22' Outer perianth lobes with 1 or 3 teeth, inner entire; stamens 3; s SN, e CW, n WTR ..... *C. uniaristata*
- 20' Involucre teeth of equal or alternating lengths, abaxial tooth not  $\gg$  others
23. Perianth lobes all or at least inner fringed or 2-lobed
24. Outer and inner perianth lobes fringed — SW ..... *C. fimbriata*
25. Perianth lobes with terminal segment linear to lanceolate, wider than lateral; flower 6–7(8) mm ..... var. *fimbriata*
- 25' Perianth lobes with terminal segment linear, barely wider than lateral; flower 8–9(10) mm ..... var. *laciniata*
- 24' Outer and/or inner perianth lobes not fringed
26. Perianth lobes white to  $\pm$  pink
27. Inner perianth lobes 2-lobed ..... *C. blakleyi*
- 27' Inner perianth lobes fringed ..... *C. obovata*
- 26' Perianth lobes red, rose, maroon, or dark purple
28. Outer perianth lobes entire; involucre tube 3.5–4 mm, awns 0.5–1 mm ..... *C. palmeri*
- 28' Outer perianth lobes 2-lobed or minutely jagged; involucre tube 4–6 mm, awns 0.5–2 mm
29. Outer perianth lobes minutely jagged or wavy-margined, inner fringed or  $\pm$  2-lobed; flower 4–4.5 mm; involucre tube 4–4.5 mm, swollen; SCoRI ..... *C. ventricosa*
- 29' Outer perianth lobes 2-lobed or notched, inner fringed; flower (4.5)5–6 mm; involucre tube 4–6 mm,  $\pm$  swollen; SCoR ..... *C. biloba*
30. Outer perianth lobes deeply 2-lobed ..... var. *biloba*
- 30' Outer perianth lobes notched or  $\pm$  cordate at tip ..... var. *immemora*
- 23' Perianth lobes entire, awned, or minutely jagged
31. Perianth lobes alike, outer and inner similar in width and length
32. Plant generally erect; branches breaking at nodes; stamens 3, fused to perianth tube top ..... *C. brevicornu*
33. Leaf blades 1–3(5) mm wide; involucres ribbed ..... var. *brevicornu*

- 33' Leaf blades 5–10 mm wide; involucre obscurely ribbed ..... var. *spathulata*
- 32' Plant prostrate to erect; branches not breaking at nodes; stamens 3–9 and fused to perianth tube base or (6)9 and fused to perianth tube top
34. Stamens fused to perianth tube top; perianth lobes entire or minutely notched; CA-FP ..... *C. polygonoides*
35. Involucre tube 1.5–2 mm, awns of prominent teeth 2–3 mm; PR ..... var. *longispina*
- 35' Involucre tube 2–2.5 mm, awns of prominent teeth 1.5–2 mm; NW, CaR, n SNF, ScV, CW ..... var. *polygonoides* (2)
- 34' Stamens fused to perianth tube base; perianth lobes entire, awned, or minutely jagged
36. Perianth lobes entire; stamens united basally — c&s SCo, s TR, w PR ..... *C. procumbens*
- 36' Perianth lobes awned or minutely jagged; stamens free
37. Plants sparsely hairy, yellow-green; flowers 1.5–2 mm, sparsely hairy abaxially — c CCo (Fort Ord, nw Monterey Co.) ..... *C. minutiflora*
- 37' Plants densely hairy, tannish to reddish or grayish; flowers 2–3.5 mm, hairy abaxially
38. Perianth lobes minutely jagged; CCo (Monterey and Santa Cruz cos. south to Santa Barbara Co.) .. *C. angustifolia* (2)
- 38' Perianth lobes awned; n CCo, SnFrB (San Francisco Peninsula)
39. Involucre awns hooked, teeth with or without scarious margins; n CCo, SnFrB ..... *C. cuspidata* var. *cuspidata* (2)
- 39' Involucre awns straight, teeth without scarious margins; n CCo ..... *C. cuspidata* var. *villosa*
- 31' Perianth lobes not alike, inner narrower and shorter
40. Involucre awns straight
41. Involucre tube 1.5–2 mm; WTR ..... *C. parryi* var. *fernandina*
- 41' Involucre tube 3–4(4.5) mm; n CCo ..... *C. valida* (2)
- 40' Involucre awns hooked
42. Involucre tube 1.5–2 mm — TR ..... *C. parryi* var. *parryi*
- 42' Involucre tube 2.5–6 mm
43. Proximal leaf-like bracts of stem early-deciduous or 0
44. Flower 4.5–6 mm; e PR ..... *C. leptotheca*
- 44' Flower 3–4(5) mm; c&s CCo, SCoRO, SW (except e PR) ..... *C. staticoides*
- 43' Proximal leaf-like bracts of stem persistent
45. Flower 4.5–6 mm, long exserted from involucre ..... *C. xanti*
46. Involucre densely hairy; e SnBr, n SnJt ..... var. *leucotheca*
- 46' Involucre thinly hairy; s SN, Teh, s SCoRI, n&e TR (except e SnBr), SNE ..... var. *xanti*
- 45' Flower 2.5–3.5 mm, ± exserted from involucre
47. Flower 3–3.5 mm; involucre tube 2.5–3 mm; stamens 9; SCoRO ..... *C. breweri*
- 47' Flower 2.5–3 mm; involucre tube 2–2.5 mm; stamens 6; n ChI ..... *C. wheeleri*

***C. angustifolia* Nutt. NARROW-LEAF SPINEFLOWER**

**NATIVE**

Plant generally decumbent, 0.3–1 dm, 0.5–10(13) dm diam, hairy. **Leaf:** blades (0.5)1–4(5) cm, (0.2)0.3–0.6 cm wide. **Inflorescence:** bracts 2, awns 0; involucre 3-angled, 6-ribbed, tube 1.5–2(2.5) mm, teeth 6, 1.5–2.5 mm, generally without scarious margins, abaxial longest, awns 1–1.5 mm, hooked. **Flower:** 1, 2–3 mm, hairy abaxially; perianth 2-colored, tube white, lobes white to rose, generally jagged at tip; stamens 3 or 6–9, fused to perianth tube base. **Fruit:** 2–2.5 mm. *n*=19,20(21–23). Uncommon. Sand; 10–500 m. s CCo (San Luis Obispo, Santa Barbara cos.). Apr–Jul

***C. biloba* Goodman**

**NATIVE**

Plant generally erect, (0.5)1–3(4) dm, hairy. **Leaf:** blades 1–3(5) cm, 0.4–1(1.3) cm wide. **Inflorescence:** bracts generally 2 proximally, a whorl of 3–5 at middle, awns straight, 1–3 mm; involucre 4–6 mm, 3-angled, 6-ribbed, ± swollen basally, ± transversely ridged, teeth 6, 1–2 mm, awns 0.5–2 mm, generally hooked. **Flower:** 1, (4.5)5–6 mm, sparsely hairy; perianth 2-colored, tube white to yellow, lobes red, maroon or dark purple, outer 2-lobed or notched, inner fringed; stamens 9. **Fruit:** 4–4.5 mm.

**C. biloba** var. **biloba** TWO-LOBE SPINEFLOWER

**NATIVE**

**Flower:** outer perianth lobes deeply 2-lobed, occasionally jagged.  $n=20$ . Uncommon. Sand, gravel, clay; 200–700 m. eastern SCoRO, w SCoRI, eastern SCoRI (near Parkfield Grade, w Fresno Co.). May–Aug

**C. biloba** var. **immemora** Reveal & Hardham HERNANDEZ SPINEFLOWER

**NATIVE**

**Flower:** outer perianth lobes notched or  $\pm$  cordate at tip.  $n=17$ –23. Sand, gravel, clay; 600–800 m. eastern SCoRI (se San Benito, eastern Monterey cos.). May–Sep {CNPS list}

**C. blakleyi** Hardham BLAKLEY'S SPINEFLOWER

**NATIVE**

Plant generally ascending, 0.5–1.5 dm, 0.5–3 dm diam, thinly hairy. **Leaf:** blades 0.5–2.5 cm, 0.3–0.8 cm wide. **Inflorescence:** bracts 2, awns 1–2.5 mm, straight; involucre 3–4.5 mm, 3-angled, 6-ribbed,  $\pm$  swollen basally,  $\pm$  transversely ridged, teeth 6, 1–3 mm, abaxial longest, awns 0.5–2 mm, straight or hooked. **Flower:** 1, 5–6 mm, sparsely hairy; perianth 2-colored, tube green-white to white, lobes white to  $\pm$  pink, outer 2-lobed, inner 2-lobed, jagged; stamens 9. **Fruit:** 3–3.5 mm.  $n=\pm 19$ . Sand or gravel; 600–1600 m. s SCoRO (n slope, Sierra Madre Mtns, Santa Barbara Co.). May–Jul {CNPS list}

**C. brevicornu** Torr.

**NATIVE**

Plant generally erect, thinly hairy. **Inflorescence:** bracts 2, awns straight, 0.2–0.5 mm; involucre 3–5 mm, 3-angled, 6-ribbed, teeth 6, 0.4–1.2 mm, awns 0.2–0.5 mm, hooked. **Flower:** 1, 2–4 mm, glabrous; perianth green-white to white or pale yellow-white, lobes entire; stamens 3, fused to perianth tube top. **Fruit:** 3–4 mm.

**C. brevicornu** var. **brevicornu** BRITTLE SPINEFLOWER

**NATIVE**

Plant 0.5–3 dm. **Leaf:** blades 1.5–3(4) cm, 0.1–0.3(0.5) cm wide, tips acute. **Inflorescence:** involucre ribbed.  $n=19$ –21(23). Sand, gravel; 60–2300 m. s SNE, D; to Utah, Arizona, northwestern Mexico. Feb–Jul

**C. brevicornu** var. **spathulata** (Rydb.) C.L. Hitchc. GREAT BASIN BRITTLE SPINEFLOWER

**NATIVE**

Plant 0.5–2(3) dm. **Leaf:** blades 1–2 cm, 0.5–1 cm wide, tips round. **Inflorescence:** involucre obscurely ribbed.  $n=19$ . Sand, gravel; 700–2900 m. SNE; to northern and central Nevada, also southeastern Oregon, southern Idaho. Apr–Jul

**C. breweri** S. Watson BREWER'S SPINEFLOWER

**NATIVE**

Plant generally decumbent, (0.3)0.5–1.5(2) dm, 1–5(7) dm diam, thinly hairy. **Leaf:** blades 0.5–2 cm, 0.3–1.2(1.5) cm wide, occasionally tomentose. **Inflorescence:** bracts 2, awns 0.5–1 mm, straight; involucre 3-angled, 6-ribbed, tube 2.5–3 mm, transversely ridged, teeth 6, 0.4–1.2 mm, awns 0.3–0.6 mm, hooked. **Flower:** 1, 3–3.5 mm, hairy; perianth white to rose or red, lobes entire; stamens 9, fused to perianth tube base. **Fruit:** 2.5–3 mm.  $n=19$ . Gravel or rocks; 60–800 m. SCoRO (sw San Luis Obispo Co.). Mar–Jul {CNPS list}

**C. clevelandii** Parry CLEVELAND'S SPINEFLOWER

**NATIVE**

Plant generally decumbent, 0.2–0.8(1) dm, 0.5–5(7) dm diam, hairy. **Leaf:** blades 0.5–1.5(2) cm, 0.3–0.6(0.8) cm wide. **Inflorescence:** bracts 2, awns 1–3 mm, straight; involucre 3–3.5 mm, 3-angled, 6-ribbed,  $\pm$  transversely ridged, teeth 6, 0.3–6 mm, abaxial longest, awns 0.3–0.6 mm, hooked. **Flower:** 1, 2.5–3 mm, sparsely hairy; perianth 2-colored, tube green-white, lobes white, outer entire or  $\pm$  2-lobed, inner entire to jagged,  $\pm$  fringed or 2-lobed; stamens 3. **Fruit:** 2.5–3 mm.  $n=21$ . Common. Sand or gravel; 400–2000 m. NW, s SN, Teh, CW, n WTR. May–Sep

**C. corrugata** (Torr.) Torr. & A. Gray WRINKLED SPINEFLOWER**NATIVE**

Plant erect, 0.3–1.5 dm, sparsely tomentose. **Leaf:** blades ± round, (0.3)0.5–1.5(2) cm, generally tomentose. **Inflorescence:** bracts 2, awns 0.5–1 mm, ± curved; involucre 3–4 mm, 3-angled, 3-ribbed, ± glabrous, transversely ridged, teeth 3, 2–4.5 mm, awns 0.6–1 mm, hooked. **Flower:** 1, 2–2.5 mm, hairy; perianth white, lobes entire; stamens 6. **Fruit:** 2.5–3 mm.  $n=19$ . Common. Sand or gravel; 70–1000 m. D; to southern Nevada, western Arizona, northwestern Mexico. Feb–May

**C. cuspidata** S. Watson**NATIVE**

Plant decumbent to ascending, 0.5–10 dm diam, hairy. **Inflorescence:** bracts 2, awns 0.5–1.2 mm; involucre 3-angled, 6-ribbed, tube 1–3 mm, generally swollen, transversely ridged, teeth 6, 0.5–2 mm, generally without scarious margins, abaxial longest, awns 1–3 mm, hooked or straight. **Flower:** 1, 2–3 mm, hairy; perianth 2-colored, tube white, lobes white to rose, entire or 3-lobed and awned; stamens 9, fused to perianth tube base. **Fruit:** 2–3 mm.

