

sepals ascending to spreading, lateral pair not saccate basally; petals white, yellow, pink, or purple [orange], claw usually present, sometimes absent, distinct; filaments unappendaged, not winged; pollen 3-colpate. **Fruits** silicles, usually dehiscent, unsegmented, usually angustiseptate, rarely terete; ovules 2(–4) per ovary; style distinct, obsolete, or absent; stigma entire or, rarely, 2-lobed. **Seeds** aseriate; cotyledons accumbent or incumbent.

Genera 4, species ca. 235 (1 genus, 42 species in the flora): nearly worldwide.

68. LEPIDIUM Linnaeus, Sp. Pl. 2: 643. 1753; Gen. Pl. ed. 5, 291. 1754 • Peppergrass, pepperwort, cress, peppercress [Greek *lepidion* or *lepidos*, scale, alluding to appearance of fruit]

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Carara Medikus; *Cardaria* Desvaux; *Coronopus* Zinn; *Neolepia* W. A. Weber; *Physolepidion* Schrenk; *Senebiera* de Candolle; *Sprengeria* Greene; *Stroganowia* Karelin & Kirilow

Plants not scapose; glabrous, pubescent, hirsute, or pilose. **Stems** usually erect or ascending, sometimes procumbent, decumbent, or prostrate, unbranched or branched. **Leaves** usually basal and cauline (basal absent in *L. fremontii*); petiolate or sessile; basal rosulate or not, petiolate (or petiole undifferentiated from blade), blade margins entire, dentate, denticulate, serrate, crenate, or lobed; cauline petiolate or sessile, blade (base auriculate or not), margins entire, dentate, or pinnately divided. **Racemes** (usually corymbose), elongated or not in fruit. **Fruiting pedicels** erect to divaricate, slender or stout. **Flowers:** sepals (usually deciduous, sometimes persistent), usually ovate or oblong, rarely suborbicular; petals (erect or spreading, sometimes rudimentary or absent), obovate, spatulate, oblong, oblanceolate, orbicular, linear, or filiform, claw absent or differentiated from blade, (apex obtuse, rounded, or emarginate); stamens 2 or 4 and equal in length, lateral or median, or 6 and tetradynamous; filaments not dilated basally; anthers ovate or oblong; (ovary placentation apical); nectar glands (4 or 6), distinct, median glands often present. **Fruits** schizocarps or silicles, (rarely indehiscent), sessile, didymous, oblong, ovate, obovate, cordate, obcordate, elliptic, orbicular, ovoid, obovoid, or globose, strongly angustiseptate or inflated and terete; valves each with prominent veins or not veined, (keeled or rounded, apex winged or not, thin or strongly thickened and ornamented, enclosing or readily releasing seed), glabrous or pubescent; replum rounded, (visible); septum complete or perforated; style absent, obsolete, or distinct, (included or exerted from apical notch); stigma capitate, usually entire, rarely 2-lobed. **Seeds** oblong or ovate [obovate], plump or flattened, winged, margined, or not winged; seed coat (smooth, minutely reticulate, or papillate), usually copiously mucilaginous when wetted, rarely not; cotyledons usually incumbent (accumbent in *L. virginicum*) [diplecolobal].

Species ca. 220 (42 in the flora): North America, Mexico, Central America, South America, Europe, Asia, n, s Africa, Australia.

The limits of *Lepidium* were expanded by I. A. Al-Shehbaz et al. (2002) to include *Cardaria*, *Coronopus*, and *Stroganowia*. Molecular data (J. L. Bowman et al. 1999; K. Mummenhoff et al. 2001) provide overwhelming support for this circumscription. A. Thellung (1906) was the first to take such a position, but subsequent authors largely ignored his work. Indeed, three Linnaean species, originally described as *L. chalepense*, *L. didymum*, and *L. draba*, were the

core of the genera *Cardaria* and *Coronopus*. Both are nested within *Lepidium*, and *Coronopus* was clearly shown to be polyphyletic (C. D. Bailey et al. 2007). All three taxa differ from *Lepidium* by trivial fruit characters; the interested reader should consult Al-Shehbaz et al. for discussions.

Lepidium species are reasonably well-defined worldwide, and taxonomists often find no problems in telling them apart. The infraspecific taxonomy, especially some of the North American species, is in a state of disarray. The main reason is dependence on characters of questionable value to establish most varieties. For example, glabrous and pubescent forms were almost always recognized as distinct varieties despite the fact that they occur within the same population. The painstaking work of R. C. Rollins (1958) on *Dithyrea* clearly demonstrated that the presence versus absence of trichomes can result from a minor genetic difference. Rollins (1993) and others (e.g., N. H. Holmgren 2005b) were influenced by the excellent work of C. L. Hitchcock (1936, 1945, 1950), who then had no idea about the genetic basis of such differences. A similar situation exists in *Draba*, where tens of varieties were established based on glabrous versus pubescent fruits. In this account, we do not recognize such varieties, and the interested reader is referred to the discussion under 35. *L. ramosissimum*.

Due to their release of copious mucilage upon wetting, the seeds of most species of *Lepidium* can be transported easily by animals, especially migratory birds, for long distances. This most likely accounts for the transcontinental dispersals in the genus discussed by K. Mummenhoff et al. (2001).

Lepidium africanum (Burman f.) de Candolle, *L. bonariense* Linnaeus, *L. graminifolium* Linnaeus, and *L. schinzii* Thellung have been recorded from North America as ballast introductions (I. A. Al-Shehbaz 1986b; R. C. Rollins 1993). Apparently, they never became naturalized in the flora area and, therefore, are not included in this account. For a recent report of *L. bonariense*, see the discussion under 28. *L. oblongum*.

SELECTED REFERENCES Al-Shehbaz, I. A., K. Mummenhoff, and O. Appel. 2002. *Cardaria*, *Coronopus*, and *Stroganowia* are united with *Lepidium* (Brassicaceae). *Novon* 12: 5–11. Bowman, J. L., H. Brüggemann, J.-Y. Lee, and K. Mummenhoff. 1999. Evolutionary changes in floral structure within *Lepidium* L. (Brassicaceae). *Int. J. Pl. Sci.* 160: 917–929. Hitchcock, C. L. 1936. The genus *Lepidium* in the United States. *Madroño* 3: 265–300. Mulligan, G. A. 1961. The genus *Lepidium* in Canada. *Madroño* 16: 77–89. Mulligan, G. A. and C. Frankton. 1962. Taxonomy of the genus *Cardaria* with particular reference to the species introduced into North America. *Canad. J. Bot.* 40: 1411–1425. Mummenhoff, K., H. Brüggemann, and J. L. Bowman. 2001. Chloroplast DNA phylogeny and biogeography of *Lepidium* (Brassicaceae). *Amer. J. Bot.* 88: 2051–2063. Muschler, R. 1908. Die Gattung *Coronopus* (L.) Gaertn. *Bot. Jahrb. Syst.* 41: 111–147. Thellung, A. 1906. Die Gattung *Lepidium* (L.) R. Br. *Mitt. Bot. Mus. Univ. Zürich* 28: 1–340.

1. Cauline leaves (at least some) sessile, blade bases auriculate, sagittate, or amplexicaul.
 2. Plants glabrous or sparsely pubescent proximally; uppermost cauline leaf blades: bases cordate-amplexicaul; basal leaf blades: margins 2- or 3-pinnatifid or pinnatisect; petals yellow 33. *Lepidium perfoliatum*
 2. Plants usually puberulent or hirsute proximally, rarely glabrate; uppermost cauline leaf blades: bases auriculate or sagittate; basal leaf blades: margins usually entire, subentire, dentate, denticulate, lyrate, or sinuate, rarely 1- or 2-pinnatifid; petals (when present) white.
 3. Stamens 2; petals absent or rudimentary; basal leaf blades: margins 1- or 2-pinnatifid; styles usually obsolete (rarely to 0.1 mm) 28. *Lepidium oblongum* (in part)
 3. Stamens 6; petals present (distinct); basal leaf blades: margins usually entire, subentire, dentate, denticulate, lyrate, or sinuate, rarely pinnatifid; styles distinct (0.2 mm or longer).
 4. Plants not rhizomatous; fruits dehiscent, apically broadly winged, notch present; racemes much-elongated in fruit.
 5. Annuals; fruit valves papillate; styles 0.2–0.5(–0.7) mm, included or only slightly exserted beyond apical notch of fruits 6. *Lepidium campestre*
 5. Perennials (with caudex); fruit valves often not papillate; styles (0.6–)1–1.5 mm, well-exserted beyond apical notch of fruits 18. *Lepidium heterophyllum*

4. Plants rhizomatous; fruits indehiscent, apically not winged, notch absent; racemes not much-elongated (corymbose panicles) in fruit.
6. Fruits flattened, cordate to subreniform, valves reticulate-veined. 14. *Lepidium draba*
6. Fruits inflated, globose, subglobose, obovoid, or obcompressed globose, valves not reticulate-veined.
7. Fruits usually globose, rarely subglobose, (2-)3-4.4(-5) mm wide, valves puberulent; styles 0.5-1.5 mm 3. *Lepidium appelianum*
7. Fruits obovoid to subglobose, or obcompressed globose, (3.5-)4-6.2(-7) mm wide, valves glabrous; styles (0.8-)1.2-2(-2.3) mm 7. *Lepidium chalepense*
1. Cauline leaves usually petiolate, blade bases (when sessile) not auriculate, sagittate, or amplexicaul (absent in *L. nanum*).
8. Valves rugose or rugose-verrucose.
9. Fruits reniform to ovate-cordate, 2.3-3.4 mm, apical notches absent, ridged; stamens 6 8. *Lepidium coronopus*
9. Fruits didymous, 1.3-1.7 mm, apical notches present, not ridged; stamens 2 13. *Lepidium didymum*
8. Valves usually smooth (rarely minutely papillate in *L. jaredii*).
10. Subshrubs or perennials (caudex woody, sometimes with persistent petiolar remains).
11. Styles included in apical notch of fruits; stamens 2; petals absent or rudimentary 32. *Lepidium paysonii*
11. Styles usually exerted beyond apical notch of fruits, rarely subequaling notch, or notch absent; stamens 6 (or 2 or 4 in *L. integrifolium*); petals well-developed.
12. Basal and proximalmost cauline leaf blade margins pinnately lobed.
13. Plants glabrous throughout; basal leaves absent; fruits 4.2-7(-8) mm wide 17. *Lepidium fremontii*
13. Plants puberulent (at least on fruiting pedicels or rachises); basal leaves present; fruits (1.5-)1.8-3.6(-4) mm wide.
14. Fruits broadly obovate; fruiting pedicels puberulent throughout 19. *Lepidium huberi*
14. Fruits ovate to suborbicular or oblong; fruiting pedicels puberulent adaxially, rarely glabrous.
15. Fruits usually ovate to suborbicular, rarely oblong; basal leaf blades: margins 1- or 2-pinnatifid to -pinnatisect; cauline leaf blades: margins often pinnately lobed. 25. *Lepidium montanum* (in part)
15. Fruits broadly ovate; basal leaf blades: margins pinnately lobed; cauline leaf blades: margins usually entire, rarely dentate.
16. Perennials or subshrubs; stems (0.7-)1-4.8(-6.1) dm; middle cauline leaf blades (0.7-)1-2(-3) mm wide. 2. *Lepidium alyssoides*
16. Perennials; stems (3.5-)4.5-16(-18) dm; middle cauline leaf blades (2.5-)4-10 mm wide. 15. *Lepidium eastwoodiae* (in part)
12. Basal and proximalmost cauline leaf blade margins usually entire, crenate, or dentate, rarely palmately 3-5-lobed (at apex).
17. Plants pulvinate or cespitose; basal leaf blades: margins usually subapically or apically 3-5-toothed or -lobed, rarely entire (*L. barnebyanum*); fruiting pedicels puberulent throughout.
18. Basal leaves rosulate; cauline leaves absent; anthers 1.4-2 mm 26. *Lepidium nanum*
18. Basal leaves not rosulate; cauline leaves present; anthers 0.3-0.8 mm.
19. Basal leaf blades: margins entire; petals 3.2-4.6 mm; fruits 4-5.5(-6.2) mm 5. *Lepidium barnebyanum*
19. Basal leaf blades: margins subapically 3-5-lobed or toothed, rarely entire (*L. davisii*); petals 2-3.5 (-4) mm; fruits 2.5-4(-5) mm.