**C. cuspidata** var. **cuspidata** SAN FRANCISCO BAY SPINEFLOWER**NATIVE**

Plant decumbent to prostrate, 0.5–1.5 dm. **Leaf:** blades 0.5–2(2.5) cm, 0.3–0.7 cm wide. **Inflorescence:** involucre tube 1–2 mm, teeth with or without scarious, ± pink margins, awns hooked. **Flower:** 2–2.5 mm. **Fruit:** 2–2.5 mm. Sand; < 300 m. n CCo, SnFrB. Apr–Jul {CNPS list}

**C. cuspidata** var. **villosa** (Eastw.) Munz WOOLLY-HEADED SPINEFLOWER**NATIVE**

Plant generally ascending, 0.5–2 dm. **Leaf:** blades 1–5 cm, 0.4–1 cm wide. **Inflorescence:** involucre tube (2)2.5–3 mm, awns straight. **Flower:** 2.5–3 mm. **Fruit:** 2.5–3 mm.  $n=19-21$ . Sand; < 60 m. n CCo. May–Aug {CNPS list}

**C. diffusa** Benth. DIFFUSE SPINEFLOWER**NATIVE**

Plant generally spreading to prostrate, 0.3–1(1.5) dm, 0.5–2(10) dm diam, hairy. **Leaf:** blades 0.3–2 cm, 0.1–0.4 cm wide. **Inflorescence:** bracts 2, awns 0; involucre 2–2.5 mm, 3-angled, 6-ribbed, teeth 6, 0.5–1 mm, margins white or ± pink to purple, abaxial longest, awns 1–2 mm, hooked. **Flower:** 1, 2.5–3 mm, glabrous; perianth 2-colored, tube lemon-yellow, lobes white, entire; stamens 3–9. **Fruit:** 2–2.5 mm.  $n=19-21$ . Common. Sand or gravel; 30–800 m. CCo, w SnFrB, w SCoRO. Apr–Jul

**C. douglasii** Benth. DOUGLAS' SPINEFLOWER**NATIVE**

Plant erect, 1–4(5) dm, hairy. **Leaf:** blades 0.5–2(4) cm, 0.1–0.4(1) cm wide. **Inflorescence:** bracts generally 2 proximally, a whorl of 3–5 at middle, awns 0; involucre 3–5 mm, 3-angled, 6-ribbed, ± swollen, finely transversely ridged, teeth 6, (0.7)1–1.5 mm, margins purple, awns 0.5–1 mm, straight. **Flower:** 1, 3.5–4(4.5) mm, hairy; perianth white to rose, lobes generally 2-lobed or toothed; stamens 9. **Fruit:** 3.5–4 mm.  $n=20$ . Sand or gravel; (200)300–1600 m. e SCoRO, SCoRI. Apr–Jul {CNPS list}

**C. fimbriata** Nutt.**NATIVE**

Plant generally erect, hairy, glandular. **Leaf:** blades tomentose abaxially. **Inflorescence:** bracts generally 2, awns 1–2 mm, straight; involucre 4–6(7) mm, 3-angled, 6-ribbed, finely transversely ridged, teeth 6, 0.3–3 mm, margins scarious, awns straight, longer three 1–2.5(3) mm, shorter three (0.3)0.5–1.5 mm. **Flower:** 1, 6–9(10) mm, glabrous; perianth 2-colored, tube yellow to yellow-white, lobes white to rose or red, oblong, fringed; stamens 9. **Fruit:** 3–4 mm.

**C. fimbriata** var. **fimbriata** FRINGED SPINEFLOWER**NATIVE**

Plant 1–3(3.5) dm. **Leaf:** blades 1–3.5 cm, 0.2–1(2.5) cm wide. **Flower:** 6–7(8) mm; perianth lobes fringed, distal segments wider than lateral.  $n=20,22$ . Sand, gravel, rocks; 30–1700 m. w PR; northern Baja California. Mar–Jul

**C. fimbriata** var. **laciniata** (Torr.) Jeps. LACINIATE SPINEFLOWER**NATIVE**

Plant 1–2(2.5) dm. **Leaf:** blades 1–2(3) cm, 0.2–1(1.5) cm wide. **Flower:** 8–9(10) mm; perianth lobes finely fringed, distal segments barely wider than lateral.  $n=20$ . Sand, gravel, rocks; 400–1500 m. w PR; northern Baja California. Mar–Jul

**C. howellii** Goodman HOWELL'S SPINEFLOWER**NATIVE**

Plant generally spreading or decumbent, 0.3–1 dm, 1–5 dm diam, hairy. **Leaf:** blades 1–3 cm, 0.5–1.5(1.8) cm wide. **Inflorescence:** bracts 2, awns 0; involucre 3–4 mm, 3-angled, 6-ribbed, teeth 6, 0.5–1 mm, margins white, awns 0.5–2 mm, straight, abaxial longest. **Flower:** 1, (3)3.5–4.5 mm, hairy; perianth 2-colored, tube white, lobes white to rose, jagged; stamens 9. **Fruit:** 3–4.5 mm.  $n=(36-38)40(41-45)$ . Coastal dunes; < 20 m. NCo (c Mendocino Co.). May–Jul {CNPS list}

**C. leptotheca** Goodman PENINSULAR SPINEFLOWER**NATIVE**

Plant generally spreading, 0.5–3(3.5) dm, 0.5–3(5) dm diam, thinly hairy. **Leaf:** blades 0.5–2(3) cm, 0.3–0.5(0.7) cm wide, generally tomentose abaxially. **Inflorescence:** bracts 2, awns 0.5–1 mm, straight; involucre 3–4 mm, 3-angled, 6-ribbed, teeth 6, 0.7–1.5 mm, awns 0.5–1 mm, hooked. **Flower:** 1, 4.5–6 mm, hairy; perianth rose to red, lobes entire; stamens 9, fused to perianth tube base. **Fruit:** 3–4 mm.  $n=19$ . Sand or gravel; (300)600–1600 m. e PR; northern Baja California. May–Aug {CNPS list}

**C. membranacea** Benth. PINK SPINEFLOWER**NATIVE**

Plant erect, 1–6(10) dm, hairy. **Leaf:** blades (1)1.5–5 cm, 0.1–0.3 cm wide, generally linear, tomentose abaxially. **Inflorescence:** bracts generally 2 (or a whorl of 3–5), awns 0.5–1 mm, straight; involucre 3–4 mm, 3-angled, 6-ribbed, tomentose to ± glabrous, ± swollen, teeth 5, 0.5–1 mm, margins scarious, awns 0.7–1.5 mm, hooked. **Flower:** 1(2), (1.5)2.5–3 mm, hairy; perianth white to rose, lobes entire; stamens 9. **Fruit:** 2.5–3 mm.  $n=19-20,(22),40-41$ . Common. Sand, gravel or rocks; 40–1400 m. NW, CaR, SNF, Teh, GV, CW, n WTR; south-central Oregon. Apr–Jul

**C. minutiflora** R. Morgan et al. FORT ORD SPINEFLOWER**NATIVE**

Plant prostrate, 0.1–0.2 dm, 0.5–2 dm diam, sparsely hairy. **Leaf:** blades 0.5–2 cm, 0.3–0.6 cm wide. **Inflorescence:** bracts 2, awns 0.2–0.5 mm; involucre 3-angled, 6-ribbed, tube 1.3–1.7(2) mm, teeth 6, 0.5–1.5 mm, without scarious margins, awns shorter, 1–1.5 mm, alternating with longer, 1.5–2 mm, all hooked. **Flower:** 1, 1.5–2 mm, sparsely hairy abaxially; perianth ± 2-colored, tube green-white, lobes white, with elongate sharp tip; stamens 3, fused to perianth tube base. **Fruit:** 1.3–1.8 mm. Uncommon. Sandy places in coastal scrub; 140–150 m. c CCo (Fort Ord, nw Monterey Co.). Late Apr–early Jul

**C. obovata** Goodman SPOON-SEPAL SPINEFLOWER**NATIVE**

Plant erect to prostrate, (0.5)1–3(4) dm, 1–4(5) dm diam, hairy. **Leaf:** blades 0.5–2.5 cm, 0.3–1 cm wide. **Inflorescence:** bracts generally 2, awns 1–2 mm, straight; involucre 3–4 mm, 3-angled, 6-ribbed, ± swollen, ± transversely ridged, teeth 6, 1–2 mm, awns straight or hooked, abaxial longest. **Flower:** 1, 4–4.5(5) mm, sparsely hairy; perianth 2-colored, tube green-white to white, lobes white to pink, outer generally entire, inner shorter, fringed; stamens (6)9. **Fruit:** 3–3.5 mm.  $n=19-21$ . Sand or gravel; 10–1300 m. s SCoRO. Abaxial tooth of involucre reported by some to be >>> others, contrary to key, further study needed. May–Jul

**C. orcuttiana** Parry ORCUTT'S SPINEFLOWER

**NATIVE**

Plant prostrate, 0.1–0.5 dm, 0.3–2(2.5) dm diam, hairy. **Leaf:** blades 0.5–1.5 cm, 0.2–0.35(0.5) cm wide. **Inflorescence:** bracts 2, awns 0 or 0.6–1 mm, straight; involucre 0.8–2 mm, 3-angled, 3-ribbed, faintly transversely ridged, teeth 3, 1.8–2 mm, awns 0.6–1 mm, hooked. **Flower:** 1, 1.5–1.8 mm, densely hairy; perianth yellow, lobes entire; stamens 9. **Fruit:** 2–2.2 mm.  $n=(18-19)20(21)$ . Sand; 60–200 m. s SCo (Del Mar to Point Loma, San Diego Co., extirpated elsewhere). Mar–May {CNPS list}

**C. palmeri** S. Watson PALMER'S SPINEFLOWER

**NATIVE**

Plant generally erect, (0.5)1–3(4) dm, hairy. **Leaf:** blades 1–3 cm, 0.4–0.8 cm wide. **Inflorescence:** bracts generally 2, generally a whorl of 3–5 at middle, awns 1–3 mm, straight; involucre 3-angled, 6-ribbed, tube 3.5–4 mm, ± swollen, ± transversely ridged, teeth 6, 1–2 mm, abaxial longest, awns 0.5–1 mm. **Flower:** 1, 4–5 mm, glabrous or hairy; perianth 2-colored, tube white to yellow, lobes red, maroon or dark purple, outer entire, inner fringed; stamens 9. **Fruit:** 3–3.5 mm.  $n=19,20(24)$ . Serpentine; 60–700 m. SCoRO (w Monterey, w San Luis Obispo cos.). May–Aug {CNPS list}

**C. parryi** S. Watson

**NATIVE**

Plant spreading to erect, 0.2–1(1.5) dm, 0.5–4(6) dm diam, hairy. **Leaf:** blades 0.5–2.5(4) cm, 0.2–0.6(1.3) cm wide. **Inflorescence:** bracts mostly 2, awns 0.4–1 mm, straight; involucre 3-angled, 6-ribbed, tube (1.5)1.7–2 mm, ± swollen, transversely ridged, teeth 6, 0.5–3 mm, awns 0.2–1.5 mm. **Flower:** 1, 2.5–3 mm, hairy; perianth 2-colored, tube green-white, lobes white, outer generally fringed, inner narrower, entire or toothed; stamens 9, fused to perianth tube base. **Fruit:** 2.5–3 mm.

**C. parryi** var. **fernandina** (S. Watson) Jeps. SAN FERNANDO VALLEY SPINEFLOWER

**NATIVE**

**Inflorescence:** involucre awns straight. Sand; 90–500 m. WTR (Laskey Mesa, Ventura Co.; n Santa Susana Mtns, Los Angeles Co.). Apr–Jun {CNPS list}

**C. parryi** var. **parryi** PARRY'S SPINEFLOWER

**NATIVE**

**Inflorescence:** involucre awns hooked. Sand; 90–800 m. c&e SCo, e TR, nw edge DSon. May–Jun {CNPS list}

**C. polygonoides** Torr. & A. Gray

**NATIVE**

Plant prostrate, 0.1–0.5 dm, 0.3–2(2.5) dm diam, hairy. **Leaf:** blades 0.3–1 cm, 0.2–0.3 cm wide. **Inflorescence:** bracts 2, awns 0; involucre 3-angled, 5–6-ribbed, tube transversely ridged, hairy, teeth 5–6, awns 1–3 mm, hooked or straight. **Flower:** 1, 1.5–1.8(2) mm, hairy; perianth white to rose, lobes entire or minutely notched; stamens (6)9, fused to perianth tube top. **Fruit:** 2–2.5 mm.

**C. polygonoides** var. **longispina** (Goodman) Munz LONG-SPINED SPINEFLOWER

**NATIVE**

Plant generally ± red. **Inflorescence:** involucre tube 1.5–2 mm, awns of prominent teeth 2–3 mm.  $n=20$ . Sand; 30–1500 m. PR; northern Baja California. Apr–Jun {CNPS list}

**C. polygonoides** var. **polygonoides** KNOTWEED SPINEFLOWER

**NATIVE**

Plant generally ± green. **Inflorescence:** involucre tube 2–2.5 mm, awns of prominent teeth 1.5–2 mm.  $n=20$ . Sand or gravel; 100–1500 m. NW, CaR, n SNF, ScV, CW. Apr–Jun

**C. procumbens** Nutt. PROSTRATE SPINEFLOWER**NATIVE**

Plant generally decumbent, 0.2–0.8 dm, 0.5–4(5) dm diam, hairy. **Leaf:** blades (0.5)1–3(4) cm, 0.1–0.7(1.2) cm wide. **Inflorescence:** bracts 2, awns 0.2–1 mm, straight; involucre 1.5–3 mm, 3-angled, 6-ribbed, faintly transversely ridged, teeth 6, 1–5 mm, margins scarious, awns 0.2–0.5 mm, hooked. **Flower:** 1, (1.7)2–3 mm, hairy; perianth white or yellow, lobes entire; stamens 9, fused to perianth tube base, united and hairy at base. **Fruit:** 1.5–2.5 mm.  $n=(19)20(21-23)$ . Common. Sand or gravel; (0)10–1300 m. c&s SCo, s TR, w PR; northern Baja California. Apr–Jun

**C. pungens** Benth.**NATIVE**

Plant prostrate to erect, 0.5–10 dm diam, hairy. **Leaf:** blades (0.5)1–5(7) cm, (0.3)0.4–0.7(1) cm wide. **Inflorescence:** bracts 2, awns 0.5–1.2 mm; involucre 3-angled, 6-ribbed, tube 2–2.5(3) mm, ± swollen, transversely ridged, teeth 6, 0.5–1 mm, margins white or pink to purple, awns 1–3 mm, hooked. **Flower:** 1, 2–3.5 mm, hairy; perianth 2-colored, tube white, lobes white to rose, jagged; stamens 9. **Fruit:** 2–2.5 mm.