20. Plants cespitose; fruits suborbicular to broadly ovate; styles 0.5–1 mm; seeds (1.8–)2–2.3 mm 10. *Lepidium davisii*
20. Plants pulvinate; fruits ovate; styles 0.3–0.6 mm; seeds 1.2–1.5 mm 29. *Lepidium ostleri*
17. Plants not pulvinate, not cespitose; basal leaf blades: margins entire or uniformly dentate; fruiting pedicels usually puberulent adaxially, rarely glabrous.
21. Fruits obovate to somewhat rhomboid, 7–11 mm; fruiting pedicels glabrous; seeds 3.7–4.5 mm 41. *Lepidium tiehmii*
21. Fruits oblong-elliptic, ovate, oblong, or suborbicular, 1.6–4(–4.4) mm; fruiting pedicels usually pubescent or puberulent, sometimes glabrous (less than 6 mm); seeds 0.8–2 mm.
22. Plants rhizomatous; fruits (1.6–)1.8–2.4(–2.7) mm, apically not winged, notch usually absent; styles 0.05–0.15 mm 23. *Lepidium latifolium*
22. Plants not rhizomatous; fruits (2.5–)3–4(–4.4) mm, apically winged, notch present; styles 0.2–1 mm.
23. Perennials or subshrubs (woody base aboveground); stamens 6; racemes slightly elongated (subcorymbose panicles) in fruit 9. *Lepidium crenatum*
23. Perennials (woody base not aboveground); stamens usually 4, rarely 2 or 6; racemes elongated (not corymbose) in fruit 20. *Lepidium integrifolium*
- [10. Shifted to left margin.—Ed.]
10. Annuals or biennials (without woody caudex, without persistent petiolar remains).
24. Stamens 2.
25. Fruit valves distinctly reticulate-veined; sepals persistent 39. *Lepidium strictum*
25. Fruit valves usually not veined (rarely weakly veined); sepals deciduous or, rarely, tardily so.
26. Fruits 1.7–2.1 × 1.2–1.6 mm; plants puberulent with clavate trichomes 38. *Lepidium sordidum*
26. Fruits 1.8–7 × 1.5–5(–5.6) mm; plants puberulent, hirsute, or hispid with cylindrical trichomes.
27. Fruiting pedicels often strongly flattened, 0.2–0.7 mm wide; fruit valves hirsute to hispid (sometimes only on margins) 22. *Lepidium lasiocarpum*
27. Fruiting pedicels terete or only slightly flattened, 0.1–0.3(–4) mm wide; fruit valves glabrous or puberulent (at least on margins).
28. Fruits elliptic.
29. Basal leaf blades pinnatifid; racemes slightly elongated in fruit, rachises with curved trichomes; fruiting pedicels usually puberulent adaxially, rarely throughout 35. *Lepidium ramosissimum*
29. Basal leaf blades (1- or 2- or 3-pinnatisect; racemes considerably elongated in fruit, rachises with straight trichomes; fruiting pedicels puberulent throughout 36. *Lepidium ruderales*
28. Fruits obovate, suborbicular, or orbicular.
30. Plants hirsute; basal leaf blade margins pinnatifid.
31. Stems often simple from base; rachises pubescent, trichomes curved with fewer, longer, straight ones 4. *Lepidium austrinum*
31. Stems often several from base; rachises hirsute, trichomes mostly straight 28. *Lepidium oblongum* (in part)
30. Plants puberulent or glabrous; basal leaf blade margins dentate, serrate, lyrate, or pinnatifid.

32. Fruits obovate to obovate-suborbicular, widest beyond middle; rachises with straight, slender to subclavate trichomes; petals absent or rudimentary, 0.3–0.9 mm; cotyledons incumbent. 11. *Lepidium densiflorum*
32. Fruits orbicular, widest at middle; rachises usually with curved, cylindrical trichomes, rarely glabrous; petals usually present, rarely rudimentary, 1–2(–2.5) mm; cotyledons usually accumbent, rarely incumbent 42. *Lepidium virginicum*
- [24. Shifted to left margin.—Ed.]
24. Stamens 4 or 6.
33. Stamens 4; styles usually obsolete, rarely to 0.1 mm, usually included in, or equaling, apical notch of fruits.
34. Fruiting pedicels terete or slightly flattened, 0.1–0.3 mm wide.
35. Fruits 2.4–3.6 mm, apically winged, apical notches 0.3–0.8 mm deep; stamens all median; petals absent 30. *Lepidium oxycarpium*
35. Fruits 1.8–2 mm, apically not winged, apical notches 0.05–0.1 mm deep; stamens 2 median, 2 lateral; petals present (rudimentary, 0.4–0.6 mm) 34. *Lepidium pinnatifidum*
34. Fruiting pedicels strongly flattened, 0.4–1.4 mm wide.
36. Sepals somewhat persistent; fruit valves hirsute (trichomes spreading, mixed with smaller ones); petals usually pubescent on outside, rarely glabrescent, with fringed margin; racemes compact, subcapitate to cylindrical in fruit 24. *Lepidium latipes*
36. Sepals deciduous; fruit valves glabrous or (sparsely, uniformly) puberulent, pubescent, or hirsute (sometimes only on margin); petals usually absent, when present, glabrous, without fringed margin; racemes lax or somewhat dense, not compact in fruit.
37. Petals usually present, rarely rudimentary or absent; fruit valves slightly veined or not; fruiting pedicels not appressed to rachises 27. *Lepidium nitidum*
37. Petals absent; fruit valves strongly reticulate-veined; fruiting pedicels appressed to rachises or distally recurved.
38. Fruits (3–)4–6 × 2.5–3.5 mm, apical notches (0.8–)1–2 mm deep, V-shaped; fruiting pedicels (2–)3–4.2 mm 1. *Lepidium acutidens*
38. Fruits 2.5–3.5 × 2–2.8 mm, apical notches 0.5–0.7(–0.8) mm deep (closed), often U-shaped; fruiting pedicels (1.6–)1.9–2.5(–3) mm 12. *Lepidium dictyotum*
33. Stamens 6; styles (0.1–)0.2–1.6 mm, usually exerted beyond, rarely subequaling or included in, apical notch of fruits.
39. Fruiting pedicels suberect to ascending, subappressed to rachises; fruits (4–)5–6.4(–7) mm; styles usually included in, rarely subequaling, apical notch of fruits; cotyledons 3-lobed 37. *Lepidium sativum*
39. Fruiting pedicels divaricate-ascending to horizontal or descending, not appressed to rachises; fruits 2–3.8(–4.2) mm; styles exerted from apical notch of fruits; cotyledons entire.
40. Petals usually yellow (rarely creamy white at early anthesis, or fading whitish).
41. Fruiting pedicels (2.7–)3–4.4(–5) mm, glabrous adaxially; racemes dense, slightly elongated (corymbose to subcapitate) in fruit, rachises glabrous adaxially; fruits divergently winged apically, apical notches 0.2–0.6 mm deep 16. *Lepidium flavum*
41. Fruiting pedicels 5–15 mm, pilose adaxially; racemes lax, much-elongated in fruit, rachises usually pilose, rarely glabrous; fruits not winged apically, apical notches 0(–0.1) mm deep 21. *Lepidium jaredii*
40. Petals white.
42. Filaments puberulent 31. *Lepidium papilliferum*
42. Filaments glabrous.

[43. Shifted to left margin.—Ed.]

43. Annuals; rachises pilose, trichomes straight 40. *Lepidium thurberi*
 43. Annuals or biennials; rachises puberulent, trichomes straight or curved.
 44. Petals suborbicular, 1.5–2.5 mm wide; cauline leaf blades lanceolate or oblanceolate to linear; stems (3.5–)4.5–16(–18) dm, often simple from base 15. *Lepidium eastwoodiae* (in part)
 44. Petals spatulate to oblanceolate, 1.3–1.8 mm wide; cauline leaf blades often pinnatifid to pinnatisect, sometimes linear; stems 0.4–5(–7) dm, simple or few to several from base 25. *Lepidium montanum* (in part)

1. *Lepidium acutidens* (A. Gray) Howell, Fl. N.W. Amer., 64. 1897 [F]



Lepidium dictyotum A. Gray var. *acutidens* A. Gray, Proc. Amer. Acad. Arts 12: 54. 1877;
L. oxycarpum Torrey & A. Gray var. *acutidens* (A. Gray) Jepson

Annuals; hirsute or puberulent. **Stems** few to several from base, erect to ascending, unbranched, (0.5–)0.8–3 dm. **Basal leaves**

(soon withered); not rosulate; petiole 1–4 cm; blade linear or pinnatisect, (2–)2.5–6.1(–7.2) cm × (0.5–)1–2(–3) mm, (lobes linear to narrowly oblong), margins entire. **Cauline leaves** sessile; blade linear, 1.2–5.8 cm × 0.5–2(–3) mm, base attenuate, not auriculate, margins entire. **Racemes** elongated, (dense or lax) in fruit; rachis puberulent or hirsute, trichomes straight, cylindrical. **Fruiting pedicels** erect to slightly ascending, straight and appressed to rachis or distally slightly recurved, (strongly flattened), (2–)3–4.2 × 0.4–0.6 mm (width proximal to apex), puberulent throughout. **Flowers**: sepals oblong to ovate, 0.7–1.1 × 0.2–0.6 mm; petals absent; stamens 4, median; filaments 0.5–1 mm; anthers ca. 0.1 mm. **Fruits** ovate to ovate-oblong, (3–)4–6 × 2.5–3.5 mm, apically winged, apical notch (V-shaped), (0.8–)1–2 mm deep; valves thin, smooth, strongly reticulate-veined, usually glabrous, rarely pubescent; style absent or obsolete, included in apical notch. **Seeds** ovate, 1.3–2 × 0.8–1.2 mm.

Flowering Feb–Apr. Alkaline flats, gullies, or fields, saline vernal flats, grassy fields; 0–400 m; Calif., Oreg.; Mexico (Baja California).

Lepidium acutidens was treated by C. L. Hitchcock (1936) and R. C. Rollins (1993) as a variety of *L. dictyotum*. The differences in the fruits as well as the absence of intermediates between them, despite the overlap of their ranges in California, justify their recognition as independent species.

2. *Lepidium alyssoides* A. Gray, Mem. Amer. Acad. Arts, n. s. 4: 10. 1849 [F]



Lepidium alyssoides var. *angustifolium* (C. L. Hitchcock) Rollins; *L. alyssoides* var. *junceum* Rollins; *L. alyssoides* var. *minus* Thellung; *L. alyssoides* var. *polycarpum* Thellung; *L. alyssoides* var. *streptocarpum* Thellung; *L. montanum* Nuttall subsp. *alyssoides* (A. Gray)

C. L. Hitchcock; *L. montanum* var. *alyssoides* (A. Gray)

M. E. Jones; *L. montanum* subsp. *angustifolium*

(C. L. Hitchcock) C. L. Hitchcock; *L. montanum* var.

angustifolium C. L. Hitchcock; *L. tortum* L. O. Williams

Perennials or subshrubs; (woody base often aboveground); glabrous or minutely puberulent. **Stems** few to several from base, erect to ascending, branched throughout, (0.7–)1–4.8(–6.1) dm. **Basal leaves** often not rosulate; petiole 1–6 cm; blade pinnately lobed, (1–)1.5–8(–11) cm × (5–)10–35 mm, margins (of lobes) entire or denticulate. **Cauline leaves** sessile; blade linear, (0.8–)1.3–7(–9.5) cm × (0.7–)1–2(–3) mm, base attenuate, not auriculate, margins entire. **Racemes** elongated in fruit; rachis puberulent or glabrous. **Fruiting pedicels** divaricate to horizontal, straight or recurved to somewhat sigmoid, (terete), 3.5–8(–11) × 0.2 mm, glabrous or puberulent adaxially. **Flowers**: sepals ovate to oblong, 1–2 × 0.8–1 mm; petals white, suborbicular, 2–3 × 1–2 mm, claw 0.5–1.5 mm; stamens 6; filaments 1.5–2 mm, (glabrous); anthers 0.2–0.4 mm. **Fruits** broadly ovate, 2–3.7(–4.3) × (1.5–)1.8–2.9(–3.4) mm, apically winged, apical notch 0.1–0.3(–0.4) mm deep; valves thin, smooth, not veined, glabrous; style 0.2–0.6 mm, exserted beyond apical notch. **Seeds** ovate, 1.5–1.8(–2) × 0.9–1.2(–1.5) mm. **2n** = 32.

Flowering May–Jul. Pinyon-juniper or sagebrush communities, prairies, grasslands, sandstone outcrops, gypsum flats, sand dunes, dry flats and river bottoms, gravelly roadsides; 1200–2800 m; Ariz., Colo., Nev., N.Mex., Tex., Utah, Wyo.; Mexico (Chihuahua, Coahuila, Nuevo León, San Luis Potosí).

Of the five varieties of *Lepidium alyssoides* recognized by R. C. Rollins (1993), one (var. *mexicanum* Rollins) is a short-tufted form of the species restricted to Mexico that does not seem to merit recognition, another

(var. *junceum*) is a glabrescent form of the type variety, a third (var. *eastwoodiae*) is treated below as a distinct species, and the fourth (var. *angustifolium*) is included here within *L. alyssoides*.

3. *Lepidium appelianum* Al-Shehbaz, Novon 12: 7.
2002 [F] [I] [W]



Hymenophysa pubescens C. A. Meyer in C. F. Ledebour, Icon. Pl. 2: 20. 1830, not *Lepidium pubescens* Desvieux 1814; *Cardaria pubescens* (C. A. Meyer) Jarmolenko; *C. pubescens* var. *elongata* Rollins

Perennials; (rhizomatous); often densely hirsute. **Stems** simple or several from base, erect or ascending, branched distally, (1)–1.5–3.5(–5) dm. **Basal leaves** (often withered by anthesis); not rosulate; petiole 0.5–1.5 cm; blade obovate to oblanceolate, (1)–2–6(–7) cm × 3–20 mm, margins dentate to sinuate. **Cauline leaves** sessile; blade oblong or lanceolate, 1–5(–8) cm × (3)–5–15(–30) mm, base sagittate, margins dentate or subentire, (surfaces pubescent). **Racemes** (usually corymbose, rarely paniculate), rarely elongated in fruit; rachis pubescent, trichomes often curved. **Fruiting pedicels** divaricate to ascending, straight or slightly curved, (terete), 3–9(–12) × 0.2–0.3 mm, pubescent. **Flowers**: sepals oblong, 1.4–2 × 0.7–1 mm; petals white, broadly obovate, (2.2)–2.8–4 × 1–3 mm, claw 1–1.4 mm; stamens 6; filaments 2–2.5 mm, (glabrous); anthers 0.4–0.5 mm. **Fruits** (indehiscent), globose or, rarely, subglobose, (2)–3–4.4(–5) mm diam., (inflated), apically not winged, apical notch absent; valves thin, smooth, not veined, densely puberulent; style 0.5–1.5 mm. **Seeds** (brown or dark brown), ovoid, 1.5–2 × 1–1.5 mm. $2n = 16$.

Flowering May–Sep. Roadsides, sagebrush communities, alkaline meadows, waste grounds, ditch and stream sides, fields, pastures; 400–2400 m; introduced; Alta., B.C., Man., Sask.; Calif., Colo., Idaho, Mich., Mo., Mont., Nebr., Nev., N.Mex., N.Dak., Oreg., Pa., Utah, Wash., Wis., Wyo.; c Asia; introduced also in South America, other parts of Asia.

Lepidium appelianum has become a noxious weed in most of its range in North America.

4. *Lepidium austrinum* Small, Fl. S.E. U.S., 468, 1331.
1903 [F] [W]



Lepidium austrinum var. *orbiculare* Thellung; *L. lasiocarpum* var. *orbiculare* (Thellung) C. L. Hitchcock

Annuals or biennials; often densely hirsute, (trichomes cylindrical). **Stems** often simple from base, erect, branched distally, (1.5)–2–6.7(–9.4) dm.

Basal leaves (later withered); rosulate; petiole (0.7)–1.5–4.5 cm; blade pinnatifid, 2–8.3 cm × 9–26 mm, margins (of lobes) entire or dentate. **Cauline leaves** shortly petiolate; blade oblanceolate to nearly linear, 1–4.5(–6.2) cm × 3–10(–17) mm, base attenuate to cuneate, not auriculate, margins entire or dentate. **Racemes** much-elongated in fruit; rachis pubescent, trichomes curved, with fewer and longer, straight ones. **Fruiting pedicels** usually divaricate, rarely horizontal, straight or slightly recurved, (terete), (2.5)–3–4.1(–4.7) × 0.2 mm, puberulent adaxially. **Flowers**: sepals oblong, 0.8–1 × 0.2–0.4 mm; petals (sometimes absent), white, oblanceolate, 0.4–1.6 × 0.1–0.8 mm, claw absent; stamens 2, median; filaments 0.8–1 mm; anthers 0.1–0.2 mm. **Fruits** elliptic-obovate to obovate-orbicular, 2.4–3.2 × 1.8–2.5 mm, apically winged, apical notch 0.2–0.5 mm deep; valves thin, smooth, not veined, sparsely puberulent, (trichomes often antrorsely appressed, sometimes restricted to margin); style 0.05–0.1 mm, included in apical notch. **Seeds** ovate, 1.4–1.6 × 0.7–0.9 mm.

Flowering Mar–Jun. Disturbed grounds, railroad tracks and embankments, fields, knolls, stream banks, waste areas, open banks, roadsides, sandy terraces; Kans., La., Miss., N.Mex., Okla., Tex.; Mexico (Coahuila, Nuevo León, San Luis Potosí).

5. *Lepidium barnebyanum* Reveal, Great Basin
Naturalist 27: 178. 1967 [C] [E] [F]



Lepidium montanum Nuttall subsp. *demissum* C. L. Hitchcock, Madroño 10: 157. 1950, not *L. demissum* C. L. Hitchcock 1945

Perennials; (cespitose, caudex thick, woody, numerous-branched, with persistent petiolar remains); puberulent. **Stems** simple or few from base (caudex), erect to ascending, unbranched or branched distally, (0.3)–0.5–1.5(–1.7) dm. **Basal leaves** not rosulate; petiole 0.3–0.8 cm, (papery); blade linear, (0.5)–1–7(–8)

cm × 10–36 mm, margins entire. **Cauline leaves** sessile; blade linear, base attenuate, not auriculate, margins entire, (similar to basal, smaller distally). **Racemes** slightly elongated in fruit; rachis puberulent, trichomes straight. **Fruiting pedicels** divaricate-ascending, straight, (terete), 3–8 × 0.3–0.4 mm, puberulent throughout. **Flowers:** sepals (sometimes somewhat persistent), oblong-obovate, 1.8–2.8 × 1.3–1.8 mm; petals white to pale yellow, suborbicular to broadly obovate, 3.2–4.6 × 2.5–3.2 mm, claw 0.5–1.5 mm; stamens 6; filaments 1.8–2.6 mm, (glabrous); anthers 0.5–0.8 mm. **Fruits** ovate, 4–5.5(–6.2) × 3–3.8 mm, apically winged, apical notch 0–0.2 mm deep; valves thin, smooth, not veined, glabrous; style 0.5–1.2 mm, exserted beyond apical notch. **Seeds** ovate, 2.2–2.8 × 1.4–1.6 mm.

Flowering May–Jun. Pinyon-juniper and sagebrush communities, white sandy shale; of conservation concern; 1800–2000 m; Utah.

Lepidium barnebyanum is known from the Green River and Uinta Shale Formations in Duchesne County. It is in the Center for Plant Conservation's National Collection of Endangered Plants.

6. *Lepidium campestre* (Linnaeus) W. T. Aiton in W. Aiton and W. T. Aiton, Hortus Kew. 4: 88. 1812

[F] [I] [W]



Thlaspi campestre Linnaeus, Sp. Pl. 2: 646. 1753; *Neolepia campestris* (Linnaeus) W. A. Weber

Annuals; densely hirsute. **Stems** simple from base, erect, unbranched or branched distally, (0.8–)1.2–5(–6.3) dm. **Basal leaves** rosulate; petiole (0.5–)1.5–6 cm; blade oblanceolate or

oblong, (1–)2–6(–8) cm × 5–15 mm, margins entire, lyrate, or pinnatifid. **Cauline leaves** sessile; oblong, lanceolate, or narrowly deltate-lanceolate, (0.7–)1–4(–6.5) cm × (2–)5–10(–15) mm, base sagittate or auriculate, margins dentate or subentire. **Racemes** much-elongated in fruit; rachis hirsute, trichomes spreading, straight. **Fruiting pedicels** horizontal, straight or slightly recurved, (terete), (3–)4–8(–10) × 0.3–0.4 mm, hirsute. **Flowers:** sepals oblong, (1–)1.3–1.8 × 0.6–0.8 mm; petals white, spatulate, (1.5–)1.8–2.5(–3) × (0.2–)0.5–0.7 mm, claw 0.6–1 mm; stamens 6; filaments (1.2–)1.5–1.8(–2) mm, (glabrous); anthers 0.3–0.5 mm. **Fruits** broadly oblong to ovate, (4–)5–6(–6.5) × (3–)4–5 mm, (curved adaxially), apically broadly winged, apical notch (0.2–)0.4–0.6 mm deep; valves thin, papillate except for wing, not veined; style 0.2–0.5(–0.7) mm, slightly exserted beyond, or included in, apical notch. **Seeds** (dark brown), ovoid, 2–2.3(–2.8) × 1–1.4 mm. $2n = 16$.

Flowering May–Jun. Roadside, pastures, gardens, open flats, pine woodlands, rocky slopes, forests, waste

grounds, disturbed areas, meadows, fields; 0–2600 m; introduced; B.C., Nfld. and Labr. (Nfld.), N.S., Ont., P.E.I., Que., Sask.; Ala., Ark., Calif., Colo., Conn., Del., D.C., Fla., Ga., Idaho, Ill., Ind., Iowa, Kans., Ky., La., Maine, Md., Mass., Mich., Miss., Mo., Mont., Nebr., Nev., N.H., N.J., N.Mex., N.Y., N.C., Ohio, Oreg., Pa., R.I., S.C., Tenn., Utah, Vt., Va., Wash., W.Va., Wis., Wyo.; Europe; Asia; introduced also in South America, South Africa.

7. *Lepidium chalepense* Linnaeus, Cent. Pl. II, 23. 1756

[F] [I]

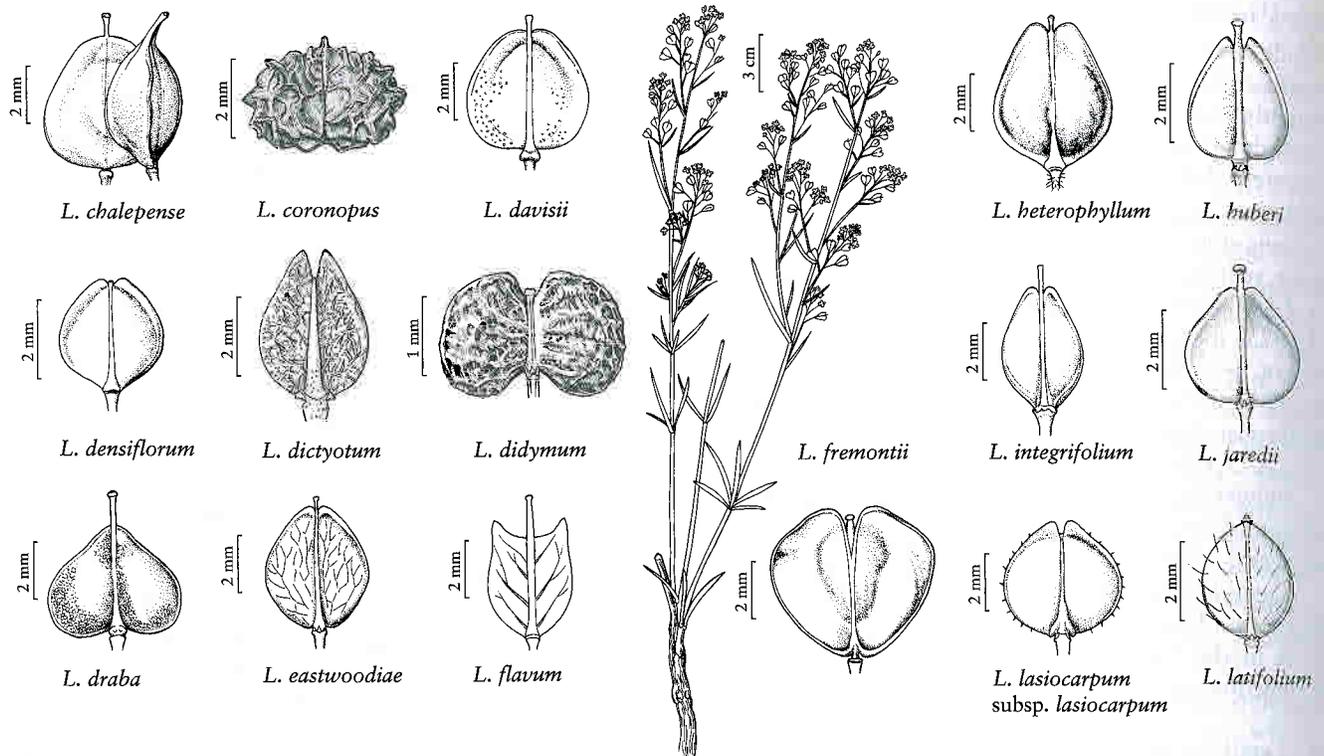


Cardaria chalepensis (Linnaeus) Handel-Mazzetti; *C. draba* (Linnaeus) Desvaux subsp. *chalepensis* (Linnaeus) O. E. Schulz; *C. draba* var. *repens* (Schrenk) O. E. Schulz; *C. repens* (Schrenk) Jarmolenko; *Cochlearia draba* (Linnaeus) Linnaeus; *Lepidium draba* Linnaeus subsp.

chalepense (Linnaeus) Thellung; *L. draba* var. *repens* (Schrenk) Thellung; *L. repens* (Schrenk) Boissier; *Physolepidion repens* Schrenk

Perennials; (rhizomatous); densely hirsute to glabrate or glabrous. **Stems** several from base, erect or decumbent basally, branched (several) distally, (0.8–)2.1–6.6(–9.2) dm. **Basal leaves** (early withered); not rosulate; petiole 0.9–4.4 cm; blade obovate, spatulate, or ovate, (1.8–)2.5–8.6(–14) cm × 10–37 mm, margins subentire or dentate. **Cauline leaves** sessile; blade obovate to oblong or lanceolate to oblanceolate, (1.5–)2.6–9.3(–13.2) cm × (7–)12–31(–45) mm, base sagittate-amplexicaul or auriculate, margins dentate or entire, (surfaces pubescent or glabrous). **Racemes** (corymbose panicles), elongated in fruit; rachis glabrous or puberulent, trichomes cylindrical, straight or curved. **Fruiting pedicels** ascending to horizontal, straight, (terete), 5–16(–19) × 0.2–0.3 mm, glabrous or sparsely puberulent adaxially. **Flowers:** sepals oblong to ovate, 1.7–3 × 1–1.6 mm; petals white, obovate, 3–5 × 1.2–2.4 mm, claw 1.2–2 mm; stamens 6; filaments 2–3.3 mm, (glabrous); anthers 0.5–0.6 mm. **Fruits** (indehiscent), obovoid to subglobose or obcompressed globose, 3.5–5.8(–7) × (3.5–)4–6.2(–7) mm, apically not winged, apical notch absent; valves thin, smooth, often not veined, glabrous; style (0.8–)1.2–2(–2.3) mm. **Seeds** (dark reddish brown), ovate, 1.5–2.3 × 1–1.3 mm. $2n = 48, 80, 128$.