**C. pungens** var. **hartwegiana** Reveal & Hardham BEN LOMOND SPINEFLOWER**NATIVE**

Plant ascending to erect, 0.5–2.5 cm. **Inflorescence:** involucre teeth margins dark pink to purple.  $n=20$ . Sand; 90–500 m. CCo (Ben Lomond sand hills, Santa Cruz Co.). Apr–Jul {CNPS list}

**C. pungens** var. **pungens** MONTEREY SPINEFLOWER**NATIVE**

Plant prostrate or ascending, 0.5–1.5 dm. **Inflorescence:** involucre teeth margins white (± pink).  $n=20$ . Sand; < 65 m. CCo (s Santa Cruz, n Monterey cos.; extirpated San Luis Obispo Co.), SnFrB (s Santa Cruz Co.). Apr–Jul {CNPS list}

**C. rectispina** Goodman STRAIGHT-AWNED SPINEFLOWER**NATIVE**

Plant generally decumbent, 0.3–0.8(1) dm, 0.5–4(5) dm diam, hairy. **Leaf:** blades 0.5–1.5(2) cm 0.2–0.6 cm wide. **Inflorescence:** bracts 2, awns 0.5–1.5 mm; involucre 2–2.5(3) mm, 3-angled, 6-ribbed, ± swollen, ± transversely ridged, teeth 6, 1–2 mm, abaxial longest, awns 0.3–2.5 mm, straight or hooked. **Flower:** 1, 3.5–4 mm, hairy; perianth 2-colored, tube yellow, outer lobes white, entire or ± 2-lobed, inner shorter, yellow, jagged; stamens 9. **Fruit:** 3–3.5 mm.  $n=(18)20(22)$ . Sand or gravel; 200–600 m. SCoRO (s Monterey, San Luis Obispo cos.). May–Jul {CNPS list}

**C. rigida** (Torr.) Torr. & A. Gray DEVIL'S SPINEFLOWER**NATIVE**

Plant erect, 0.2–0.8(1.5) dm, hairy. **Leaf:** blades 0.5–2.5 cm, (0.3)0.5–2 cm wide, occasionally tomentose abaxially, cauline blades awned, hard and thorn-like in age. **Inflorescence:** bracts 2, awns 2–4 mm, straight; involucre 2–3 mm, 3-angled, 3-ribbed, transversely ridged, teeth 3, abaxial tooth 5–10 mm, others 2–5 mm, awns straight, 0.5–2.5 mm. **Flower:** 1–2, 1.5–1.8 mm, densely hairy; perianth yellow, lobes entire; stamens 9, fused to perianth tube top. **Fruit:** (1.5)1.8–2.2 mm.  $n=19,20$ . Common. Sand or gravel; 60–1900 m. SNE, D; to southwestern Utah, western Arizona, northwestern Mexico. Feb–Jun

**C. robusta** Parry**NATIVE**

Plant erect to decumbent, 1–6 dm diam, hairy. **Inflorescence:** bracts 2, awns 0; involucre 2.5–4 mm, 3-angled, 6-ribbed, teeth 6, 0.3–0.8(1) mm, awns 0.7–1.3 mm, hooked. **Flower:** 1, 2.5–4 mm, hairy; perianth 2-colored, tube white, lobes white to rose, generally jagged or toothed; stamens 9. **Fruit:** 3.5–4 mm.

**C. robusta** var. **hartwegii** (Benth.) Reveal & Rand. MORGAN SCOTTS VALLEY SPINEFLOWER**NATIVE**

Plant erect, (0.5)1–3 dm. **Leaf:** blades 1.5–5 cm, 0.2–0.5(0.7) cm wide. **Inflorescence:** involucre 2.5–3.5 mm, teeth margins rose-pink. Sand; 200–300 m. s SnFrB (Scott Valley, Santa Cruz Co.). Apr–Jul {CNPS list}

**C. robusta** var. **robusta** ROBUST SPINEFLOWER**NATIVE**

Plant spreading or decumbent, 1–2 dm. **Leaf:** blades 1.5–5 cm, 0.3–0.7(1) cm wide. **Inflorescence:** involucre 2.5–4 mm, teeth margins white. Sand or gravel; 10–300 m. n&c CCo (s Santa Cruz, n Monterey cos.), sw SnFrB (extirpated). May–Sep {CNPS list}

**C. spinosa** S. Watson MOJAVE SPINEFLOWER**NATIVE**

Plant prostrate, 0.3–0.8(1) dm, 0.5–8 dm diam, hairy. **Leaf:** blades (0.3)0.5–1.5(2) cm, (0.3)0.5–1(1.2) cm wide, generally tomentose abaxially. **Inflorescence:** bracts 3, whorled, awns 1–3.5 mm, straight; involucre 3-angled, (4)5-ribbed, tube 2–2.5 mm, teeth (4)5, abaxial tooth 2–4 mm, awn 1–2.5 mm, straight, others 0.5–1 mm, awns 0.3–0.8 mm, straight. **Flower:** 1, 2.5–3.5 mm, glabrous; perianth generally white, lobes entire, inner shorter, narrower; stamens 9, fused to perianth tube base. **Fruit:** 2.5–3 mm.  $n=(20)22(23)$ . Sand or gravel; 600–1300 m. s SCoRI (Caliente Range), w DMoj. Apr–Jul {CNPS list}

**C. staticoides** Benth. TURKISH RUGGING**NATIVE**

Plant generally erect, 0.5–6 dm, hairy. **Leaf:** blades 0.5–3(8) cm, 0.3–1(2.5) cm wide, tomentose abaxially, thinly hairy or glabrous adaxially. **Inflorescence:** bracts 2, awns 0.5–2 mm, straight; involucre 3–4(5) mm, 3-angled, 6-ribbed, generally transversely ridged, teeth 6, 0.7–1.3(1.5) mm, awns 0.5–1 mm, hooked. **Flower:** 1, 3–4(5) mm, hairy; perianth rose to red, lobes entire or occasionally toothed; stamens 9, fused to perianth tube base. **Fruit:** 3–4 mm.  $n=19(20)21$ . Common. Sand, gravel or rocks; 300–1700 m. c&s CCo, SCoRO, SW (except e PR). Highly variable. Apr–Jul

**C. stellulata** Benth. STARLITE SPINEFLOWER**NATIVE**

Plant erect, 0.5–3 dm, hairy. **Leaf:** blades 0.5–2 cm, 0.8–2(2.2) cm wide. **Inflorescence:** bracts generally 2 proximally, a whorl of 3–5 near middle, awns 0; involucre congested, 3–4 mm, 3-angled, 6-ribbed, ± swollen, finely transversely ridged, teeth 6, 1–1.5 mm, margins white, awns 0.5–1 mm, straight. **Flower:** 1, 4–4.5(5) mm, ± hairy; perianth cream or rose, lobes obcordate to 2-lobed; stamens 9. **Fruit:** 3.5–4.5 mm.  $n=19–21$ . Sand or gravel; 30–900 m. NCoRI, CaRF, SNF, e SnFrB. Apr–Jul

**C. uniaristata** Torr. & A. Gray ONE-AWN SPINEFLOWER**NATIVE**

Plant spreading, 0.2–0.6(0.8) dm, 0.5–4(5) dm diam, hairy. **Leaf:** blades 0.5–1.5(2) cm, 0.2–0.8 cm wide. **Inflorescence:** bracts 2, awns straight, 1.5–4 mm; involucre 2–3 mm, 3-angled, 6-ribbed, slightly swollen, ± transversely ridged, teeth 6, 0.3–6 mm, awns 2.5–5.5 mm, straight, or 0.3–0.5 mm, hooked. **Flower:** 1, 2–3 mm, hairy; perianth 2-colored, tube green-white, lobes white, outer with 1 or 3 teeth, inner entire; stamens 3. **Fruit:** 2–3 mm.  $n=(39)40(41)$ . Common. Sand, gravel, talus or clay; 800–1900 m. s SN, e CW, n WTR. Apr–Jul

**C. valida** S. Watson SONOMA SPINEFLOWER**NATIVE**

Plant erect to spreading, 1–3 dm, 1–6 dm diam, hairy. **Leaf:** blades 1–2.5(5) cm, 0.4–0.8(1.2) cm wide. **Inflorescence:** bracts 2, awns 0; involucre 3–4(4.5) mm, 3-angled, 6-ribbed, finely transversely ridged, teeth 6, erect, equal, with white margins, awns straight, 0.5–1.3 mm. **Flower:** 1, (4)5–6 mm, hairy on proximal 1/2; perianth 2-colored, tube white, lobes white to lavender or rose, fringed to toothed; stamens 9, fused to perianth tube base. **Fruit:** 3–4.5 mm. Sand; 10–90 m. n CCo (extirpated except Point Reyes Peninsula). Jun–Aug {CNPS list}



**C. ventricosa** Goodman POTBELLIED SPINEFLOWER

**NATIVE**

Plant spreading, (0.5)1–5 dm, 1–5(7) dm diam, hairy. **Leaf:** blades (0.5)1–3(4) cm, (0.2)0.4–1(1.2) cm wide. **Inflorescence:** bracts 2–3 proximally, a whorl of 3–5 near middle, awns 1–3 mm, straight; involucre 4–4.5 mm, 3-angled, 6-ribbed, swollen, transversely ridged, teeth 6, 1–3 mm, awns 0.5–2 mm, straight or hooked. **Flower:** 1, 4–4.5 mm, hairy; perianth 2-colored, tube white to green-yellow, lobes red to maroon, inner fringed or ± 2-lobed; stamens 9. **Fruit:** 3–3.5 mm. *n*=20–22. Serpentine; 500–1000 m. SCoRI (s San Benito, se Monterey, ne San Luis Obispo, w Fresno cos.). May–Sep {CNPS list}

**C. watsonii** Torr. & A. Gray WATSON'S SPINEFLOWER

**NATIVE**

Plant erect, 0.2–1(1.5) dm, hairy. **Leaf:** blades (0.3)0.5–1.5(2) cm, 0.2–0.4(0.5) cm wide, generally tomentose. **Inflorescence:** bracts 2, awns 0.5–1 mm, ± curved; involucre 3-angled, 5-ribbed, tube 3–4.5 mm, finely transversely ridged, teeth 5, abaxial tooth 2–6 mm, others 1–2 mm, awns 0.4–0.8(1) mm, hooked. **Flower:** 1, 1.5–2.5 mm, hairy; perianth yellow, lobes entire; stamens 9, fused to perianth tube top. **Fruit:** 2.5–3 mm. Common. Sand or gravel; 300–2400 m. sw SnJV, n edge TR, GB, w DMOj; eastern Washington, southern Idaho, southwestern Utah, northwestern Arizona. Apr–Aug

**C. wheeleri** S. Watson WHEELER'S SPINEFLOWER

**NATIVE**

Plant erect, 0.5–2(2.5) cm, hairy. **Leaf:** blades 0.5–2 mm, 0.2–0.6 cm wide, tomentose abaxially. **Inflorescence:** bracts 2, awns 0.5–1 mm, straight; involucre 3-angled, 6-ribbed, tube 2–2.5 mm, transversely ridged, teeth 6, 0.3–0.8(1) mm, awns 0.3–0.5 mm, straight. **Flower:** 1, 2.5–3 mm, glabrous or sparsely hairy; perianth white to rose or red, lobes entire; stamens 6, fused to perianth tube base. **Fruit:** 2.5–3 mm. Gravel to rocks; < 400 m. n ChI (Santa Cruz, Santa Rosa islands). Apr–Jun {CNPS list}

**C. xanti** S. Watson

**NATIVE**

Plant erect, (0.3)0.5–2.5(3) dm, hairy. **Leaf:** blades 0.3–1(1.5) cm, 0.3–0.8(1) cm wide, tomentose abaxially. **Inflorescence:** bracts 2, awns 0.5–1 mm, straight; involucre 3–4.5 mm, 3-angled, 6-ribbed, teeth 6, 0.7–1.5, awns 0.5–1 mm, hooked. **Flower:** 1, 4.5–6 mm, hairy; perianth generally rose to red, lobes entire; stamens 9, fused to perianth tube base. **Fruit:** 4–4.5 mm.