Flowering May–Jun. Mountain slopes, roadsides, fields, agricultural lands, stream banks, pastures, waste areas; 300–4200 m; introduced; Alta., B.C., Man., Ont., Sask.; Ariz., Calif., Colo., Idaho, Ill., Iowa, Kans., Mont., Nebr., Nev., N.Mex., N.Dak., Oreg., S.Dak., Tex., Utah, Wash., Wyo.; Asia; introduced also in South America (Argentina), Europe.



LEPIDIUM

From the synonymy above, it is evident that the disposition of *Lepidium chalepense* has varied: more than one species (e.g., R. C. Rollins 1940; G. A. Mulligan and C. Frankton 1962), one species (e.g., Rollins 1993), a variety of *Lepidium* (*Cardaria*) *draba* (N. H. Holmgren 2005b), or a synonym of the latter species (C. L. Hitchcock 1936). In our opinion, the differences in fruit morphology and chromosome number justify its recognition as a distinct species.

8. *Lepidium coronopus* (Linnaeus) Al-Shehbaz, Novon
14: 156. 2004 [F] [I]



Cochlearia coronopus Linnaeus, Sp. Pl. 2: 648. 1753; *Carara coronopus* (Linnaeus) Medikus; *Coronopus procumbens* Gilbert; *C. ruellii* Allioni; *C. squamatus* (Forsskål) Ascherson; *C. verrucarius* (Garsault) Muschler & Thellung; *Lepidium squamatum* Forsskål; *Senebiera coronopus* (Linnaeus) Poiret

Annuals; glabrous or puberulent. **Stems** often several from base, usually procumbent to decumbent, rarely

ascending, branched distally, (0.3–)0.6–2.5(–3.5) dm. **Basal leaves** rosulate; petiole (1–)2–5(–5.8) cm; blade 1- or 2-pinnatisect, (3–)4–10(–15) cm, margins (of lobes) entire or dentate. **Cauline leaves** shortly petiolate; blade pinnatisect, base cuneate, not auriculate, margins (of lobes) entire or dentate, (similar to basal, smaller and less divided distally). **Racemes** (leaf-opposed), ± slightly elongated in fruit; rachis glabrous. **Fruiting pedicels** ascending, straight, (stout, terete), (0.7–)1–2(–2.4) × 0.4–0.5 mm, glabrous. **Flowers**: sepals (persistent), oblong, 1–1.5 × 0.5–0.6 mm; petals white, obovate to obovate-oblong, 1–2 × 0.4–0.6 mm, claw absent; stamens 6; filaments (median pairs) 0.7–1 mm, (glabrous); anthers 0.15–0.25 mm. **Fruits** (indehiscent), reniform to ovate-cordate, 2.3–3.4 × 3–4.4 mm, apically not winged, apical notch absent; valves thick, rugose-verrucose, with distinct ridges, prominently veined, glabrous; style 0.2–0.7 mm. **Seeds** ovate-oblong, (curved, not winged), 1.2–1.6 × 0.7–1 mm. $2n = 32$.

Flowering May–Aug. Waste grounds, abandoned fields, pastures, roadsides, disturbed sites; introduced; N.B., N.S., Ont., Que.; Ala., Calif., La., Mo., N.J., Tenn.; Europe; sw Asia; n Africa; introduced also in South America (Chile), s Africa, Australia.

9. *Lepidium crenatum* (Greene) Rydberg, Bull. Torrey Bot. Club 33: 141. 1906 [C] [E]



Thelypodium crenatum Greene, Pittonia 4: 20. 1899; *Lepidium montanum* Nuttall subsp. *spatulatum* (B. L. Robinson) C. L. Hitchcock; *L. montanum* var. *spatulatum* (B. L. Robinson) C. L. Hitchcock; *L. scopulorum* M. E. Jones var. *spatulatum* B. L. Robinson; *L. vaseyanum* Thellung

Perennials or subshrubs; (woody base aboveground); puberulent. **Stems** simple from base, erect, branched distally, (2-)3-8(-11) dm. **Basal leaves** rosulate (on sterile shoots); petiole (1.5-)2.5-8(-10) cm; blade oblanceolate to spatulate, (2-)3-7(-9) cm × 5-23(-32) mm, margins crenate to serrate-crenate. **Cauline leaves** shortly petiolate or sessile; blade oblong to oblanceolate, 1-3.5 cm × 4-15 mm, base cuneate, not auriculate, margins entire. **Racemes** (subcorymbose panicles), slightly elongated in fruit; rachis puberulent, trichomes straight. **Fruiting pedicels** divaricate-ascending to horizontal, straight, (terete), 3-6(-8) × 0.2-0.25 mm, puberulent adaxially. **Flowers:** sepals oblong to ovate, (1-)1.3-1.8 (-2) × 0.9-1.2 mm; petals white, suborbicular to broadly obovate, (1.8-)2-3 × 1.3-2 mm, claw 0.5-1 mm; stamens 6; filaments 1.4-1.6 mm, (glabrous); anthers 0.5-0.7 mm. **Fruits** broadly ovate, (2.5-)3-3.5(-4) × (2-)2.3-2.8 mm, apically winged, apical notch 0.1-0.2 mm deep; valves thin, smooth, not veined, glabrous; style 0.2-0.6 mm, exerted beyond apical notch. **Seeds** ovate, 1.5-2 × 1-1.3 mm.

Flowering Jun-Aug. Pinyon-juniper and brush communities; clay bluff of sandstone mesa, arroyo banks; of conservation concern; 1800-2000 m; Colo., N.Mex.

Lepidium crenatum is known from Delta, Moffatt, Montezuma, and Montrose counties in Colorado. It was reported from Utah by C. L. Hitchcock (1936) and R. C. Rollins (1993), but we have not seen any material to confirm its occurrence there.

10. *Lepidium davisii* Rollins, Madroño 9: 164. 1948 [E] [F]



Lepidium montanum Nuttall subsp. *davisii* (Rollins) C. L. Hitchcock

Perennials; (cespitose, caudex woody, many-branched, with persistent petiolar remains); puberulent. **Stems** simple from base, erect, unbranched or branched (few) distally, (0.2-)0.5-1(-1.4) dm. **Basal leaves** (often deciduous); not rosulate; blade spatulate to oblanceolate, 1-2.5(-3.2) cm

× 2-6(-9) mm, margins entire or apically 3(-5)-toothed or -lobed. **Cauline leaves** sessile; blade usually oblanceolate or oblong, rarely obovate, (0.8-)1.3-2.5 cm × (2-)4-7 mm, base obtuse or cuneate, not auriculate, margins entire or apically 3(-5)-toothed. **Racemes** slightly elongated in fruit; rachis puberulent, trichomes straight or curved. **Fruiting pedicels** divaricate-ascending, straight, (slender or slightly stout, terete), (2.5-)3-4.2(-5) × 0.4-0.5 mm, usually puberulent throughout, rarely glabrate. **Flowers:** sepals suborbicular to oblong-ovate, 1.2-2 × 1-1.5 mm; petals white, obovate, 2-3.2(-4) × 1.5-2 mm, claw 0.5-1 mm; stamens 6; filaments 1.7-2.3 mm, (glabrous); anthers 0.4-0.7 mm. **Fruits** suborbicular to broadly ovate, (2.5-)3-4.3(-5) × (2-)2.3-4 mm, apically winged, apical notch 0.1-0.4 mm deep; valves thin, smooth, not veined, glabrous or sparsely puberulent; style 0.5-1 mm, exerted beyond apical notch. **Seeds** oblong-ovate, (1.8-)2-2.3 × 1-1.2 mm. **2n** = 32.

Flowering May-Jun. Playas of sagebrush plains and mesa, vernal ponds; 800-1600 m; Idaho, Nev., Oreg.

Lepidium davisii is restricted to six counties in Idaho (Ada, Elmore, Owyhee, Twin Falls), Nevada (Elko), and Oregon (Malheur).

11. *Lepidium densiflorum* Schrader, Index Seminum (Göttingen) 1832: 4. 1832 [F] [W]



Lepidium densiflorum var. *elongatum* (Rydberg) Thellung; *L. densiflorum* var. *macrocarpum* G. A. Mulligan; *L. densiflorum* var. *pubicarpum* (A. Nelson) Thellung; *L. densiflorum* var. *ramosum* (A. Nelson) Thellung; *L. elongatum* Rydberg; *L. neglectum* Thellung; *L. pubicarpum* A. Nelson; *L. ramosum* A. Nelson

Annuals or biennials; puberulent or glabrous, (trichomes cylindrical). **Stems** simple from base, erect, branched distally, (1-)2.5-5(-6.5) dm. **Basal leaves** (early withered); rosulate; petiole 0.5-1.5(-2) cm; blade oblanceolate, spatulate, or oblong, (1.5-)2.5-8(-11) cm × 5-10(-20) mm, margins coarsely serrate or pinnatifid. **Cauline leaves** shortly petiolate; blade narrowly oblanceolate or linear, (0.7-)1.3-6.2(-8) cm × (0.5-)1.5-10 (-18) mm, base attenuate to cuneate, not auriculate, margins usually entire or irregularly serrate to dentate, rarely pinnatifid. **Racemes** considerably elongated in fruit; rachis puberulent, trichomes straight, slender to subclavate. **Fruiting pedicels** divaricate-ascending to horizontal, straight or slightly recurved, (terete), (1.5-)2-3.5(-4) × 0.15-0.25 mm, puberulent adaxially. **Flowers:** sepals oblong, 0.5-0.8(-1) × 0.3-0.5 mm; petals (absent or rudimentary) white, filiform, 0.3-0.9 mm, claw absent; stamens 2, median; filaments 0.6-1(-1.8) mm; anthers 0.1-0.2 mm. **Fruits** obovate to obovate-

suborbicular, (2-)2.5-3(-3.5) × 1.5-2.5(-3) mm (widest beyond middle), apically winged, apical notch 0.2-0.4 mm deep; valves thin, smooth, not veined, glabrous or sparsely puberulent (at least on margin); style 0.1-0.2 mm, included in apical notch. Seeds ovate, 1.1-1.3 (-1.5) × 0.8-0.9 mm. $2n = 32$.

Flowering May-Jul. Waste places, disturbed sites, prairies, fields, pastures, grasslands, chaparral, meadows, sagebrush flats, flood plains, gravelly hillsides, rock crevices, seashores, sandy places, shaley barrens, open mesa, roadsides; 0-3500 m; Alta., B.C., Man., N.B., Nfld. and Labr., N.W.T., N.S., Ont., P.E.I., Que., Sask., Yukon; Ala., Alaska, Ariz., Ark., Calif., Colo., Conn., Del., D.C., Fla., Ga., Idaho, Ill., Ind., Iowa, Kans., Ky., La., Maine, Md., Mass., Mich., Minn., Miss., Mo., Mont., Nebr., Nev., N.H., N.J., N.Mex., N.Y., N.C., N.Dak., Ohio, Okla., Oreg., Pa., R.I., S.C., S.Dak., Tenn., Tex., Utah, Vt., Va., Wash., W.Va., Wis., Wyo.; Mexico (Chihuahua, Nuevo León); introduced in Europe, Asia.

North American records of *Lepidium apetalum* Willdenow mostly represent misidentifications of *L. densiflorum*. The latter has obovate fruits widest beyond the middle, whereas *L. apetalum* has elliptic fruits widest at the middle.

The number and limits of the varieties recognized in *Lepidium densiflorum*, as well as the characters used to delimit them, vary among authors (A. Thellung 1906; C. L. Hitchcock 1936; G. A. Mulligan 1961; R. C. Rollins 1993; N. H. Holmgren 2005b). The variation almost always does not correlate with geography, and the recognition of varieties in this species is neither practical nor very useful. All of those authors admitted that these varieties are "very weak at best" (Rollins, p. 554). Of them, perhaps var. *pubicarpum* (including var. *elongatum*) might merit recognition. It is distributed in almost all of the Mountain and Pacific states and is distinguished from the other varieties solely by the presence of trichomes or minute papillae on the fruit valves. The density of these trichomes ranges from moderate and covering the entire valve surface to very sparse and represented by individual papillate trichomes restricted to the valve margin. Furthermore, the length of these trichomes may vary from ca. 0.01 to 0.3 mm. In some species (e.g., *L. dictyotum*) both glabrous- and pubescent-fruited forms occur, yet none of the above authors gave formal recognition to both forms. It is not known if both glabrous and puberulent fruits occur within the same population in *L. densiflorum*. The species is autogamous, but nothing is known about the rates of gene flow between and within populations.

12. *Lepidium dictyotum* A. Gray, Proc. Amer. Acad. Arts 7: 329. 1868 [E]



Lepidium acutidens (A. Gray) Howell var. *microcarpum* Thellung; *L. dictyotum* var. *macrocarpum* Thellung; *Nasturtium dictyotum* (A. Gray) Kuntze

Annuals; hirsute. Stems few to several from base, erect to ascending, or (outer ones) decumbent, unbranched, (0.15-

0.3-1.3(-2.1) dm. Basal leaves (soon withered); not rosulate; petiole 0.5-2 cm; blade pinnatifid to pinnatisect (lobes linear to narrowly oblong), (1.5-)2.2-5.7(-7) cm × (0.5-)1-2(-3) mm, margins entire. **Cauline leaves** sessile; blade usually linear, rarely with linear lobes, 1-5 cm × 0.5-2 mm, base attenuate, not auriculate, margins entire. **Racemes** elongated, (dense) in fruit; rachis hirsute, trichomes straight, cylindrical. **Fruiting pedicels** erect to slightly ascending, straight and appressed to rachis or distally slightly recurved, (strongly flattened), (1.6-)1.9-2.5(-3) × 0.4-0.8 mm (width proximal to apex), usually hirsute or, rarely, only adaxially. **Flowers:** sepals oblong to ovate, 0.7-1.1 × 0.2-0.6 mm; petals absent; stamens 4, median; filaments 0.5-1 mm; anthers ca. 0.1 mm. **Fruits** ovate, 2.5-3.5 × 2-2.8 mm, apically winged, apical notch (closed, often U-shaped), 0.5-0.7(-0.8) mm deep; valves thin, smooth, strongly reticulate-veined, usually hirsute, rarely glabrous; style absent or obsolete, included in apical notch. Seeds ovate, 1.2-1.8 × 0.8-1.2 mm.

Flowering Mar-Jun. Margins of playas, saline areas, meadows, gypsum hills, dried pools, alkaline and clay flats and sinks, near hot springs, roadsides, borders of springs and ponds, sandy flats; 0-1600 m; Calif., Idaho, Nev., Oreg., Utah, Wash.; Mexico (Baja California).

13. *Lepidium didymum* Linnaeus, Syst. Nat. ed. 12, 2: 433. 1767; Mant Pl. 1: 92. 1767 [E] [I]



Carara didyma (Linnaeus) Britton; *Coronopus didymus* (Linnaeus) Smith; *Senebiera didyma* (Linnaeus) Persoon; *S. incisa* Willdenow; *S. pinnatifida* de Candolle

Annuals; (fetid); glabrous or pilose. Stems few to several from base, erect to ascending or decumbent, branched distally, 1-4.5(-7) dm. Basal leaves (soon withered); not rosulate; petiole 0.5-4(-6) cm; blade 1- or 2-pinnatisect, 1-6(-8) cm, margins (of lobes) entire or dentate (sometimes deeply lobed). **Cauline leaves** shortly petiolate to subsessile; blade similar to basal, smaller and less divided distally, lobes lanceolate to oblong or elliptic, 1.5-3.5(-4.5) cm ×

5–12 mm, base not auriculate, margins (of lobes) entire, serrate, or incised. **Racemes** elongated in fruit; rachis glabrous or pubescent, trichomes straight, cylindrical. **Fruiting pedicels** divaricate to horizontal, straight slightly recurved, (terete), 1.4–2.5(–4) × 0.15–2 mm, glabrous or sparsely pubescent adaxially. **Flowers:** sepals (tardily deciduous), ovate, 0.5–0.7(–0.9) mm; petals white, elliptic to linear, 0.4–0.5 × ca. 0.1 mm, claw absent; stamens 2, median; filaments 0.3–0.6 mm; anthers 0.1–0.2 mm. **Fruits** schizocarpic, didymous, 1.3–1.7 × 2–2.5 mm, apically not winged, apical notch 0.2–0.4 mm deep; valves thick, rugose, strongly veined, glabrous; style absent or obsolete, included in apical notch. **Seeds** ovate, 1–1.2 × 0.7–0.8 mm. $2n = 32$.

Flowering Mar–Jul. Roadsides, waste areas, lawns, pastures, fields, gardens, disturbed areas; 0–1000 m; introduced; B.C., N.B., Nfld. and Labr. (Nfld.); N.S., Que.; Ala., Ariz., Ark., Calif., Conn., Fla., Ga., La., Maine, Md., Mass., Miss., Mo., N.J., N.Y., N.C., Ohio, Oreg., Pa., S.C., Tenn., Tex., Va., W.Va., Wis.; South America; introduced also in Mexico (Sinaloa), Central America (Honduras), Europe, Asia, s Africa, Australia.

14. *Lepidium draba* Linnaeus, Sp. Pl. 2: 645. 1753

F I W



Cardaria draba (Linnaeus) Desvaux; *Cochlearia draba* (Linnaeus) Linnaeus; *Nasturtium draba* (Linnaeus) Crantz

Perennials; (rhizomatous); hirsute or glabrate. **Stems** often simple from base, erect or decumbent basally, branched (several) distally, (0.8–)2–6.5

(–9) dm. **Basal leaves** (early withered); not rosulate; petiole 1–4 cm; blade obovate, spatulate, or ovate, (1.5–)3–10(–15) cm × 10–40 mm, margins sinuate to dentate or entire. **Cauline leaves** sessile; blade ovate, elliptic, oblong, or lanceolate, oblanceolate, or obovate, (1–)3–9(–15) cm × (5–)10–20(–50) mm, base sagittate-amplexicaul or auriculate, margins dentate or entire, (surfaces pubescent or glabrous). **Racemes** (corymbose panicles), slightly or considerably elongated in fruit; rachis glabrous or puberulent, trichomes straight or curved, cylindrical. **Fruiting pedicels** ascending to horizontal, straight, (terete), 5–10(–15) × 0.2–0.3 mm, glabrous or sparsely puberulent adaxially. **Flowers:** sepals oblong to ovate, 1.5–2.5 × 0.7–1.2 mm; petals white, obovate, (2.5–)3–4(–4.5) × (1–)1.3–2(–2.2) mm, claw 1–1.7 mm; stamens 6; filaments 2–3 mm, (glabrous); anthers 0.4–0.5 mm. **Fruits** (indehiscent), cordate to subreniform, (2–)2.5–3.7(–4.3) × (3.2–)3.7–5(–5.6) mm, apically (obtuse to subacute), not winged, apical notch absent; valves thin, smooth, reticulate-veined, glabrous; style (0.6–)1–1.8(–2) mm. **Seeds** ovate, 1.5–2.3 × 1–1.3 mm. $2n = 32, 64$.

Flowering Apr–Aug. Mountain slopes, roadsides, fields, agricultural lands, stream sides, disturbed grounds, pastures, waste areas; 0–3300 m; introduced; Alta., B.C., Man., N.S., Ont., Sask.; Ariz., Calif., Colo., Conn., D.C., Idaho, Ill., Ind., Iowa, Kans., Md., Mass., Mich., Minn., Mo., Mont., Nebr., Nev., N.J., N.Mex., N.Y., N.Dak., Ohio, Okla., Oreg., Pa., R.I., S.Dak., Utah, Wash., Wyo.; s Europe; sw Asia; introduced also in Mexico (Distrito Federal), South America, s Africa, Australia.

Although *Lepidium draba* is poorly established and known from old collections in the eastern part of the United States, it has become a noxious weed in several western states.

Lepidium draba and its nearest relatives, *L. appelianum* and *L. chalepense*, form a monophyletic clade most closely related to *L. campestre* (K. Mummenhoff et al. 2001). A. Thellung (1906) and C. L. Hitchcock (1936) correctly placed *L. draba* in *Lepidium*, as did Linnaeus. The recognition of the first three species in *Cardaria* and the maintenance of their nearest relative, *L. campestre*, in *Lepidium* do not make any sense on both phylogenetic and taxonomic grounds.

15. *Lepidium eastwoodiae* Wooton, Bull. Torrey Bot.

Club 25: 258. 1898 E F



Lepidium alyssoides A. Gray var. *eastwoodiae* (Wooton) Rollins; *L. moabense* S. L. Welsh; *L. montanum* Nuttall var. *eastwoodiae* (Wooton) C. L. Hitchcock

Annuals, biennials, or perennials; (base woody); glabrous or pubescent. **Stems** simple from base, erect, branched distally, (3.5–)4.5–16(–18) dm. **Basal leaves** (soon deciduous), not rosulate; petiole (1–)2–5.5(–7.5) cm; blade pinnatifid, (2–)3–6.8(–9) cm × 10–30 mm, margins (of lobes) dentate to serrate. **Cauline leaves** shortly petiolate or sessile; blade narrowly lanceolate or oblanceolate to linear, 3–7 cm × (2.5–)4–10 mm (smaller distally), base attenuate to cuneate, not auriculate, margins usually entire, rarely dentate. **Racemes** elongated in fruit; rachis puberulent, trichomes straight or curved. **Fruiting pedicels** divaricate-ascending to horizontal, usually slightly recurved or somewhat sigmoid, rarely straight, (not winged), (3–)3.5–7.5(–8) × 0.2–0.3 mm, puberulent adaxially. **Flowers:** sepals suborbicular to oblong, 0.8–1.5 × 0.7–1.2 mm; petals white, suborbicular, 2.2–3.5(4) × 1.5–2.5 mm, claw 0.7–1.5 mm; stamens 6; filaments 1.5–2.5 mm, (glabrous); anthers 0.3–0.4 mm. **Fruits** broadly ovate, 2–3.5(–4) × 1.8–2.6(–3) mm, apically winged, apical notch 0.1–0.2 mm deep; valves thin, smooth, not veined, glabrous; style (0.2–)0.3–0.6(–0.7) mm, exerted beyond apical notch. **Seeds** (dark brown), ovate, 1.4–1.8 × 0.8–1.1 mm.

Flowering Jul–Sep. Pinyon-juniper, sagebrush, or mixed desert shrub communities; 900–2200 m; Ariz., Colo., N.Mex., Utah.

C. L. Hitchcock (1936) and R. C. Rollins (1993) reduced *Lepidium eastwoodiae* to a variety of *L. montanum* and *L. alyssoides*, respectively. However, the differences in morphology and flowering periods support its recognition as an independent species.

We have not examined the holotype of *Lepidium moabense* and follow N. H. Holmgren (2005b) in reducing it to synonymy of *L. eastwoodiae*.