**C. xanti** var. **leucotheca** Goodman WHITE-BRACTED SPINEFLOWER

**NATIVE**

**Inflorescence:** involucre densely hairy. Sand or gravel; (60)400–1300 m. eastern SnBr, n SnJt. Apr–Jun {CNPS list}

**C. xanti** var. **xanti** PINYON SPINEFLOWER

**NATIVE**

**Inflorescence:** involucre thinly hairy. *n*=19,21. Common. Sand, gravel; (60)300–1600 m. s SN, Teh, s SCoRI, n&eastern TR (except eastern SnBr), SNE (s Mono Co.). Possible roadside waif in SNE, now extirpated. Apr–Jul

## ROSACEAE ROSE FAMILY

## Daniel Potter &amp; Barbara Ertter, family description, key to genera; treatment of genera by Daniel Potter, except as noted

Annual to tree, glandular or not. **Leaf:** simple to palmately or pinnately compound, generally alternate; stipules free to fused (0), persistent to deciduous. **Inflorescence:** cyme, raceme, panicle, cluster, or flowers 1; bractlets on pedicel ("pedicel bractlets") generally 0–3(many), subtended by bract or generally not. **Flower:** generally bisexual, radial; hypanthium free or fused to ovary, saucer- to funnel-shaped, subtending bractlets ("hypanthium bractlets") 0–5, alternate sepals; sepals generally 5; petals generally 5, free; stamens (0,1)5–many, anther pollen sacs generally 2; pistils (0)1–many, simple or compound, ovary superior to inferior, styles 1–5. **Fruit:** 1–many per flower, achene (fleshy-coated or not), follicle, drupe, or pome with generally papery core, occasionally drupe-like with 1–5 stones. **Seed:** generally 1–5 (per fruit, not per flower). 110 genera, ± 3000 species: worldwide, especially temperate; many cultivated for ornamental, fruit, especially *Cotoneaster*, *Fragaria*, *Malus*, *Prunus*, *Pyracantha*, *Rosa*, *Rubus*. [Potter et al. 2007 Plant Syst Evol 266:5–43] Number of teeth is per leaf or leaflet, not per side of leaf or leaflet, except in *Drymocallis*. —Scientific Editors: Daniel Potter, Thomas J. Rosatti.

## ROSA

## Barbara Ertter

Shrub to vine, often thicket-forming, generally prickly. **Leaf:** generally odd-pinnately compound; stipules generally attached to petiole, generally gland-margined. **Inflorescence:** generally ± cyme or flowers 1; pedicel bractlets 0. **Flower:** hypanthium urn-shaped, bractlets 0; sepals often with long expanded tip; petals generally 5 (except cultivated), generally pink in California (white to red or yellow); stamens generally > 20; pistils generally many, ovaries superior, styles attached at tip, generally hairy. **Fruit:** bony achenes generally enclosed in fleshy, generally ± red hypanthium (hip). 100+ species: generally northern temperate. (Latin: ancient name) [Ertter & Lewis 2008 Madroño 55:170–177] Species hybridize freely; other non-natives established locally. FNANM treatment by Lewis & Ertter uses both subspecies, varieties, the latter mostly reserved for localized variants within a subsp.; 2 vars. in *Rosa woodsii* subsp. *gratissima* treated here but not in TJM2 (2012).

1. Leaflets << 1 cm, toothed ± 1/2 to base; hypanthium densely prickly — PR ..... *R. minutifolia*
- 1' Leaflets generally > 1 cm, toothed < 1/4 to base; hypanthium glabrous to stalked-glandular
2. Sepals with toothed lateral lobes; prickles compressed side-to-side, curved
  3. Hypanthium 1–2 mm wide at flower, 5–7 mm wide at fruit; pistils generally < 10 ..... *R. multiflora*
  - 3' Hypanthium 4–5 mm wide at flower, 10–20 mm wide at fruit; pistils > 10
    4. Leaves and sepals ± glandless; petals white to pink; terminal leaflet ± ovate ..... *R. canina*
    - 4' Leaves and sepals glandular; petals pink; terminal leaflet generally elliptic to ± widely obovate ..... *R. rubiginosa*
- 2' Sepals generally entire (tip sometimes toothed); prickles compressed or slender, straight or curved
  5. Sepals deciduous in fruit; hypanthium 1.5–2 mm wide at flower; pistils 5–10; sepal tip generally << body; petals ± 10 mm — leaflets glabrous, flowers 1–3; pedicels generally stalked-glandular ..... *R. gymnocarpa*
  6. Leaflets generally (5)7–9; terminal leaflet tip generally ± obtuse, ± 10–30 mm; pedicels ± 15–30 mm; plants to ± 5–20 dm, generally in shade on non-ultramafic substrates; widespread ..... var. *gymnocarpa*
  - 6' Leaflets generally 5(7); terminal leaflet tip widely obtuse to rounded, 4–20 mm; pedicels ± 10–15 mm; plants to generally 3–6 dm, full sun on ultramafic substrates; KR ..... var. *serpentina*
- 5' Sepals persistent; hypanthium 2.5–7 mm wide at flower; pistils generally > 10; sepal tip ± = or often > body; petals 10–25 mm
7. Dwarf, openly rhizomed shrubs, generally 1–5(10) dm; leaflet tip often ± truncate — leaf margins generally ± glandular, generally double-toothed
8. Hypanthium stalked-glandular — prickles generally ± slender, often many; NW, CW, MP(1 site), 150–1550(1950) m ..... *R. spithamea*
- 8' Hypanthium generally glandless, rarely sparsely glandular
  9. Prickles few, paired, ± thick-based; terminal leaflet generally widely obovate; flower 1–2(7); CaR, SN, 700–2500 m ..... *R. bridgesii*
  - 9' Prickles generally many, generally not paired, both slender and ± thick-based; terminal leaflet generally ± elliptic; flowers generally 1–5; CW, generally < 300 m ..... *R. pinetorum*

- 7' Open or thicket-forming shrubs, generally > 5 dm; leaflet tip not truncate
10. Terminal leaflet ± obovate-elliptic, widest at or above middle; leaf axis finely velvety, hairs ± 0.1 mm (glabrous), glandless; prickles slender to ± thick-based, generally ± straight; sepals glandless (in California); CaRH, SNH, Teh, TR, GB, DMtns ..... *R. woodsii*
11. Prickles generally many, 2–10(13) mm, often ± thick-based, internodal prickles generally present in inflorescence; c&s SNH, Teh, TR, SNE, DMtns, s DMoj exc DMtns (Box S Springs, Cushenbury Springs) ..... subsp. *gratissima*
12. Leaf axis finely velvety; c&s SNH, Teh, TR, SNE, DMtns ..... var. *gratissima*
- 12' Leaf axis glabrous; s DMoj exc DMtn (Box S Springs, Cushenbury Springs) ..... var. *glabrata*
- 11' Prickles few to many, 2–7 mm, slender, internodal prickles generally 0 in inflorescence; CaRH, n SNH, MP, n SNE ..... subsp. *ultramontana*
- 10' Terminal leaflet generally ovate to elliptic, generally widest at or below middle; leaf axis variously hairy, hairs to 1 mm, sometimes glandular; prickles generally ± thick-based, often curved; sepals often glandular; CA-FP, adjacent DMoj
13. Flowers generally 1(6); hypanthium generally 5–7 mm wide at flower, (10)13–20 mm wide at fruit, generally ± spheric; achenes generally 4.5–6 mm — prickles to 20 mm, generally ± compressed, ± straight to ± curved; sepal tips generally > body, toothed ..... *R. nutkana*
14. Leaflets generally ± single-toothed, generally glandless; prickles generally few; NCoRO, KR, CaRH; 750–1500 m ..... subsp. *macdougali*
- 14' Leaflets double-toothed, ± glandular especially beneath; prickles generally many; NCo, NCoRO, CCo; < 700 m ..... subsp. *nutkana*
- 13' Flowers 1–many; hypanthium 2.5–5.5 mm wide at flower, 7–15(20) mm wide at fruit, spheric to (ob)ovoid; achenes 3–5 mm
15. Prickles generally thick-based, generally curved (straight), few to many; leaflets and leaf axis generally ± shaggy-hairy, hairs to 1 mm; pedicel generally ± hairy; hypanthium generally (ob)ovoid, glabrous to sparsely hairy, neck 2–4.5 mm wide at flower ..... *R. californica*
- 15' Prickles slender to ± thick-based, straight (± curved), 0–few; leaflets and leaf axis ± glabrous to ± hairy, hairs 0.1–1 mm; pedicels generally glabrous (except for glands); hypanthium spheric to ovoid, glabrous, neck ± 2 mm wide at flower ..... *R. pisocarpa*
16. Flowers 1–3(10); sepals generally glandless; prickles 0 to paired at nodes; leaflets generally 5(7) ..... subsp. *ahartii*
- 16' Flowers (1)3–10; sepals generally glandular; prickles generally paired at nodes; leaflets generally (5)7(9) ..... subsp. *pisocarpa*

***R. bridgesii* Rydb. SIERRAN DWARF ROSE****NATIVE**

Dwarf shrub, openly rhizomed, generally 1–4(8) dm. **Stem:** prickles few, generally paired, 3–10 mm, ± thick-based, straight. **Leaf:** axis glabrous to finely hairy, glandular; leaflets generally 5–7, ± hairy, glandular; terminal leaflet generally 10–30(50) mm, generally widely obovate (elliptic), widest above middle, tip generally ± truncate, margins double-toothed, glandular. **Inflorescence:** 1–2(7)-flowered; pedicels 4–17 mm, glabrous and glandless to ± glandular. **Flower:** hypanthium ± 3–4 mm wide at flower, glabrous, generally glandless, neck 1.5–3 mm wide; sepals glandular, margins entire, tip generally < body, entire; petals 10–20 mm, pink to red; pistils generally 10–30. **Fruit:** 7–14 mm wide, ± ovoid; sepals erect, persistent; achenes 4–6.5 mm.  $2n=14,28$ . Open forest, rocky areas; 700–2500 m. CaR, SN; southern Oregon. May–Aug

**R. californica** Cham. & Schltld. CALIFORNIA ROSE**NATIVE**

Shrub or thicket-forming, 8–25 dm. **Stem:** prickles few to many, paired or not, 3–15 mm, thick-based and compressed, generally curved (straight). **Leaf:** axis ± shaggy-hairy (± glabrous), hairs to 1 mm, glandless or glandular; leaflets 5–7(9), ± hairy, sometimes glandular; terminal leaflet generally 15–50 mm, ± ovate-elliptic, generally widest at or below middle, tip rounded to acute, margins single- or double-toothed, glandular or not. **Inflorescence:** (1)3–30(50)-flowered; pedicels generally ± 5–20 mm, generally ± hairy, glandless. **Flower:** hypanthium 3–5.5 mm wide at flower, glabrous to sparsely hairy, glandless, neck 2–4.5 mm wide; sepals glandular or not, entire, tip generally ± = body, entire; petals generally 15–25 mm, pink; pistils 20–40. **Fruit:** generally 8–15(20) mm wide, generally (ob)ovoid; sepals generally erect, persistent; achenes generally 3.5–4.5 mm.  $n=14$ . Generally ± moist areas, especially streambanks; < 1800 m. CA-FP (except CaRH, SNH, Teh); southern Oregon, northern Baja California. Variable; needs study. Feb–Nov

**R. canina** L. DOG ROSE**NATURALIZED**

Shrub or thicket-forming, generally 8–40 dm. **Stem:** prickles ± few, generally not paired, 3–10 mm, thick-based and compressed, curved. **Leaf:** axis glabrous or with hairs to 1 mm, glandless; leaflets generally 5–7, (±) glabrous; terminal leaflet generally 15–40 mm, ± ovate, widest below middle, tip ± acute, margins ± single-toothed, sparsely glandular. **Inflorescence:** generally 1–5-flowered; pedicels generally 10–20 mm, generally glabrous, glandless. **Flower:** hypanthium generally 4–5 mm wide at flower, glabrous, glandless, neck 2–3 mm wide; sepals ± glandless, margins with toothed lateral lobes, tip generally ± = body, ± toothed; petals 15–30 mm, white to pale pink; pistils 25–40. **Fruit:** 10–20 mm wide; ± ellipsoid; sepals reflexed, unevenly deciduous; achenes 4.5–6 mm.  $2n=35$ . Generally ± dry open areas; 100–1500 m. NW, n SN; to Washington, Idaho, Utah, also eastern United States; native to Eurasia. May–Jul

**R. gymnocarpa** Nutt. WOOD ROSE**NATIVE**

Loose shrub. **Stem:** prickles few to many, generally not paired (except SnFrB), 2–8 mm, ± slender, straight. **Leaf:** axis generally glabrous ± glandular; leaflets glabrous; terminal leaflet margins ± double-toothed, glandular. **Flower:** hypanthium 1.5–2 mm wide at flower, glabrous and glandless, neck ± 1.5 mm wide; sepals glandular or not, entire, tip generally << body, entire; petals ± 10 mm, pink to red; pistils 5–10. **Fruit:** 4–12 mm wide, ellipsoid to ± spheric; sepals erect to reflexed, evenly deciduous; achenes (3)4–7 mm.  $n=7$ .