16. *Lepidium flavum* Torrey in War Department [U.S.], *Pacif. Rail. Rep.* 4(5): 67. 1857 [F]



Lepidium flavum var. *apterum* Henrard; *L. flavum* var. *felipense* C. L. Hitchcock; *Nasturtium flavum* (Torrey) Kuntze; *Sprengeria flava* (Torrey) Greene; *S. minuscula* Greene; *S. watsoniana* Greene

Annuals; glabrous. **Stems** few to several from base, prostrate or decumbent, branched, (0.2–)0.4–3(–4.6) dm. **Basal leaves** rosulate; petiole (0.3–)0.6–2.5(–3.2) cm; blade spatulate to oblanceolate or linear, pinnatifid or lobed (lobes 3–9 pairs, ovate to oblong), (0.7–)1.3–5.2(–6) cm × 3–8 mm, margins (of lobes) entire. **Cauline leaves**: petioles 0.1–0.5 cm; blade obovate to spatulate or oblanceolate, (0.6–)1–1.8(–2.3) cm × 2–8(–14) mm, base attenuate-cuneate, not auriculate, margins dentate-sinuate to crenate or entire. **Racemes** (corymbose to subcapitate), slightly elongated in fruit; rachis glabrous. **Fruiting pedicels** divaricate to horizontal, straight or slightly sigmoid, (terete), (2.7–)3–4.4(–5) × 0.2–0.3 mm, glabrous. **Flowers**: sepals obovate-oblong, 1–2 × 0.6–1 mm; petals yellow (rarely creamy white at early anthesis), spatulate, (1.8–)2–2.8(–3) × 0.6–1 mm, claw 0.5–1 mm; stamens 6; filaments (median pairs) 1.2–2 mm, (glabrous); anthers 0.4–0.5 mm. **Fruits** usually narrowly to broadly ovate, rarely suborbicular, (2.2–)2.5–3.8(–4.2) × (1.6–)2.2–3.2(–3.5) mm, apically divergently winged, apical notch 0.2–0.6 mm deep; valves thin, smooth, moderately reticulate-veined, usually glabrous, rarely pubescent; style 0.7–1.6 mm, exerted beyond apical notch. **Seeds** ovate, 1–1.6 × 0.6–0.9 mm. $2n = 32$.

Flowering Mar–Jun. Sagebrush communities, open mesas, sandy flats and deserts, alluvial fans, dry valley floors, floodplains, washes, alkaline flats, roadsides, playa margins; 600–1600 m; Calif., Nev.; Mexico (Baja California).

The slightly smaller-fruited form of *Lepidium flavum*, recognized by C. L. Hitchcock (1936) and R. C. Rollins (1993) as var. *felipense*, does not merit recognition.

17. *Lepidium fremontii* S. Watson, *Botany* (Fortieth Parallel), 30, plate 4, figs. 3, 4. 1871 [E] [F]



Lepidium fremontii var. *stipitatum* Rollins; *Nasturtium fremontii* (S. Watson) Kuntze

Perennials or subshrubs; (woody base aboveground); (glaucous), glabrous throughout. **Stems** several from base, erect or ascending, branched (several) distally, 2–5.5(–10) dm. **Basal leaves** absent. **Cauline leaves** sessile; blade linear and undivided or pinnately lobed (lobes 3–7(–9), linear), (1.5–)2.2–8.4(–10.2) cm × (0.7–)1–2.8(–4.2) mm, base attenuate, not auriculate, margins entire, (similar, smaller distally). **Racemes** (panicles), elongated in fruit. **Fruiting pedicels** divaricate-ascending to horizontal, usually straight, rarely slightly curved, (terete), (3.5–)4.3–7.6(–8.5) × 0.15–0.2 mm. **Flowers**: sepals obovate, 1.5–2.5(–3) × 1–1.6 mm; petals white, spatulate, 2.5–4.2 × 1.5–2.2 mm, claw 1–2 mm; stamens 6; filaments 1.8–3 mm; anthers 0.4–0.7 mm. **Fruits** obovate to orbicular, (4–)4.5–7(–8) × 4.2–7(–8) mm, apically winged, apical notch (0.1–)0.2–0.5 mm deep; valves thin, smooth, not veined; style 0.2–0.8(–1) mm, exerted beyond apical notch. **Seeds** ovate, 1.6–2.1 × 0.9–1.1 mm. $2n = 32$.

Flowering Mar–Jun. Desert shrub communities, pinyon-juniper woodlands, sandy washes, gravelly deserts, barren knolls, bluffs, roadsides, steep limestone outcrops, rocky ledges and slopes; 400–2100 m; Ariz., Calif., Nev., Utah.

Rollins established var. *stipitatum* on the basis of fruits obovate with gynophores 0.5–0.75 mm versus (var. *fremontii*) fruits orbicular to ovate and sessile. These two characters often do not covary and stipitate fruits occur sporadically throughout the species range, including Arizona (*Lemmon s.n.*, GH), California (*Morefield 3427*, GH), and Nevada (*Comanor 18*, GH; *Hitchcock 3078*, GH).

18. *Lepidium heterophyllum* Bentham, *Cat. Pl. Pyrénées*, 95. 1826 [F] [I]



Perennials; (caudex branched); hirsute. **Stems** branched from base, erect to ascending, often decumbent basally, unbranched or branched (few) distally, 1–5 dm. **Basal leaves** rosulate; petiole 1–6.2 cm; blade oblanceolate or oblong-elliptic; 1–4.5 cm × 4–14 mm, margins entire, repand, or denticulate. **Cauline leaves** sessile; blade oblong to deltate-lanceolate, 1–3.5 cm × 3–8 mm, base sagittate or auriculate, margins dentate to denticulate. **Racemes** much-elongated in fruit; rachis

hirsute, trichomes spreading, straight. **Fruiting pedicels** horizontal, straight or slightly recurved, (terete), 2.8–5 × 0.3–0.4 mm, hirsute. **Flowers:** sepals oblong, 1.6–2.2 × 0.6–1.1 mm; petals white, spatulate, 1.8–2.8 × 0.8–1.4 mm, claw 1–2 mm; stamens 6; filaments 1.8–2.6 mm, (glabrous); anthers 0.4–0.5 mm. **Fruits** broadly oblong to ovate, 4–5.5 × 3.5–4 mm, (curved adaxially), apically broadly winged, apical notch 0.2–0.3 mm deep; valves thin, often not papillate, not veined; style (0.6–)1–1.5 mm, well-exserted beyond apical notch. **Seeds** (dark brown), ovoid, 1.8–2.2 × 1–1.2 mm. $2n = 48$.

Flowering May–Jun. Gravel mounds, roadsides, abandoned fields, waste grounds, disturbed sites, gardens, hillsides; 0–300 m; introduced; B.C., Nfld. and Labr. (Nfld.); Calif., Colo., Maine, Mass., N.Y., Oreg., Pa., Wash; Europe.

The records from Maine and Massachusetts are based on old collections, and it is not known if *Lepidium heterophyllum* has become established as part of the weedy flora of those states.

19. *Lepidium huberi* S. L. Welsh & Goodrich, Great Basin Naturalist 55: 359, fig. 1. 1995 [C][E][F]



Perennials or subshrubs; (caudex to 2 cm diam., woody base aboveground); puberulent. **Stems** several from base, erect to ascending, branched distally, (1.8–)3–6(–7) dm. **Basal leaves** not rosulate; petiole 1–3 cm; blade ovate to lanceolate, pinnatifid, 1–4.5 cm × 8–25 mm, margins (of lobes) entire. **Cauline leaves** shortly petiolate or sessile; blade lanceolate to oblanceolate, 1.8–3.5 cm × 3–10 mm (smaller distally), base cuneate, not auriculate, margins entire or coarsely serrate. **Racemes** (subcorymbose panicles), individual racemes slightly elongated; rachis puberulent, trichomes straight. **Fruiting pedicels** divaricate to horizontal, straight or slightly curved, (not winged), 4–7 × 0.2 mm, puberulent throughout. **Flowers:** sepals suborbicular to broadly ovate, 1.2–2 × 1.2–1.5 mm; petals white, suborbicular to obovate, 2–3.2 × 1.5–2 mm, claw 0.5–1 mm; stamens 6; filaments 1.4–1.7 mm, (glabrous); anthers 0.4–0.5 mm. **Fruits** often broadly obovate, 2–3.3 × 1.8–2.5 mm, apically winged, apical notch 0.1–0.2 mm deep; valves thin, smooth, not veined, glabrous; style 0.2–0.8 mm, exserted beyond apical notch. **Seeds** ovate, 1.4–1.6 × 0.8–1 mm.

Flowering Jul–Aug. Pine and sagebrush communities; of conservation concern; 1500–3000 m; Colo., Utah.

Lepidium huberi is known in Colorado from Rio Blanco County and in Utah from Uintah County.

20. *Lepidium integrifolium* Nuttall in J. Torrey and A. Gray, Fl. N. Amer. 1: 116. 1838 [C][E][F]



Lepidium montanum Nuttall subsp. *integrifolium* (Nuttall) C. L. Hitchcock; *L. montanum* var. *integrifolium* (Nuttall) C. L. Hitchcock; *L. utahense* M. E. Jones; *L. zionis* A. Nelson; *Nasturtium integrifolium* (Nuttall) Kuntze

Perennials; (caudex often thick, not aboveground, covered with persistent petiolar remains); puberulent. **Stems** several from base (caudex), ascending, branched distally, (1–)1.5–3.5(–4) dm. **Basal leaves** rosulate; petiole (0.5–)1.5–6(–7.5) cm; blade oblanceolate to obovate, (1.5–)2.5–7(–9) cm × (10–)15–25 mm, margins usually entire, rarely denticulate subapically. **Cauline leaves** shortly petiolate or sessile; blade narrowly lanceolate to broadly oblanceolate, 1–5 cm × 2–9(–12) mm, base cuneate, not auriculate, margins usually entire, rarely denticulate subapically. **Racemes** elongated in fruit; rachis puberulent, trichomes straight, sometimes clavate. **Fruiting pedicels** divaricate-ascending to horizontal, straight, (not winged), (4–)5–10 × 0.3–0.5 mm, puberulent adaxially. **Flowers:** sepals oblong-obovate, (1.5–)1.8–2.5 × 0.8–1.3 mm; petals white, obovate, (2.3)2.5–3.6(–4) × 1.5–2.2 mm, claw 0.5–1 mm; stamens (2 or) 4 (or 6), median and lateral when 4, (erect); filaments 1.7–2.5 mm, (glabrous); anthers 0.5–0.8 mm. **Fruits** ovate, (3–)3.2–4(–4.4) × 2–3.5 mm, apically winged, apical notch 0.1–0.3 mm deep; valves thin, smooth, not veined, glabrous; style 0.5–0.8(–1) mm, exserted beyond apical notch. **Seeds** ovate, 1.8–2 × 0.9–1.1 mm.

Flowering Jun–Jul. Alkaline and saline meadows; of conservation concern; 1300–2000 m; Ariz., Nev., Utah, Wyo.

The circumscription of *Lepidium integrifolium* is somewhat controversial. C. L. Hitchcock (1936) treated it as two varieties or (Hitchcock 1950) two subspecies of *L. montanum*, whereas R. C. Rollins (1993) treated it as a distinct species with two varieties. Rollins indicated that the species has two stamens, but such occurrence is rather rare. Most commonly, it has four stamens and is readily distinguished from related species by having four nectar glands and sepals sparsely pubescent subapically with crisped trichomes. Nothing is known about the populational variation of stamen number in the species and whether one or more taxa are involved.

21. *Lepidium jaredii* Brandegee, Zoë 4: 398. 1894
(as *jaredii*) [C] [E] [F]



Lepidium jaredii subsp. *album*
Hoover

Annuals; sparsely pilose (at least distally). **Stems** simple or several from base, erect to ascending, branched distally, 1–6(–7) dm. **Basal leaves** (withered by anthesis); not rosulate. **Cauline leaves** sessile; blade lanceolate to linear, 2–7.5(–10) cm × 2–10 mm, base cuneate to attenuate, not auriculate, margins entire or sparsely dentate subapically. **Racemes** considerably elongated in fruit, (lax); rachis usually pilose, rarely glabrous, trichomes usually curved, cylindrical. **Fruiting pedicels** divaricate to horizontal, straight or slightly sigmoid, (terete), 5–15 × 0.15–0.2 mm, pilose adaxially. **Flowers**: sepals oblong, 1.8–2.5 × 0.9–1.5 mm; petals lemon yellow (fading whitish), spatulate, 2.8–4 × 1.2–1.8 mm, claw 1–1.4 mm; stamens 6; filaments 1.8–2.5 mm, (glabrous); anthers 0.5–0.6 mm. **Fruits** broadly ovate, 3–3.8(–4) × 2.8–3.2(–3.5) mm, apically not winged, apical notch 0(–0.1) mm deep; valves thin, obscurely veined, smooth or minutely papillate, glabrous; style 0.3–0.8(–1) mm, exerted beyond apical notch. **Seeds** (reddish brown), oblong, 1.8–2.2 × 1–1.4 mm. $2n = 16$.

Flowering Mar–Apr. Arroyos, washes, alkaline bottoms and meadows, dry hillsides; of conservation concern; 500–700 m; Calif.

Lepidium jaredii is known from Fresno, San Benito, and San Luis Obispo counties.

22. *Lepidium lasiocarpum* Nuttall in J. Torrey and
A. Gray, Fl. N. Amer. 1: 115. 1838 [F] [W]



Lepidium ruderalis Linnaeus var.
lasiocarpum (Nuttall) Engelm.
ex A. Gray; *Nasturtium*
lasiocarpum (Nuttall) Kuntze

Annuals; hirsute or hispid, (trichomes cylindrical). **Stems** usually few to several, rarely simple from base, erect to ascending or (outer ones) decumbent, branched distally, (0.15–)0.6–3(–3.8) dm. **Basal leaves** (later withered); not rosulate; petiole (0.4–)1–3.5(–5) cm; blade spatulate to oblanceolate, lyrate-pinnatifid, pinnatisect, or 2-pinnatifid, (0.7–)1.5–4.5(–7.5) cm × (9–)12–20(–30) mm, margins rarely dentate, (lobes) entire or dentate. **Cauline leaves** subsessile or petioles 0.8–2.2 cm, blade lanceolate to oblanceolate, (0.7–)1.2–3.3(–5) cm × (2–)4–12 mm, base cuneate,

not auriculate, margins subentire to dentate. **Racemes** often considerably elongated in fruit; rachis hirsute or hispid, trichomes straight, cylindrical. **Fruiting pedicels** divaricate-ascending to horizontal, straight or slightly curved, (often strongly flattened), (1.8–)2–4(–4.6) × 0.2–0.7 mm (to 0.3 mm thick), hirsute to hispid throughout or adaxially. **Flowers**: sepals oblong, 1–1.3(–1.5) × 0.5–0.8 mm; petals (sometimes absent), white, oblanceolate to linear, (0.3–)0.6–1.5(–2) × (0.1–)0.2–0.5 mm, claw absent; stamens 2, median; filaments 1–1.4 mm; anthers 0.2–0.3 mm. **Fruits** ovate to ovate-orbicular, 2.8–4(–4.6) × 2.4–3.6(–4) mm, (base broadly cuneate to rounded), apically winged, apical notch (0.2–)0.3–0.6(–0.7) mm deep; valves thin, smooth, not veined, hirsute to hispid (on surface or margin); style obsolete or to 0.1 mm, included in apical notch. **Seeds** ovate, 1.4–2.2 × 0.9–1.4 mm.

Subspecies 3 (2 in the flora): w United States, n Mexico.

R. C. Rollins (1993) and C. L. Hitchcock (1945) divided *Lepidium lasiocarpum* into four and seven varieties, respectively. Hitchcock admitted that the species is highly variable in every aspect and that his varieties cover some of the “more conspicuous” variations. In our opinion, perhaps two or three groups are somewhat sufficiently defined to be recognized formally, though the lines separating them blur in some parts of the species range. We are reluctantly treating them as subspecies; subsp. *palmeri* (S. Watson) Thellung is restricted to Mexico (Baja California). The other infraspecific taxa recognized by those authors are based on trivial differences in leaf and indumentum, and we do not believe that they merit recognition.

The reports by R. C. Rollins (1993) and N. H. Holmgren (2005b) of four and six stamens in *Lepidium lasiocarpum* were most likely repeated from C. L. Hitchcock (1936, 1945b) without further verification. We have examined hundreds of specimens that definitely belong to this species, and in not a single case did we find a flower with more than two stamens. It is quite likely that the reports of more than two stamens were based on misidentified plants.

1. Fruit valves hirsute (or fringed on margin), trichomes not pustular-based; fruiting pedicels 0.2–0.4(–0.6) mm wide, usually less than 3 times as wide as thick; nectar glands toothlike, to 0.2 mm 22a. *Lepidium lasiocarpum* subsp. *lasiocarpum*
1. Fruit valves hispid, trichomes pustular-based; fruiting pedicels (0.4–)0.5–0.7 mm wide, often more than 3 times as wide as thick; nectar glands not toothlike (subulate), 0.3–0.5 mm 22b. *Lepidium lasiocarpum* subsp. *wrightii*

22a. *Lepidium lasiocarpum* Nuttall
subsp. *lasiocarpum* [F]



Lepidium georginum Rydberg;
L. lasiocarpum subsp. *georginum*
(Rydberg) Thellung; *L. lasiocarpum*
var. *georginum* (Rydberg)
C. L. Hitchcock; *L. lasiocarpum*
var. *rosulatum* C. L. Hitchcock

Fruiting pedicels 0.2–0.4(–0.6)
mm wide, usually less than 3
times as wide as thick. Nectar

glands toothlike, 0.1–0.2 mm. **Fruit valves** hirsute or
minutely fringed on margin, trichomes not pustular-
based. $2n = 32$.

Flowering Mar–Jun. Pinyon-juniper woodlands,
sagebrush and other shrub communities, open deserts,
dry washes and flats, waste places, streambeds,
roadsides, sandy areas, rock slides, stony slopes; 50–
2700 m; Ariz., Calif., Colo., Nev., N.Mex., Tex., Utah;
Mexico (Baja California, Coahuila, Nuevo León, San
Luis Potosí, Sinaloa, Sonora).

In subsp. *lasiocarpum* there is considerable variation
in the density and location of trichomes on the fruit
valve; in some populations (e.g., *Rollins & Munz 6741*,
GH), the trichomes are present over the entire valve; in
others they are restricted as a fringe along part of the
fruit margin.

22b. *Lepidium lasiocarpum* Nuttall subsp. *wrightii*
(A. Gray) Thellung, Mitt. Bot. Mus. Univ. Zürich
28: 266. 1906



Lepidium wrightii A. Gray,
Smithsonian Contr. Knowl.
5(6): 15. 1853; *L. lasiocarpum* var.
rotundum C. L. Hitchcock;
L. lasiocarpum var. *wrightii*
(A. Gray) C. L. Hitchcock;
L. nelsonii L. O. Williams

Fruiting pedicels (0.4–)0.5–0.7
mm wide, often more than

3 times as wide as thick. **Nectar glands** subulate, 0.3–0.5
mm. **Fruit valves** hispid, trichomes pustular-based.
 $2n = 32$.

Flowering Feb–May. Roadsides, rocky draws, dry
washes, loose sand, stony or gravelly areas, clay flats;
200–1100 m; Ariz., N.Mex., Tex.; Mexico (Coahuila,
Tamaulipas).

I. A. Al-Shehbaz (1986b) reported subsp. *wrightii*
from Louisiana, but we have seen no additional material
from that state, where it was likely introduced.

23. *Lepidium latifolium* Linnaeus, Sp. Pl. 2: 644. 1753
[F] [I] [W]



Cardaria latifolia (Linnaeus) Spach

Perennials; (rhizomes thick,
caudex woody); glabrous or
pubescent. **Stems** simple from
base, erect, branched distally,
(2–)3.5–12(–15) dm. **Basal**
leaves not rosulate; petiole 1–9
(–14) cm; blade elliptic-ovate
to oblong, (2–)3.5–15(–25) cm

× (5–)15–50(–80) mm, (leathery), margins entire or
serrate. **Cauline leaves** sessile or shortly petiolate; blade
oblong to elliptic-ovate or lanceolate, (1–)2–9(–12) cm ×
3–45 mm, base cuneate, not auriculate, margins serrate
or entire. **Racemes** (subcorymbose panicles), slightly
elongated or not in fruit; rachis glabrous or sparsely
puberulent, trichomes straight, cylindrical. **Fruiting**
pedicels ascending to divaricate, straight or slightly
curved, (terete), 2–5(–6) × 0.1–0.2 mm, glabrous or
puberulent adaxially. **Flowers**: sepals suborbicular
to ovate, 1–1.4 × 0.8–0.9 mm; petals white, obovate,
1.8–2.5 × (0.8–)1–1.3 mm, claw 0.7–1 mm; stamens 6;
filaments 0.9–1.4 mm, (glabrous); anthers 0.4–0.5 mm.
Fruits oblong-elliptic to broadly ovate or suborbicular,
(1.6–)1.8–2.4(–2.7) × 1.3–1.8 mm, apically not winged,
apical notch 0(–0.1) mm deep; valves thin, smooth, not
veined, glabrous or sparsely pilose; style 0.05–0.15 mm,
exserted beyond apical notch (when present). **Seeds**
oblong, (0.8–)1–1.2 × 0.6–0.9 mm. $2n = 24$.

Flowering Jun–Sep. Pastures, grasslands, disturbed
places, fields, roadsides, slopes, saline meadows, stream
banks, waste grounds, dry flats, sagebrush and pinyon-
juniper communities, barren hillsides, ditch banks, edge
of marshes; 0–2500 m; introduced; Alta., B.C., Que.;
Ariz., Calif., Colo., Conn., Idaho, Ill., Kans., Mass.,
Mo., Mont., Nebr., Nev., N.Mex., N.Y., Oreg., Tex.,
Utah, Wash., Wyo.; s Europe; Asia; n Africa; introduced
also in Mexico (Durango, San Luis Potosí), Australia.

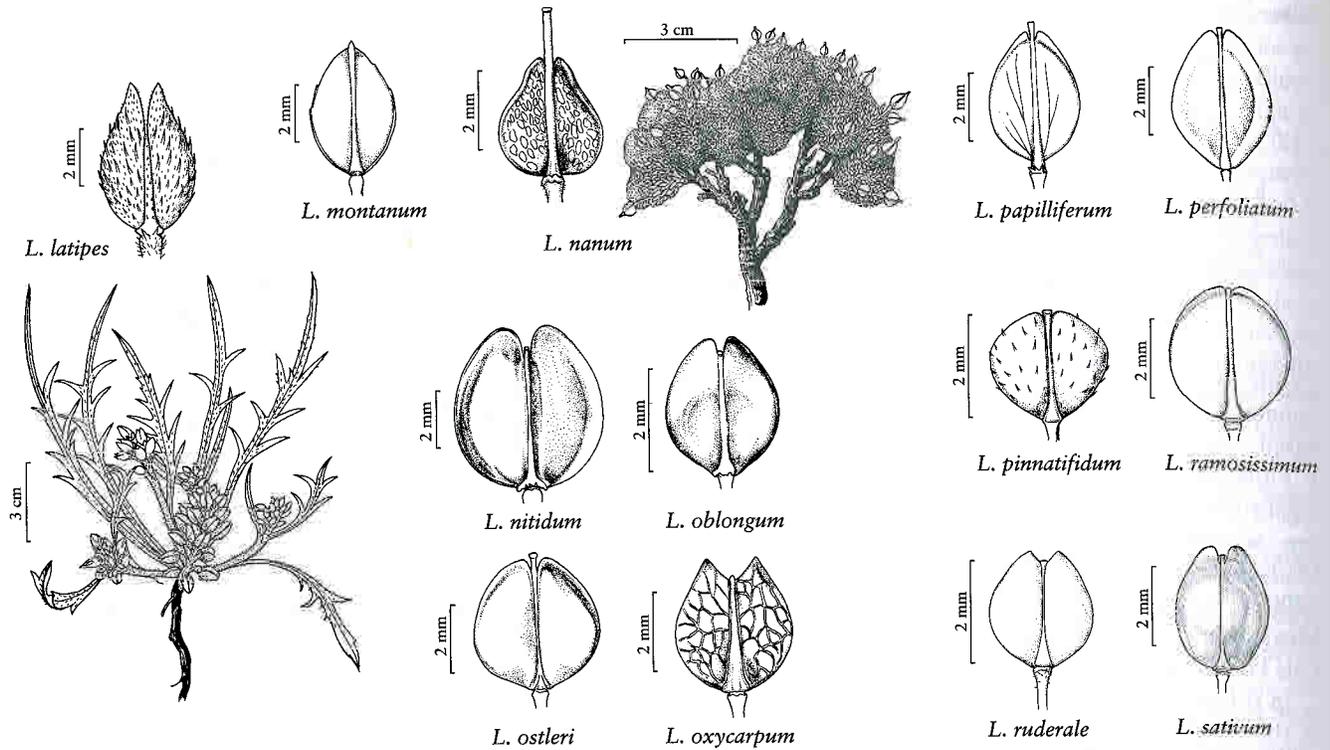
24. *Lepidium latipes* Hooker, Icon. Pl. 1: plate 41.
1836 [F]



Lepidium latipes var. *beckardii*
Rollins; *Nasturtium latipes*
(Hooker) Kuntze

Annuals; puberulent or hirsute.
Stems simple or several from
base, erect to ascending or (outer
ones) decumbent, unbranched
or branched, 0.2–1.5(–3.8) dm.