**R. gymnocarpa** var. **gymnocarpa****NATIVE**

Plant generally ± 5–20 dm. **Leaf:** leaflets generally (5)7–9; terminal leaflet ± 10–30 mm, elliptic to (ob)ovate, tip ± obtuse. **Inflorescence:** pedicels generally ± 15–30 mm, generally stalked-glandular. **Fruit:** 5–12 mm wide, ellipsoid to ± spheric; achenes (1)4–10.  $n=7$ . Common. Generally in shade of forest, scrub, generally not ultramafic substrates; 30–2000 m. NW, CaR, n&c SN, CW, PR, MP; to British Columbia, Montana. (Feb)Apr–Jul

**R. gymnocarpa** var. **serpentina** Ertter & W.H. Lewis GASQUET ROSE**NATIVE**

Plant (1)3–6(13) dm. **Leaf:** leaflets generally 5(7); terminal leaflet 4–20 mm, widely elliptic to ± round, tip widely obtuse to rounded. **Inflorescence:** pedicels ± 10–15 mm, stalked-glandular or not. **Fruit:** 4–8 mm wide, irregularly ovoid to ellipsoid; achenes 1–4. Full sun in chaparral, dwarf forest on ultramafic substrates; 400–1500 m. KR; southern Oregon. Apr–Jun

**R. minutifolia** Engelm. SMALL-LEAVED ROSE**NATIVE**

Dense shrub or thicket-forming, ± 3–10 dm. **Stem:** prickles many, generally not paired, 2–12 mm, slender, straight. **Leaf:** axis finely short-hairy, sparsely glandular; leaflets 5–7, hairy; terminal leaflet ± 3–6 mm, ± round, widest near middle, tip ± obtuse, margins toothed ± 1/2 to midvein, ± glandless. **Inflorescence:** generally 1-flowered; pedicels ± 2–10 mm, hairy, glandless. **Flower:** hypanthium ± 3 mm wide at flower, densely prickly, neck ± 2 mm wide; sepals glandless, with toothed lateral lobes, tip generally ± = body, toothed; petals ± 10–20 mm, dark pink; pistils generally ± 10. **Fruit:** ± 5 mm wide, ± spheric; sepals erect to spreading, persistent; achenes unknown.  $n=7$ . Chaparral; ± 160 m. s PR (Otay Mesa); northern Baja California. Feb–Apr {CNPS list}

**R. multiflora** Thunb. MULTIFLORA ROSA**NATURALIZED**

Shrub, thicket-forming, or climbing, 15–30(75) dm. **Stem:** prickles generally ± few, generally not paired, ± 4–6 mm, thick-based and compressed, curved. **Leaf:** axis ± hairy, sparsely glandular; leaflets generally 7–9, ± hairy and glandular; terminal leaflet 10–45 mm, elliptic to obovate, widest above middle, tip acute to acuminate, margins generally single-toothed, glandless. **Inflorescence:** generally 5–30-flowered; pedicels 5–15 mm, sparsely hairy and/or glandular. **Flower:** hypanthium 1–2 mm wide at flower, glabrous to ± hairy, glandular or not, neck 1.5–2 mm wide; sepals generally glandular, with toothed lateral lobes, tip < body, entire; petals 7–13 mm, generally white; pistils generally < 10. **Fruit:** 5–7 mm wide; ovoid to spheric; sepals reflexed, unevenly deciduous; achenes 3.5–5 mm.  $2n=14$ . Generally ± disturbed open sites; 20–700 m. NCoRO, CaR, ScV, SnGb; widely naturalized in North America; native to eastern Asia. Apr–Jun

**R. nutkana** C. Presl**NATIVE**

Shrub or thicket-forming, generally 5–20 dm. **Stem:** prickles paired or not, 10–20 mm, generally ± compressed and thick-based, ± straight to ± curved. **Leaf:** axis ± hairy, glandular; leaflets generally 5–7, sparsely hairy; terminal leaflet ± 15–50(60) mm, ± wide-elliptic to -ovate, widest at or below middle, tip ± obtuse. **Inflorescence:** generally 1(6)-flowered; pedicels generally ± 10–20 mm, variously glabrous, hairy, and/or glandular. **Flower:** hypanthium generally 5–7 mm wide at flower, glabrous, glandular or not, neck 3–6 mm wide; sepals generally glandular, entire, tip generally > body, toothed; petals 15–25 mm, pink; pistils generally 30–60. **Fruit:** (10)13–20 mm wide, generally ± spheric; sepals generally erect, ± persistent; achenes generally 4.5–6 mm.  $n=21$ .

**R. nutkana** subsp. **macdougalii** (Holz.) Piper**NATIVE**

**Stem:** ± openly branched; prickles generally few. **Leaf:** leaflets generally glandless, margins generally ± single-toothed. Generally ± moist flats; 750–1500 m. KR, NCoRO, CaRH; to British Columbia, Montana, Wyoming, Colorado. May–Jul

**R. nutkana** subsp. **nutkana** NOOTKA ROSE**NATIVE**

**Stem:** densely branched; prickles generally many. **Leaf:** leaflets ± glandular, especially beneath, margins double-toothed. Generally ± moist flats; < 700 m. NCo, NCoRO, CCo; coastal to Alaska. [*Rosa nutkana* var. *nutkana*] CCo plants may be mostly hybrids with other species. Apr–Jul

**R. pinetorum** A. Heller PINE ROSE**NATIVE**

Dwarf shrub, openly rhizomed, generally < 10 dm. **Stem:** prickles generally many, generally not paired, 3–10 mm, both slender and ± thick-based, straight. **Leaf:** axis glabrous or finely hairy, glandular; leaflets 5–7, glabrous to hairy; terminal leaflet 10–30 mm, generally ± elliptic, widest near middle, tip ± obtuse, margins ± single- or double-toothed, ± glandular. **Inflorescence:** generally 1–5-flowered; pedicels generally 10–30 mm, glabrous, glandular or not. **Flower:** hypanthium generally ± 4 mm wide at flower, glabrous, glandless, neck ± 3 mm wide; sepals generally ± glandular, entire, tip generally ± = body, entire or toothed; petals ± 15–20 mm, pink; pistils ± 10–20. **Fruit:** ± 12 mm wide, spheric; sepals ± erect, persistent; achenes 3–4 mm.  $2n=14,21$ . Pine woodland; generally < 300 m. w-c CW. Hybrids of *Rosa gymnocarpa* × *Rosa spithamea* also key here. May–Jun {CNPS list}

**R. pisocarpa** A. Gray CLUSTER ROSE

## NATIVE

Shrub or thicket-forming. **Stem:** prickles 0–few, ± thick-based to slender, straight (± curved). **Leaf:** axis ± glabrous to ± hairy, hairs 0.1–1 mm, glandless or sparsely glandular; leaflets sparsely hairy (± glabrous); terminal leaflet ± ovate-elliptic, widest at or below middle, tip ± obtuse, margins generally single-toothed, glandless. **Inflorescence:** pedicels ± 10–20 mm, generally glabrous. **Flower:** hypanthium generally 2.5–4 mm wide at flower, glabrous, glandless, neck ± 2 mm wide; sepal margin entire, tip generally > body, entire; petals 12–18 mm, pink; pistils 20–30. **Fruit:** 7–13 mm wide, spheric to ovoid; sepals erect, persistent; achenes 3–4.5 mm.

**R. pisocarpa** subsp. **ahartii** Ertter & W.H. Lewis AHART ROSE

## NATIVE

Plant generally 4–15 dm. **Stem:** prickles 0, single or paired at nodes, often 0, 2–5 mm. **Leaf:** leaflets generally 5(7); terminal leaflet generally 20–45(60) mm. **Flower:** 1–3(10); sepals generally glandless. **Fruit:** 8–13 mm wide, ± ovoid, neck 2.5–3.5 mm wide. Generally ± moist areas; 150–1700 m. CaR, n SN; southern Oregon. May–Aug

**R. pisocarpa** subsp. **pisocarpa** CLUSTER or PEA ROSE

## NATIVE

Plant generally 10–25 dm. **Stem:** prickles generally paired at nodes, 2–10 mm. **Leaf:** leaflets generally (5)7(9); terminal leaflet 15–35 mm. **Flower:** (1)3–10; sepals generally glandular. **Fruit:** 7–10 mm wide, spheric, neck 1.5–3 mm wide.  $n=7$ . Generally ± moist areas; 30–2100 m. NW, CaR; to British Columbia. May–Aug

**R. rubiginosa** L. SWEET-BRIER

## NATURALIZED

Shrub or thicket-forming, 8–30 dm. **Stem:** prickles generally few, generally not paired, ± 5–15 mm, thick-based, compressed, curved. **Leaf:** axis ± hairy, hairs 0.2–1 mm, glandular; leaflets generally 5–7, ± hairy, glandular; terminal leaflet generally 10–35 mm, elliptic to ± widely obovate, widest near middle, tip obtuse, margins double-toothed, glandular. **Inflorescence:** generally 1–8-flowered; pedicels ± 10 mm, glabrous, stalked-glandular. **Flower:** hypanthium generally 4–5 mm wide at flower, ± glabrous, glandless to sparsely stalked-glandular, neck ± 3 mm wide; sepals glandular, lateral lobes toothed, tip ± = body, generally toothed; petals generally 10–20 mm, pink; pistils 20–45. **Fruit:** 10–18 mm wide; ± ellipsoid; sepals spreading to reflexed, unevenly deciduous; achenes 4–5 mm.  $2n=35$ . Generally ± dry, often disturbed open sites; 30–1400 m. NW (except NCoRH), CaR, n&c SN, Teh, CCo, SnFrB; to eastern North America; native to Europe. [*Rosa eglanteria* L., nom. rej.] May–Aug

**R. spithamea** S. Watson COAST GROUND ROSE

## NATIVE

Dwarf shrub, openly rhizomed, generally < 5 dm. **Stem:** prickles few to many, generally not paired, 3–8(12) mm, generally slender (thick-based), ± straight. **Leaf:** axis generally glabrous (finely hairy), glandular; leaflets 5–7(9), 2–4 per side, (±) glabrous; terminal leaflet ± 10–30 mm, ± widely elliptic (obovate), widest near middle, tip obtuse to truncate, margins ± double-toothed, glandular. **Inflorescence:** 1–10-flowered; pedicels generally 5–15 mm, glabrous, ± stalked-glandular. **Flower:** hypanthium generally 4–5 mm wide at flower, stalked-glandular, neck 3–4 mm wide; sepals generally glandular, entire, tip generally ± = body, entire; petals 10–15 mm, pink to red; pistils 10–20. **Fruit:** 7–12(15) mm wide, ± spheric; sepals ± erect, persistent; achenes 3.5–5 mm.  $2n=28$ . Open forest, chaparral, especially after fire; generally 150–1550(1950) m. NW, CW, MP; Oregon. Generally blooms after fires. Plants in southern CW with larger prickles, described as *Rosa granulata* Greene, may be hybrids with *Rosa californica*; study needed. Apr–Aug

**R. woodsii** Lindl.

## NATIVE

Shrub, open or thicket-forming, generally 5–30 dm. **Stem:** prickles paired or not, generally ± straight (± curved) (in California). **Leaf:** axis finely velvety (glabrous), hairs ± 0.1 mm, glandless; leaflets 5–7, (±) glabrous; terminal leaflet 10–40 mm, ± obovate-elliptic, widest at or above middle, tip ± obtuse, margins single-toothed, glandless. **Inflorescence:** 1–12-flowered; pedicels generally 10–20 mm, ± glabrous, glandless. **Flower:** hypanthium generally 3–5 mm wide at flower, glabrous, glandless, neck 2–4 mm wide; sepals glandless (in California), generally entire (or with simple, linear lobes), tip ± = body, entire; petals generally 15–20 mm, pink; pistils generally 20–35. **Fruit:** generally 9–12 mm wide; sepals generally erect, persistent; achenes 3–4 mm. Yosemite Valley plants ambiguous.

**R. woodsii** subsp. **gratissima** (Greene) W.H. Lewis & Ertter MOJAVE ROSE

**NATIVE**

**Stem:** ± densely branched; prickles generally many with internodal prickles generally present in inflorescence, 2–10(13) mm, often ± thick-based, sometimes slender. **Flower:** generally 1–3. **Fruit:** ovoid to spheric.  $2n=14$ . Includes *Rosa woodsii* var. *glabrata* (Parish) D. Cole, *Rosa woodsii* var. *gratissima* (Greene) D. Cole, not treated in TJM2 (20102).

**R. woodsii** var. **glabrata** (Parish) D. Cole

**NATIVE**

**Leaf:** axis glabrous. Desert springs; 1100–1300 m. s DMoj except DMtn (Box S Springs, Cushenbury Springs). [*Rosa mohavensis* Parish] A variety of *Rosa woodsii* subsp. *gratissima* (Greene) W.H. Lewis & Ertter. May–Aug

**R. woodsii** var. **gratissima** (Greene) D. Cole

**NATIVE**

**Leaf:** axis finely velvety. Generally ± moist areas; 800–3400 m. c&s SNH, Teh, TR, SNE, DMtns; Nevada. A variety of *Rosa woodsii* subsp. *gratissima* (Greene) W.H. Lewis & Ertter. May–Aug

**R. woodsii** subsp. **ultramontana** (S. Watson) Roy L. Taylor & MacBryde INTERIOR ROSE

**NATIVE**

**Stem:** openly branched; prickles few to many with internodal prickles generally 0 in inflorescence, 2–7 mm, slender. **Flower:** 1–12. **Fruit:** generally ± ovoid.  $2n=14$ . Generally ± moist areas; 1000–2500 m. CaRH, n SNH, MP, n SNE; to British Columbia, Montana, Nevada. [*Rosa woodsii* var. *ultramontana* (S. Watson) Jeps.] Most CaRH reports referable to *Rosa pisocarpa* subsp. *ahartii*. May–Jul

## CYPERACEAE SEDGE FAMILY

S. Galen Smith, except as noted

Annual, perennial herb, often rhizomed or stoloned, often of wet open places; roots fibrous; monoecious, dioecious, or flowers bisexual. **Stem:** generally 3-sided, generally solid. **Leaf:** generally 3-ranked; base sheathing, sheath generally closed, ligule generally 0; blade (0 or) linear, parallel-veined. **Inflorescence:** spikelets generally arranged in head-, spike-, raceme-, or panicle-like inflorescences; flower generally sessile in axil of flower bract, enclosed in a sac-like structure (perigynium) or generally not. **Flower:** unisexual or bisexual, small, generally wind-pollinated; perianth 0 or generally bristle like; stamens generally 3, anthers attached at base, 4 chambered; ovary superior, chamber 1, ovule 1, style 2–3-branched. **Fruit:** achene, 2–3 sided.  $\pm$  100 genera, 5000 species: especially temperate. [Gilmour et al. 2013 Kew Bull 68:85–105] Difficult; taxa differ in technical characters of inflorescence, fruit. In *Carex* and *Kobresia*, what appear to be individual pistillate flowers in fact are highly reduced inflorescences (whether or not the same applies to staminate flowers is still under debate). In some other works (e.g., FNANM) these are called spikelets, and they are treated as being arranged in spikes. Here and in TJM (1993), what appear to be individual pistillate flowers are called pistillate flowers in *Carex* (and they are treated as being arranged in spikelets), but spikelets in *Kobresia* (and they are treated as being arranged into spikes). Though internally inconsistent, the approach here is consistent with traditional usage, and reflects a preference for character states that may be determined in the field. Molecular, morphological, and embryological evidence indicates that *Eriophorum crinigerum* is to be segregated to a new genus, as *Calliscirpus criniger* (A. Gray) C.N. Gilmour et al., along with a second, newly described species, *Calliscirpus brachythrix* C.N. Gilmour et al. (Gilmour et al. 2013); key to genera modified by Peter W. Ball to include *Calliscirpus*. —Scientific Editors: S. Galen Smith, Thomas J. Rosatti, Bruce G. Baldwin.

1. Flower, fruit enclosed in sac-like structure (perigynium); flowers unisexual
  2. Perigynium open at tip ..... **CAREX**
  - 2' Perigynium open on 1 side ..... **KOBRESIA**
- 1' Flower, fruit not enclosed in sac-like structure; flowers bisexual or some staminate
  3. Flower bracts 2-ranked; spikelets generally flat
    4. Inflorescence in leaf axils; leaves cauline; stem internodes hollow ..... **DULICHIMUM**
    - 4' Inflorescence terminal; leaves basal or basal and cauline; stem internodes solid or spongy with air cavities
      5. Spikelets with  $\geq$  2 sterile proximal flower bracts; leaf sheaths  $\pm$  black; inflorescence head-like ..... **SCHOENUS**
      - 5' Spikelets with 0–1 sterile proximal flower bracts; leaf sheaths not  $\pm$  black; inflorescence head-like to openly branched
        6. Spikelets with 2–36 flower bracts, each bract subtending a bisexual flower; fruits 2–many per spikelet ..... **CYPERUS**
        - 6' Spikelets with 2(3) flower bracts, proximal bract sterile or subtending a bisexual flower, distal sterile or subtending a staminate flower; fruits 1 per spikelet ..... **KYLLINGA**
  - 3' Flower bracts spiraled (except *Isolepis levynsiana*); spikelets not flat ( $\pm$  flat in *Isolepis levynsiana*)
    7. Flower stems generally with cauline leaves 0 (1–2 cauline in *Schoenoplectus saximontanus*)
      8. Inflorescence bracts 0; spikelet 1; leaves 2, blade 0 or tooth-like,  $\leq$  1 mm; fruit tubercle generally present .... **ELEOCHARIS**
      - 8' Inflorescence bracts  $\geq$  1; spikelets  $\geq$  1; leaves 1–3, generally some clearly bladed; fruit tubercle 0
        9. Flower bract (outer if 2) with  $\geq$  3 veins; stem  $\leq$  40 cm
          10. Flower bract 1 per flower ..... **ISOLEPIS**
          - 10' Flower bracts (1)2 per flower (a 2nd, inner bract between flower, spikelet axis generally present) ..... **LIPOCARPHA**
        - 9' Flower bract with 1 vein, at least in distal-most part of spikelet; stem  $\leq$  400 cm
          11. Stems  $\leq$  15 cm,  $<$  1 mm diam; spikelets 1, 3–4.6 mm, 1.5–2.8 mm wide ..... **TRICHOPHORUM**
          - 11' Stems (1)10–400 cm,  $\leq$  10 mm diam; spikelets 1–200, 3–23 mm, 2–7 mm wide
            12. Ligule ciliate; stem, leaf air cavities 0; stem wiry; flower bracts shiny, in proximal part of spikelet 3–9-veined, at least in distal-most 1-veined, tip not notched ..... **AMPHISCIRPUS**
            - 12' Ligule glabrous; stem, leaf generally with air cavities; stem rarely wiry; flower bracts dull, 1-veined, tip generally notched ..... **SCHOENOPLECTUS**
    - 7' Flower stems with cauline leaves  $\geq$  1 (see also *Schoenoplectus saximontanus*)
      13. Inflorescences generally  $>$  1, terminal and generally  $\geq$  1 axillary
        14. Flowers 10–50 per spikelet ..... **SCIRPUS** (2)
        - 14' Flowers  $<$  6 per spikelet



15. Stem 5–10 mm diam; leaf blades 5–10 mm wide, margins saw-toothed ..... **CLADIUM**  
 15' Stem ≤ 2 mm diam; leaf blades 0.5–5 mm wide, margins generally scabrous ..... **RHYNCHOSPORA**  
 13' Inflorescence 1, terminal
16. Leaf sheath tip margins scabrous or ciliate; stem, leaf blades glabrous or generally ± scabrous or puberulent  
 17. Leaf sheath tip ciliate, hairs >> 1 mm, soft ..... **BULBOSTYLIS**  
 17' Leaf sheath tip scabrous, hairs << 1 mm, stiff ..... **FIMBRISTYLIS**  
 16' Leaf sheath tip margins glabrous; stem, leaf blades glabrous or on keels or angles scabrous
18. Stem cylindric; perianth bristles 10–25, smooth, >> fruit ..... **ERIOPHORUM**  
 18' Stem 3-angled; perianth bristles 3–6(12), barbed, < to > fruit  
 19. Flower bracts puberulent (glabrous in age), tip notched, generally with curved awn often broken off;  
 tubers durable ..... **BOLBOSCHOENUS**  
 19' Flower bracts glabrous, tip entire or sharp-pointed, awn 0 or minute; tubers 0
20. Inflorescence congested, head-like; perianth bristles > fruit ..... **CALLISCIRPUS**  
 20' Inflorescence openly branched with head-like clusters at branch tips; perianth bristles ≤ fruit ..... **SCIRPUS** (2)

**CALLISCIRPUS COTTON GRASS**

**Peter W. Ball**

Perennial herb, caespitose, erect. **Stem:** 3-angled, solid, ± scabrous. **Leaf:** basal and cauline; ligule fringed; blade flat, ± scabrous on keel or angles. **Inflorescence:** 1, terminal, head-like; inflorescence bracts 1–several, leaf- or scale-like; spikelets 5–30+; flower bracts spiraled, > 10, ovate, membranous, glabrous, tip entire. **Flower:** bisexual; perianth bristles 6(–12), > fruit, generally > flower bracts, > flower bracts in fruit, irregularly bent to ± straight, distally with upward-pointing barbs; stamens 3; style 3-branched. **Fruit:** 3-sided, ± flat. 2 species: California, southwest Oregon. (Greek: beautiful *Scirpus*) [Gilmour et al. 2013 Kew Bull 68:85–105] See note under family about addition of this genus.

1. Flower bracts 0.6–1.3 mm wide; ligule hairs 0.05–0.2 mm (ligule sometimes appearing subentire); perianth bristles with short sparse barbs ..... ***C. brachythrix***  
 1' Flower bracts 1.2–2.0 mm wide; ligule hairs 0.25–0.6 mm; perianth bristles with long dense barbs ..... ***C. criniger***

***C. brachythrix*** C. N. Gilmour, J. R. Starr, & Naczi

**NATIVE**

Plant 2–8.5 dm. **Leaf:** 10–85 cm, 1–5 mm wide. **Inflorescence:** spikelets 5–14 mm; flower bracts 1.2–5.7 mm. **Flower:** perianth bristles 4–10 mm, barbs short, sparse. Wet meadows, streambanks, seepage slopes, generally on acidic substrates; 1250–3600 m. SNH. July–Aug

***C. criniger*** (A. Gray) C.N. Gilmour, J.R. Starr, & Naczi

**NATIVE**

Plant 2–10 dm. **Leaf:** 4–45 cm, 1–6 mm wide. **Inflorescence:** spikelets 5–15 mm; flower bracts 0.7–5.2 mm. **Flower:** perianth bristles 4.5–9 mm, barbs long, dense. Wet meadows, streambanks, seepage slopes; generally on serpentine; 200–2250 m. NW, CaR; southwest Oregon. [*Eriophorum criniger*, orth. var.; *Eriophorum crinigerum* (A. Gray) Beetle] Jun–Aug

**ERIOPHORUM COTTON GRASS**

**Peter W. Ball**

Perennial herb, erect. **Stem:** cylindric, solid. **Leaf:** basal and cauline; ligule present; blade ± scabrous on keel or angles.

**Inflorescence:** 1, terminal, ± umbel-like [head-like or spikelet 1]; inflorescence bracts 1–several, leaf- or scale-like; spikelets several [1]; flower bracts spiraled, > 10, ovate, membranous, glabrous, tip entire. **Flower:** bisexual; perianth bristles 10–25, >> fruit, generally > flower bracts, >> flower bracts in fruit, ± straight, barbs 0; stamens 3; style 3-branched. **Fruit:** 3-sided, ± flat. ± 25 species: northern temperate. (Greek: wool-bearing) *Eriophorum crinigerum* moved to *Calliscirpus* (Gilmour et al. 2013); see note under family.

**E. gracile** Roth SLENDER COTTONGRASS

**NATIVE**

Plant 30–60 cm; rhizomes long. **Stem:** smooth. **Leaf:** 2–30 cm, 1–2 mm wide, blade distally 3-sided, smooth. **Inflorescence:** spikelets (1)2–5, 7–11 mm; flower bracts 3–4 mm. **Flower:** perianth bristles 10–20 mm, ± straight, ± white, barbs 0.  $2n=30,38$ . Wet meadows, bogs; generally 600–2900 m. CaR, n&c SNH, SnFrB (extirpated); circumboreal. May–Jul {CNPS list}

**POACEAE (Gramineae) GRASS FAMILY**  
**James P. Smith, Jr., except as noted**

Annual to woody perennial herb; roots generally fibrous. **Stem:** generally round, hollow; nodes swollen, solid. **Leaf:** alternate, 2-ranked, generally linear, parallel-veined; sheath generally open; ligule membranous or hairy, at blade base. **Inflorescence:** various (of generally many spikelets). **Spikelet:** glumes generally 2; florets (lemma, palea, flower) 1–many; lemma generally membranous, sometimes glume-like; palea generally  $\pm$  transparent,  $\pm$  enclosed by lemma. **Flower:** generally bisexual, minute; perianth vestigial; stamens generally 3; stigmas generally 2, generally plumose. **Fruit:** grain, sometimes achene- or utricle-like.

650–900 genera;  $\pm$  10550 species: worldwide; greatest economic importance of any family (wheat, rice, maize, millet, sorghum, sugar cane, forage crops, ornamental, weeds; thatching, weaving, building materials). [Barkworth et al. 2003 FNANM:25; Barkworth et al. 2007 FNANM:24] Generally wind-pollinated. *Achnatherum*, *Ampelodesmos*, *Hesperostipa*, *Nassella*, *Piptatherum*, *Piptochaetium*, *Ptilagrostis* moved to *Stipa*; *Elytrigia*, *Leymus*, *Pascopyrum*, *Pseudoroegneria*, *Taeniatherum* to *Elymus*; *Hierochloa* to *Anthoxanthum*; *Lolium*, *Vulpia* to *Festuca*; *Lycurus* to *Muhlenbergia*; *Monanthochloa* to *Distichlis*; *Pleuraphis* to *Hilaria*; *Rhynchelytrum* to *Melinis*. The following taxa (in genera not included here), recorded in California from historical collections or reported in literature, are extirpated, lacking vouchers, or not considered naturalized: *Acrachne racemosa* (Roth) Ohwi, *Allolepis texana* (Vasey) Soderstr. & H.F. Decker, *Amphibromus nervosus* (Hook. f.) Baill., *Axonopus affinis* Chase, *Axonopus fissifolius* (Raddi) Kuhl., *Coix lacryma-jobi* L., *Cutandia memphitica* (Spreng.) K. Richt., *Dinebra retroflexa* (Vahl) Panz., *Eremochloa ciliaris* (L.) Merr., *Eustachys distichophylla* (Lag.) Nees, *Gaudinia fragilis* (L.) P. Beauv., *Miscanthus sinensis* Andersson, *Neyraudia arundinacea* (L.) Henrard, *Phyllostachys aurea* Rivière & C. Rivière, *Phyllostachys bambusoides* Siebold & Zuccarini, *Rottboellia cochinchinensis* (Lour.) Clayton, *Schedonnardus paniculatus* (Nutt.) Branner & Coville, *Schizachyrium cirratum* (Hack.) Wootton & Standl., *Schizachyrium scoparium* (Michx.) Nash, *Themeda quadrivalvis* (L.) Kuntze, *Thysanolaena latifolia* (Hornem.) Honda, *Tribolium obliterum* (Hemsl.) Renvoize, *Zea mays* L., *Zizania palustris* L. var. *interior* (Fassett) Dore, *Zoysia japonica* Steud. *Paspalum pubiflorum* E. Fourn., *Paspalum quadrifarium* Lam., are now reported for southern California (J Bot Res Inst Texas 4:761–770). See Glossary p. 30 for illustrations of general family characteristics. —Scientific Editors: James P. Smith, Jr., J. Travis Columbus, Dieter H. Wilken.

**AGROSTIS BENT GRASS**  
**Paul M. Peterson & Michael J. Harvey**

Annual or perennial herb, generally tufted, occasionally from rhizomes or stolons. **Stem:** generally erect. **Leaf:** sheath generally smooth, glabrous; ligule membranous; blade flat to rolled. **Inflorescence:** panicle-like, densely cylindrical to openly ovate. **Spikelet:** glumes generally subequal, back generally glabrous, vein generally finely scabrous, 1-veined, generally acute; floret 1, < glumes, generally breaking above glumes; callus glabrous to densely hairy; lemma generally 5-veined, veins not converging, occasionally extended as short teeth, awned from back or not; palea generally 0 or  $\ll$  lemma, translucent; anthers generally 3.  $\pm$  220 species: especially temperate America, Eurasia. (Greek: pasture) [Peterson et al. 2011 J Bot Res Inst Texas 5:421–426] Some cultivated in pastures, lawns. *Agropogon lutosus* (Poir.) P. Fourn. is a sterile hybrid between *Agrostis stolonifera* and *Polypogon monspeliensis*. *Agrostis viridis* is treated as *Polypogon viridis*. *Agrostis nebulosa* Boiss. & Reut. is reported for California (FNANM 24: 661), but no specimens have been located. Generic delimitation adopted here reflects editorial preference. *Agrostis lacuna-vernalis* newly described, added as native.

1. Rhizomes or stolons well developed, clearly present; perennial herb
  2. Plant from stolons
    3. Ligule 0.5–2 mm, generally wider than long; stolons < 5 cm; inflorescence widely ovate in outline, 1°  
 branches mostly spreading, spikelets not crowded ..... *A. capillaris* (3)
    - 3' Ligule 2–5 mm, longer than wide; stolons 5–100 cm; inflorescence elliptic to lanceolate in outline, 1°  
 branches generally all ascending, spikelets overlapping, crowded ..... *A. stolonifera*
  - 2' Plant from rhizomes
    4. Floret callus hairs 1.5–2 mm, generally > 1/2 lemma; ligule 4–7 mm ..... *A. hallii* (3)
    - 4' Floret callus hairs generally minute, sparse, or 0; ligule generally < 3 mm (except *Agrostis gigantea*)
    5. Palea 0 or minute,  $\ll$  lemma
      6. Proximal leaf blade 1–6 mm wide; lemma tip minutely toothed; rhizome < 10 cm; anthers 0.7–1.8 mm ..... *A. pallens* (3)
      - 6' Proximal leaf blade < 1 mm wide; lemma tip  $\pm$  acute; rhizome < 5 cm; anthers 0.5–0.7 mm ..... *A. variabilis* (3)
    - 5' Palea well developed,  $\pm$  1/2 to slightly < lemma

7. Inflorescence ± oblong in outline, ± open, branches generally ascending to erect; montane to alpine, 1300–3500 m ..... *A. humilis* (2)
- 7' Inflorescence generally ovate in outline, open, most branches spreading; open, generally disturbed places, < 2000 m
8. Rhizomes < 5 cm, slender, not clearly scaly; ligule generally wider than long; inflorescence branches with spikelets on distal 1/2 ..... *A. capillaris* (3)
- 8' Rhizomes < 25 cm, ± thick, ± scaly; ligule longer than wide; inflorescence branches with spikelets ± throughout ..... *A. gigantea* (2)
- 1' Rhizomes or stolons 0; annual or perennial herb
9. Lemma awned from back or near tip
10. Inflorescence open, generally oblong to ovate in outline; spikelets not crowded, inflorescence axes clearly visible
11. Inflorescence generally oblong to lanceolate in outline, 1° branches generally ascending
12. Lemma awned below middle; anthers 1–1.5 mm; proximal leaf sheaths finely tomentose ..... *A. hooveri*
- 12' Lemma awned at or above middle; anthers ≤ 0.8 mm; proximal leaf sheaths generally glabrous
13. Proximal inflorescence branches 1–2 cm; awn < 3.5 mm, straight to bent; palea < 1/3 lemma; anthers 0.3–0.6 mm ..... *A. exarata* (3)
- 13' Proximal inflorescence branches 2–6 cm; lemma awn < 2 mm, straight; palea 1/5–1/4 lemma; anthers 0.6–0.8 mm ..... *A. oregonensis* (2)
- 11' Inflorescence generally ovate in outline, proximal-most 1° branches spreading, distal branches generally ascending
14. Lemma back puberulent below middle; floret axis prolonged beyond floret ± 1 mm, short-hairy-tufted; palea > 1 mm ..... *A. avenacea*
- 14' Lemma back glabrous or fine-scabrous; floret axis not prolonged beyond lemma; palea 0 or minute
15. Lemma generally awned near tip, awn 3–10 mm, wavy; callus hairs < 0.6 mm, dense; anther 1, persistent in fruit; annual ..... *A. elliotiana*
- 15' Lemma awned below middle, awn < 2 mm, ± straight; callus hairs << lemma, sparse; anthers 3, deciduous; perennial herb ..... *A. scabra* (2)
- 10' Inflorescence dense, generally cylindrical; spikelets crowded, overlapping, inflorescence axes not clearly visible
16. 1° inflorescence branches generally > 0.5 cm, often evident at base (except *Agrostis blasdalei*)
17. Leaf blade generally < 1 mm wide, ± inrolled; floret callus glabrous; inflorescence base often partly enclosed by sheath of distal-most leaf; anthers 1–2 mm ..... *A. blasdalei* (2)
- 17' Leaf blade generally 2–10 mm wide, flat; floret callus minutely hairy; inflorescence base not partly enclosed by sheath of distal-most leaf; anthers ± 0.5 mm
18. Back of glume fine-scabrous throughout; palea 0.5–0.7 mm; ligule 1.5–2 mm ..... *A. densiflora* (3)
- 18' Back of glume ± glabrous (keel fine-scabrous); palea ± 0.3 mm; ligule 2.5–4 mm ..... *A. exarata* (3)
- 16' 1° inflorescence branches generally < 0.5 cm (< 1.5 cm in *Agrostis microphylla*), obscured by densely clustered spikelets
19. Lemma teeth 4, two < 1 mm, other two 1–1.5 mm; lemma awned below middle; callus densely short-hairy ..... *A. tandilensis*
- 19' Lemma teeth 0 or 2, equal; lemma awned at or above middle; callus generally sparsely hairy, hairs minute
20. Lemma awned above middle, awn < 3.5 mm, straight; glume tips acute; perennial herb ..... *A. densiflora* (3)
- 20' Lemma awned ± at middle, awn 3.5–10 mm, generally bent; glume tips narrowly acuminate to awn-like; annual
21. Lemma 2–4 mm, awn 8–10 mm ..... *A. hendersonii*
- 21' Lemma 1.5–2 mm, awn 3.5–8 mm ..... *A. microphylla*
- 9' Lemma awnless (occasionally short-awned near tip in *Agrostis capillaris*, from near middle in *Agrostis pallens*)
22. Spikelets crowded and often overlapping on same branch, spikelet stalks and 2° axes not clearly visible
23. Palea 1/3–2/3 lemma
24. Lf blade 2–10 mm wide; lemma 1.5–2 mm; floret callus minutely hairy; coastal bluffs ..... *A. densiflora* (3)
- 24' Lf blade 0.3–1.5 mm wide; lemma 1.1–1.5 mm; floret callus glabrous; vernal pools ..... *A. lacuna-vernalis*

- 23' Palea 0 or < 1/3 lemma
25. Leaf blade generally < 1 mm wide, generally inrolled or folded
26. Anthers 1–2 mm; inflorescence branches generally < 0.5 cm; coastal habitats < 100 m ..... *A. blasdalei* (2)
- 26' Anthers 0.5–0.7 mm; inflorescence branches 0.5–1.5 cm; inland mtns, 1600–4000 m ..... *A. variabilis* (3)
- 25' Leaf blade generally 2–7 mm wide, generally flat
27. Floret callus hairs 1.5–2 mm, generally slightly > 1/2 lemma ..... *A. hallii* (3)
- 27' Floret callus hairs 0 or < 0.5 mm, < 1/2 lemma
28. Proximal inflorescence branches 1–2 cm; anthers 0.3–0.6 mm ..... *A. exarata* (3)
- 28' Proximal inflorescence branches 2–5 cm; anthers 0.7–1.8 mm ..... *A. pallens* (3)
- 22' Spikelets not crowded, generally well spaced on same branch, axes generally clearly visible
29. 1° inflorescence axes branched 1–2 × above middle, spikelets 0 on proximal 1/2
30. Proximal leaf blades 2–4 mm wide; glumes 2–3 mm; palea 1/5–1/4 lemma; anthers 0.6–0.8 mm ..... *A. oregonensis* (2)
- 30' Proximal leaf blades 0.5–3 mm wide; glumes 1.5–3 mm; palea 0 or minute, << lemma; anthers <= 0.7 mm
31. Leaves basal and cauline; inflorescence ± 2 × longer than wide; 1° axes ± stiff ..... *A. idahoensis*
- 31' Leaves mostly basal; inflorescence ± long as wide; 1° axes flexible, proximal ± arched ..... *A. scabra* (2)
- 29' 1° inflorescence axes branched 1–2 × from base upwards, spikelets distributed throughout
32. Floret callus hairs 1.5–2 mm, generally slightly > 1/2 lemma; anthers >= 1.5 mm ..... *A. hallii* (3)
- 32' Floret callus glabrous or hairs minute, << lemma; anthers generally < 1.5 mm (except some *Agrostis pallens*)
33. Palea 0 or minute, << lemma
34. Leaf blade 1–6 mm wide; plants generally 10–70 cm; anthers 0.7–1.8 mm ..... *A. pallens* (3)
- 34' Leaf blade generally < 1 mm wide; plants 4–30 cm; anthers 0.5–0.7 mm ..... *A. variabilis* (3)
- 33' Palea >= 1/2 lemma
35. Inflorescence branches ascending to erect; anthers < 1 mm; moist to ± dry areas, generally > 1500 m ..... *A. humilis* (2)
- 35' Inflorescence branches spreading to ascending; anthers 0.8–1.5 mm; disturbed areas, generally < 1500 m
36. Ligule 0.5–2 mm, generally wider than long; inflorescence branches with spikelets on distal 1/2 ..... *A. capillaris* (3)
- 36' Ligule 2–6 mm, longer than wide; inflorescence branches with spikelets ± throughout ..... *A. gigantea* (2)

**A. avenacea** J.F. Gmel. PACIFIC BENT GRASS**NATURALIZED**

Perennial herb 15–65 cm. **Leaf:** ligule 3–5 mm; proximal blades 8–20 cm, 1–3 mm wide, generally flat, finely scabrous.

**Inflorescence:** 7–30 cm, widely ovate, open; distal 1° branches generally ascending, proximal 1° branches spreading, 5–15 cm, axes branched above middle, thread-like. **Spikelet:** glumes 2.5–3.6 mm, back puberulent below middle; floret axis prolonged beyond floret ± 1 mm, tip hairy-tufted, hairs ± 0.6 mm; callus hairs < 0.7 mm; lemma 1.3–2(2.3) mm, back puberulent below middle, tip 2-toothed, awned from middle, awn 4–7.5 mm, bent; palea > 1 mm, ± 1/2 lemma; anther ± 0.5 mm.  $2n=56$ . Open, often disturbed places; < 300 m. s NCo, s NCoR, SNF, GV, CW, n SCo; to Texas, Ohio, South Carolina; native to southern Pacific islands. [*Agrostis filiformis* G. Forst.; *Lachnagrostis filiformis* (G. Forst.) Trin.] Jun–Jul {Weed listed by Cal-IPCI}

**A. blasdalei** Hitchc. BLASDALE'S BENT GRASS**NATIVE**

Perennial herb 6–30 cm, decumbent to erect. **Leaf:** ligule generally 1–1.5 mm; proximal blades 2–5 cm, generally < 1 mm wide, ± inrolled. **Inflorescence:** 2–8 cm, cylindric, dense; base often partly enclosed by sheath of distal-most leaf; 1° branches ascending to appressed, proximal generally < 0.5 cm. **Spikelet:** glumes 1.8–4 mm; callus glabrous; lemma 1.5–3 mm, occasionally awned above middle, awn < 0.7 mm, straight; palea ± 0.3 mm, < 1/3 lemma; anthers 1–2 mm.  $2n=42$ . Dunes, gravelly soils, coastal bluffs, scrub; < 100 m. s NCo, n CCo, n SnFrB. May intergrade locally with *Agrostis densiflora*; needs study. May–Jul {CNPS list}

**A. capillaris** L. COLONIAL BENT  
NATURALIZED

Perennial herb 10–75 cm; stolons or rhizomes < 5 cm, slender. **Leaf:** ligule 0.5–2 mm, generally wider than long; proximal blades 3–10 cm, 1–5 mm wide, generally flat. **Inflorescence:** 3–20 cm, widely ovate in outline, open; 1° most branches spreading, proximal 1.5–4 cm, axes thread-like. **Spikelet:** glumes 2–3 mm; callus glabrous or minutely hairy; lemma 1.5–2.5 mm, occasionally short-awned near tip; palea 1/2–2/3 lemma; anthers 0.8–1.3 mm.  $2n=28$ . Roadsides, open, disturbed places; < 1900 m. KR, CaR, n&c SN, CCo, SnFrB, SCo; to Alaska, western United States, Canada; native to Europe. Jul–Sep

**A. densiflora** Vasey CALIFORNIA BENT GRASS  
NATIVE

Perennial herb 9–85 cm. **Leaf:** ligule 1.5–2 mm; proximal blades 2–12 cm, 2–10 mm wide, flat. **Inflorescence:** 2–10 cm, ± cylindric, dense; 1° branches ± appressed, < 1.5 cm. **Spikelet:** glumes 2–3 mm, back finely scabrous, tip acute; callus minutely hairy; lemma 1.5–2 mm, occasionally awned above middle, awn < 3.5 mm, straight; palea 0.5–0.7 mm, ± 1/3 lemma; anthers ± 0.5 mm.  $2n=42$ . Coastal bluffs, sandy soils; < 200 m. NCo, CCo, w SnFrB; to Oregon. May–Aug

**A. eliottiana** Schult. SIERRA BENT GRASS  
NATIVE

Annual 5–45 cm. **Leaf:** ligule 2–3 mm; proximal blades 0.5–4 cm, < 1 mm wide, flat to inrolled. **Inflorescence:** 5–20 cm, generally widely ovate in outline, open; proximal 1° branches 1–4.5 cm, spreading, distal ascending, axes thread-like with spikelets clustered near tip. **Spikelet:** floret axis not prolonged beyond lemma; glumes 1.5–2 mm; callus hairs < 0.6 mm, dense; lemma 1–2 mm, back glabrous or fine-scabrous, generally awned from near tip, awn 3–10 mm, wavy; palea 0; anther 1, persistent in fruit.  $2n=14$ . Vernal pool margins; < 500 m. NCoRI, CaRF, n SNF, n ScV; to New Mexico, Kansas, Texas, eastern United States, Mexico. Apr–May

**A. exarata** Trin. SPIKE BENT GRASS  
NATIVE

Perennial herb 8–100 cm. **Leaf:** proximal sheaths generally glabrous, ligule 2.5–4 mm; proximal blades 4–15 cm, 2–7 mm wide, flat. **Inflorescence:** 5–30 cm, oblong to ± ovate in outline, ± open to dense, occasionally interrupted near base; 1° branches 1–2 cm, ascending to ± appressed. **Spikelet:** glumes 1.5–3.5 mm, acute to narrowly acuminate, back ± glabrous, keel fine-scabrous; callus hairs < 0.5 mm; lemma 1–2 mm, awned at or above middle, awn < 3.5 mm, straight to bent; palea ± 0.3 mm, < 1/3 lemma; anthers 0.3–0.6 mm.  $2n=28,42,56$ . Common. Moist or disturbed areas, open woodland, conifer forest; < 2000 m. CA-FP, GB, DMtns (Panamint Range); to Alaska, western United States, Mexico. Jun–Aug

**A. gigantea** Roth REDTOP  
NATURALIZED

Perennial herb 20–100 cm; rhizomes < 25 cm, ± scaly. **Leaf:** ligule 2–6 mm, longer than wide; proximal blades 4–10 cm, 3–8 mm wide, flat. **Inflorescence:** 8–25 cm, widely ovate in outline, open; 1° branches generally spreading, proximal 4–7 cm, axes thread-like. **Spikelet:** glumes 2–3 mm; callus hairs 0 or minute; lemma 1.5–2 mm, awn 0 (short-awned); palea 0.7–1.4 mm; anthers 1–1.4 mm.  $2n=42$ . Roadsides, disturbed areas; < 2000 m. CA-FP; to eastern United States; native to Europe. Difficult to separate from *Agrostis stolonifera*. Jun–Sep

**A. hallii** Vasey HALL'S BENT GRASS  
NATIVE

Perennial herb 17–100 cm; rhizomes < 50 cm. **Leaf:** ligule 4–7 mm; proximal blades 7–20 cm, 2–5 mm wide, flat. **Inflorescence:** 7–22 cm, lanceolate to narrowly ovate in outline, ± open to dense; 1° branches ascending to ± appressed, proximal 1–5 cm. **Spikelet:** glumes 2.5–4 mm; callus hairs 1.5–2 mm; lemma 2–3 mm, awn 0; palea minute, << lemma; anthers 1.5–2.3 mm.  $2n=42$ . Open oak woodland, conifer forest; < 1800 m. w NW, CCo, SnFrB, n SCo, WTR; Oregon. May–Jul

**A. hendersonii** Hitchc. HENDERSON'S BENT GRASS**NATIVE**

Annual 6–70 cm. **Leaf:** ligule 1–4 mm; proximal blades 1–4 cm, ± 1 mm wide, flat to weakly inrolled. **Inflorescence:** 1–5 cm, cylindric, dense; 1° branches < 0.5 cm, ascending to ± appressed. **Spikelet:** glumes 5–7 mm, tip narrowly acuminate to awn-like; callus hairs ± 0.7 mm; lemma 2–4 mm, awned ± at middle, awn 8–10 mm, ± bent; palea 0; anthers ± 0.5 mm.  $2n=42$ . Vernal pools; < 300 m. CaRF, n SNF, ScV, n SnJV; Oregon. May–Jul {CNPS list}

**A. hooveri** Swallen HOOVER'S BENT GRASS**NATIVE**

Perennial herb 30–80 cm. **Leaf:** proximal leaf sheaths finely tomentose; ligule 4–6 mm; proximal blades 10–16 cm, 1–2 mm wide, flat, becoming inrolled. **Inflorescence:** (4)10–17 cm, generally lanceolate in outline, open; 1° branches ± ascending, 15–40 cm, axes thread-like. **Spikelet:** glumes 2–3 mm; callus hairs < 0.3 mm, dense; lemma 1.5–2 mm, awned below middle, awn < 2.5 mm, bent; palea 0; anthers 1–1.5 mm. Dry sandy soils, open chaparral, oak woodland; < 600 m. s CCo, s SCoRO (San Luis Obispo, Santa Barbara cos.). Apr–Aug {CNPS list}

**A. humilis** Vasey MOUNTAIN BENT GRASS**NATIVE**

Perennial herb, cespitose, occasionally rhizomatous; 5–50 cm, erect to ascending. **Leaf:** mostly basal; ligule 0.5–2 mm; proximal blades 2–15 cm, 1–4 mm wide, flat to ± folded. **Inflorescence:** 1.5–14 cm, narrowly oblong to ovate, ± open; 1° branches generally ascending to erect, proximal 0.5–7 cm. **Spikelet:** green to purple, glumes 1.5–2.3 mm; callus hairs minute, sparse; lemma = glumes, awn 0, 5-veined; palea 1–1.5 mm; anthers 0.5–0.7 mm. Moist to dry, subalpine or alpine meadows, slopes; 1500–3350 m. KR, NCoRH, CaRH, c&s SNH; to Alaska, Montana, Colorado, New Mexico. [*Agrostis thurberiana* Hitchc.; *Podagrostis humilis* (Vasey) Björkman; *Podagrostis thurberiana* (Hitchc.) Hultén] Jul–Aug {CNPS list}

**A. idahoensis** Nash IDAHO REDTOP**NATIVE**

Perennial herb 8–30 cm. **Leaf:** basal and cauline; ligule 1–3 mm; proximal blades 1–5 cm, 0.5–2 mm wide, flat, often inrolled with age. **Inflorescence:** 3–13 cm, lanceolate to ovate in outline, ± open; 1° branches generally ascending, axes ± stiff, proximal 1–4 cm, axes thread-like. **Spikelet:** glumes 1.5–2.5 mm; callus glabrous or hairs < 0.3 mm; lemma 1–2 mm, awn 0; palea minute, << lemma; anthers 0.3–0.5 mm. Open, wet meadows, conifer forest; < 3500 m. NW, CaR, SN, n SnFrB, SnBr, SnJt, W&I; to British Columbia, western United States. Jul–Aug

**A. lacuna-vernalis** P.M. Peterson & Soreng VERNAL POOL BENT GRASS**NATIVE**

Annual 1.5–30 cm. **Leaf:** ligule 1.2–1.7 mm; proximal blades 1.4–11 cm, 0.3–1.5 mm wide, flat, folded or loosely inrolled. **Inflorescence:** 1–7.5 cm, ± cylindric, dense; 1° branches appressed, 0.6–1.4 cm. **Spikelet:** glumes 1.5–2.4 mm, smooth, scabrous above, tip acute; callus glabrous; lemma 1.1–1.5 mm, glabrous, smooth, awnless; palea 0.7–1.1 mm, 1/3–2/3 lemma; anthers 0.4–0.7 mm. Vernal pools; < 200 m. c CCo (Ft. Ord, Monterey Co.); Apr–May {CNPS list}

**A. microphylla** Steud. SMALL-LEAF BENT GRASS**NATIVE**

Annual 8–45 cm. **Leaf:** ligule 1.5–4 mm; proximal blades 3–15 cm, 0.7–2.5 mm wide, fine-scabrous, flat, becoming inrolled. **Inflorescence:** 2–12 cm, ± cylindric, dense; 1° branches ascending to ± appressed, proximal 0.3–1.5 cm. **Spikelet:** glumes 2.5–5 mm, tips narrowly acuminate to awn-like; callus hairs < 0.5 mm; lemma 1.5–2 mm, awned from middle, awn 3.5–8 mm, slightly bent; palea 0; anther ± 0.5 mm. Thin, rocky soils, cliffs, vernal pools, occasionally on serpentine; < 200 m. NCo, s NCoR, GV, CCo, SCo; to British Columbia, Baja California. May–Jul

**A. oregonensis** Vasey OREGON REDTOP**NATIVE**

Perennial herb 12–75 cm. **Leaf:** ligule 2–4.5 mm; proximal blades 10–30 cm, 2–4 mm wide, generally flat. **Inflorescence:** 8–35 cm, lanceolate to ovate in outline, open; 1° branches ascending, proximal 2–6 cm, axes thread-like. **Spikelet:** glumes 2–3 mm; callus hairs 0 or minute, sparse; lemma 1.5–2.5 mm, occasionally awned above middle, awn < 2 mm, straight; palea 1/5–1/4 lemma; anthers 0.6–0.8 mm. Moist areas, meadows, streambanks; < 2400 m. KR, NCoR, CaR, SN, SnBr, SnJt; to British Columbia, Montana, Wyoming. Jun–Jul

**A. pallens** Trin. DUNE BENT GRASS**NATIVE**

Perennial herb generally 10–70 cm, occasionally from rhizomes < 10 cm. **Leaf:** ligule 1.5–3 mm; proximal blades 1.5–5 cm, 1–6 mm wide, flat to inrolled. **Inflorescence:** 5–20 cm, lanceolate to narrowly ovate in outline, ± open; 1° branches generally ascending, proximal 2–5 cm. **Spikelet:** glumes 2–3 mm; callus hairs minute; lemma 1.5–2.5 mm, occasionally awned from near middle, awn 0.5–2.5 mm, ± straight; palea 0 or minute, << lemma; anthers 0.7–1.8 mm.  $2n=42,56$ . Common. Open meadows, woodland, forest, subalpine; 200–3500 m. CA-FP, GB; to British Columbia, Montana, Mexico. [*Agrostis diegoensis* Vasey; *Agrostis lepida* Hitchc.] Geographic and ecological variation need study. Jun–Aug

**A. scabra** Willd. ROUGH BENT GRASS**NATIVE**

Perennial herb 20–75 cm. **Stem:** ascending to erect. **Leaf:** mostly basal; ligule 2–5 mm; proximal blades 4–14 cm, 1–3 mm wide, flat, finely scabrous. **Inflorescence:** 8–25 cm, ovate in outline, open; 1° distal branches ascending, proximal branches spreading, 4–11 cm, ± arched, axes thread-like, branched 1–2 × above middle, often breaking at base in fruit. **Spikelet:** floret axis not prolonged beyond lemma; glumes 1.5–3 mm; callus hairs minute, sparse; lemma 1.5–2 mm, back glabrous or fine-scabrous; occasionally awned from below middle, awn < 2 mm, ± straight; palea 0 or minute, << lemma; anthers 3, 0.4–0.7 mm, deciduous.  $2n=42$ . Open roadsides, meadows, conifer forest; 100–3500 m. KR, NCoR, SN, TR, SnJt, SNE; to Alaska, Canada, eastern United States. [*Agrostis scabra* var. *geminata* (Trin.) Swallen] Jul–Sep

**A. stolonifera** L. CREEPING BENT**NATURALIZED**

Perennial herb 8–60 cm, decumbent to erect, often mat-like; stolons 5–100 cm. **Leaf:** ligule 2–5 mm, longer than wide; proximal blades 2–10 cm, 2–5 mm wide, flat. **Inflorescence:** 3–15 cm, elliptic to lanceolate in outline, ± dense; 1° branches ascending to ± erect, proximal generally 2–6 cm. **Spikelet:** glumes 1.5–3 mm; callus hairs minute, sparse; lemma 1.5–2 mm, awn 0; palea slightly < lemma; anthers 1–1.5 mm.  $2n=28$ . Ditches, lake margins, marshes; < 1000 m. NW, CaR, n SN, CW, SW (except ChI), W&I, DMtns; to southern Canada, eastern United States; native to Europe. [*Agrostis alba* L. var. *alba*, in part, misappl.; *Agrostis alba* L. var. *palustris* (Huds.) Pers.] Difficult to separate from *Agrostis gigantea*. Jun–Sep {Weed listed by Cal-IPCI}

**A. tandilensis** (Kuntze) Parodi KENNEDY'S BENT GRASS**NATURALIZED**

Annual 9–21 cm. **Leaf:** ligule 2–2.5 mm; proximal blades 2–5 cm, < 1 mm wide, flat, inrolled with age. **Inflorescence:** 2–5 cm, cylindric, dense; 1° branches erect to appressed, generally < 0.5 cm. **Spikelet:** glumes 3–3.5 mm; callus densely short-hairy; lemma ± 1.5 mm, back densely puberulent below middle, awned below middle, awns < 6 mm, bent, lemma tip 4-toothed, 2 teeth < 1 mm, other teeth 1–1.5 mm; palea 0; anther 1, < 0.2 mm. Vernal pools; < 100 m. Deltaic GV (Solano Co.), s SCo (San Diego Co.), expected elsewhere; native to Argentina. [*Agrostis kennedyana* Beetle; *Bromidium tandilense* (Kuntze) Rúgolo] Apr–May

**A. variabilis** Rydb. MOUNTAIN BENT GRASS**NATIVE**

Perennial herb 4–30 cm, occasionally from rhizomes < 5 cm. **Leaf:** mostly basal; ligule 1–2.5 mm; proximal blades 3–7 cm, < 1 mm wide, flat, becoming folded. **Inflorescence:** 2.5–6 cm, ± cylindric, generally ± dense; 1° branches ascending to erect, proximal 0.5–1.5 cm. **Spikelet:** glumes 2–2.5 mm; callus hairs minute; lemma 1.5–2 mm, awn generally 0; palea 0; anthers 0.5–0.7 mm. Meadows, subalpine forest, talus, alpine; 1600–4000 m. KR, NCoRH, CaRH, SNH, Wrn; to British Columbia, western Canada, Colorado, New Mexico. Jul–Aug