Basal leaves (soon withered);
not rosulate; petiole often undifferentiated (to 3 cm);
blade linear, 2–10 cm × 1–4 mm, margins entire,
dentate, or pinnatisect (lobes 2–10 pairs, margins entire
or dentate). **Cauline leaves** similar to basal, smaller,



LEPIDIDIUM

blade base attenuate, not auriculate, margins entire. **Racemes** (subcapitate to cylindrical), elongated or not in fruit, (compact); rachis puberulent, trichomes straight, cylindrical. **Fruiting pedicels** erect to slightly ascending, straight and appressed to rachis or distally slightly recurved, (strongly flattened), 2.5–5 × 0.9–1.4 mm, usually puberulent throughout, rarely only adaxially. **Flowers**: sepals (somewhat persistent), ovate, 1.1–1.4 × 0.6–0.8 mm; petals greenish, obovate-oblong, 1.9–3 × 0.8–1.3 mm, claw absent, (usually pubescent outside, with fringed margin, rarely glabrescent); stamens 4, median; filaments 0.8–1.1 mm; anthers 0.15–0.2 mm. **Fruits** oblong-ovate, 5–7 × 2.8–4 mm, apically winged, apical notch 1.4–2.8 mm deep; valves thick, smooth, strongly reticulate-veined, hirsute and puberulent, (trichomes spreading, mixed with smaller ones); style obsolete, included in apical notch. **Seeds** oblong, 2–2.4 × 1.1–1.3 mm.

Flowering Mar–Jun. Margins of vernal pools, edges of salt marshes, alkaline flats and adobe, pastures, mud-wet fields; 0–700 m; Calif.; Mexico (Baja California).

Variety *heckardii*, which is said to differ from var. *latipes* mainly by having elongated stems simple at base (instead of short and branched basally), grows mixed with var. *latipes* in single populations. It appears that the difference is trivial and may well be controlled by a few-gene difference. In our opinion, formal distinction is unwarranted; similar conditions exist in other species (e.g., 27. *Lepidium nitidum*).

25. *Lepidium montanum* Nuttall in J. Torrey and A. Gray, Fl. N. Amer. 1: 116. 1838 [E] [F]



Lepidium albiflorum A. Nelson & P. B. Kennedy; *L. alyssoides* A. Gray var. *jonesii* (Rydberg) Thellung; *L. alyssoides* var. *stenocarpum* Thellung; *L. brachybotryum* Rydberg; *L. corymbosum* Hooker & Arnott; *L. crandallii* Rydberg; *L. integrifolium* Nuttall var.

heterophyllum S. Watson; *L. jonesii* Rydberg; *L. montanum* subsp. *alpinum* (S. Watson) C. L. Hitchcock; *L. montanum* var. *alpinum* S. Watson; *L. montanum* subsp. *canescens* (Thellung) C. L. Hitchcock; *L. montanum* var. *canescens* (Thellung) C. L. Hitchcock; *L. montanum* subsp. *cinereum* (C. L. Hitchcock) C. L. Hitchcock; *L. montanum* var. *cinereum* (C. L. Hitchcock) Rollins; *L. montanum* var. *claronense* S. L. Welsh; *L. montanum* subsp. *glabrum* (C. L. Hitchcock) C. L. Hitchcock; *L. montanum* var. *glabrum* C. L. Hitchcock; *L. montanum* subsp. *heterophyllum* (S. Watson) C. L. Hitchcock; *L. montanum* var. *heterophyllum* (S. Watson) C. L. Hitchcock; *L. montanum* subsp. *jonesii* (Rydberg) C. L. Hitchcock; *L. montanum* var. *jonesii* (Rydberg) C. L. Hitchcock; *L. montanum* var. *neeseae* S. L. Welsh & Reveal; *L. montanum* var. *nevadense* Rollins; *L. montanum* var. *saliarborensense* S. L. Welsh; *L. montanum* var. *stellae*

S. L. Welsh & Reveal; *L. montanum* var. *stenocarpum* Thellung; *L. montanum* var. *todiltoense* N. D. Atwood & S. L. Welsh; *L. montanum* var. *wyomingense* (C. L. Hitchcock) C. L. Hitchcock; *L. philonitrum* A. Nelson & J. F. Macbride; *L. scopulorum* M. E. Jones; *L. utahense* Rydberg

Annuals, biennials, or perennials; (cespitose or not, woody or not at base); glabrous or pubescent. **Stems** simple to several from base, erect to ascending, often branched (several) distally, 0.4–5(–7) dm. **Basal leaves** rosulate or not; petiole (0.5–)1.2–5.3(–7.6) cm; blade 1- or 2-pinnatifid to pinnatisect, or, rarely, undivided, (0.8–)1.5–4(–6) cm, margins (of lobes) entire or dentate. **Cauline leaves** shortly petiolate; blade similar to basal, or undivided and linear, smaller distally, base cuneate to attenuate, not auriculate. **Racemes** often much-elongated in fruit; rachis usually puberulent, rarely glabrous, trichomes straight or curved, cylindrical. **Fruiting pedicels** divaricate to horizontal, slightly recurved or somewhat sigmoid, (terete), (2.7–)3.3–8.5(–10) × 0.2–0.3 mm, sparsely to densely puberulent adaxially. **Flowers:** sepals oblong to broadly ovate, 1.2–1.8(–2.1) × 0.8–1.2 mm; petals white, spatulate to oblanceolate, 2.2–3.7(–4.3) × 1.3–1.8 mm, claw 1–1.4 mm; stamens 6; filaments 1.4–2.2 mm, (glabrous); anthers 0.4–0.5 mm. **Fruits** usually ovate to suborbicular, rarely oblong, 2–4.3(–5) × (1.5–)1.8–3.6(–4) mm, apically winged, apical notch 0.1–0.3 mm deep; valves thin, smooth, not veined, usually glabrous, rarely puberulent; style obsolete 0.2–0.7(–0.9) mm, usually exerted beyond, rarely subequaling, apical notch. **Seeds** oblong, 1.2–1.8 × 0.7–1 mm. $2n = 32$.

Flowering Apr–Aug. Pinyon-juniper woodlands, sagebrush and other shrub communities, rocky hillsides and crevices, bajadas, spring seepages, washes, gypseous grounds, sandstone cliffs, limestone gravel, playas, knolls, gumbo hills, sandy areas, alkaline flats and lowlands, roadsides; 1200–2700 m; Ariz., Calif., Colo., Idaho, Mich., Mont., Nev., N.Mex., Oreg., Utah, Wyo.

There is little agreement among North American authors as to the characters emphasized, the number of infraspecific taxa, their ranks, and their synonymies in treatments of *Lepidium montanum*. C. L. Hitchcock (1936) divided the species into 13 varieties and two forms, and later (Hitchcock 1950) further expanded its limits to include 15 subspecies and two varieties. His circumscription was so broad that it involved at least eight taxa accepted as different species by R. C. Rollins (1993), N. H. Holmgren (2005b), and us. These include *L. alyssoides*, *L. barnebyanum*, *L. crenatum*, *L. davisii*, *L. eastwoodiae*, *L. integrifolium*, *L. montanum*, and *L. papilliferum*.

Although the recognition of seven of Hitchcock's infraspecific taxa as distinct species helped somewhat in reducing heterogeneity in *Lepidium montanum*, this species complex remains far from being adequately treated in recent monographic (R. C. Rollins 1993)

or floristic (N. H. Holmgren 2005b) works. In all, 12 varieties remain accepted in the species, and these only partially cover its overall complexity. The characters that various authors emphasized in the delimitation of infraspecific taxa include duration, habit, plant height, indumentum density, division of basal and cauline leaves, leaf shape, and fruit size. Indeed, the species is so highly variable in all of these aspects that the overall number of forms is mind boggling. Holmgren's assessment that there are intermediates between the various varieties, even in areas where they do not overlap, is correct. The species is badly in need of thorough biosystematic and molecular studies to determine the number and range of infraspecific taxa, to discern the patterns of variation, and to determine how distinct the species is from the seven segregates mentioned in the previous paragraph.

Some of the varieties (e.g., *alpinum*, *coloradense*, *montanum*, *neeseae*, and *stellae*), all of which were accepted by both R. C. Rollins (1993) and N. H. Holmgren (2005b), are distinct enough, and merit recognition at some rank. As indicated by Rollins, var. *neeseae* is quite distinct from the rest and should perhaps be treated as a separate species, but we have seen only two isotypes, and neither had fully developed fruits. Without a painstaking study of this entire species complex, we prefer not to accept formally only a small fraction of its enormous variation. This does not mean that leaving the species as such is the ideal solution, and the listing of synonyms above is meant solely to guide the reader into the complexity involved. A workable and satisfactory key to all of the varieties is not possible at the current stage of knowledge, and attempts to make one (e.g., Rollins, Holmgren) have been unsuccessful. The Michigan record is based on an introduction more than 70 years ago.

SELECTED REFERENCE Hitchcock, C. L. 1950. On the subspecies of *Lepidium montanum*. *Madroño* 10: 155–158.

26. *Lepidium nanum* S. Watson, *Botany* (Fortieth Parallel), 30, plate 4, figs. 5–7. 1871 [E] [F]



Perennials; (forming pincushion-like, pulvinate mounds, caudex woody, to 1.5 cm diam., buried, much-branched, covered with persistent leaves); puberulent. **Stems** simple from base (caudex branches), erect to ascending, unbranched distally, 0.05–0.2 dm. **Basal leaves** rosulate; petiole undifferentiated; blade obovate, 2.5–5 cm × 15–25(–35) mm, margins entire, (ciliolate), apex deeply 3-lobed (lobes ovate to suborbicular, margins entire). **Cauline leaves** absent. **Racemes** slightly elongated in fruit, (2–7-fruited); rachis puberulent, trichomes straight, cylindrical. **Fruiting pedicels** suberect to ascending, often straight, (terete), 2–4.5 × 0.2–0.3 mm, puberulent

throughout. **Flowers:** sepals (tardily deciduous), obovate, 1.3–4 × 0.8–1.1 mm; petals pale yellow or creamy white, spatulate, 1.8–2.9 × 0.8–1.2 mm, claw 0.8–1.1 mm; stamens 6; filaments 1.4–2 mm, (glabrous); anthers 1.4–2 mm. **Fruits** ovate, 2–4.2 × 1.5–3 mm, often apically winged, apical notch 0.1–0.2 mm deep; valves thin, smooth, not veined, glabrous; style (0.4–) 0.6–1(–1.2) mm, exserted beyond apical notch. **Seeds** oblong, 1–2 × 0.8–1 mm.

Flowering May–Jun. Gypsum knolls, tufa mounds around hot springs, quartzite gravel, barren areas with shale and chalky soil, gravelly hillsides, white calcareous soils; 1500–2200 m; Nev., Utah.

Lepidium nanum is most common in Nevada and is known in Utah from collections in Tooele County.

27. *Lepidium nitidum* Nuttall in J. Torrey and A. Gray, Fl. N. Amer. 1: 116. 1838 [F] [W]



Lepidium leiocarpum Hooker & Arnott; *L. nitidum* var. *howellii* C. L. Hitchcock; *L. nitidum* var. *insigne* Greene; *L. nitidum* var. *oreganum* (Howell ex Greene) C. L. Hitchcock; *L. oreganum* Howell ex Greene; *L. strictum* (S. Watson) Rattan var. *oreganum* (Howell ex Greene) B. L.

Robinson; *Nasturtium nitidum* (Nuttall) Kuntze

Annuals; puberulent. **Stems** simple to numerous from base, erect to ascending or decumbent, sometimes branched distally, (0.4–)1–3.5(–4.2) dm. **Basal leaves** (soon withered); not rosulate; petiole (0.4–)1–4.2(–5) cm; blade pinnatisect (lobes usually linear to filiform, rarely oblong to lanceolate), (0.8–)1.5–7.3(–8) cm, margins (of lobes) usually entire, rarely dentate. **Cauline leaves** petiolate or sessile; similar to basal, blade smaller, sometimes undivided and linear, base attenuate, not auriculate. **Racemes** much-elongated, (lax) in fruit; rachis puberulent to hirsutulous, trichomes straight, cylindrical. **Fruiting pedicels** usually divaricate, rarely ascending or suberect, usually slightly or weakly recurved, rarely straight, (strongly flattened), 2.5–5(–6.5) × (0.4–)0.6–0.9(–1.1) mm, puberulent adaxially and sometimes on proximal 1/3 abaxially. **Flowers:** sepals oblong-ovate, (0.7–)0.9–1.3(–1.5) × 0.5–0.8 mm; petals (rarely rudimentary or absent), white, oblanceolate, (0.8–)1.2–2(–2.8) × 0.2–1(–1.6) mm, claw absent, (glabrous); stamens usually 4, median, rarely 6; filaments (0.5–)0.7–1(–1.3); anthers 0.1–0.2 mm. **Fruits** orbicular to broadly ovate, (2.5–)3–5.5(–6.5) × (2–)2.6–5(–5.4) mm, apically winged, apical notch 0.3–0.7(–1) mm deep; valves thin, smooth, slightly veined or not, usually glabrous, rarely minutely and sparsely puberulent (along margin); style usually obsolete, rarely to 0.1 mm, included in apical notch. **Seeds** ovate-oblong, 1.6–2.6 × 0.9–1.2 mm.

Flowering Feb–Mar. Alkaline flats and sinks, meadows, pastures, dry vernal pools, fields, sandy beaches, grassy area, gravelly slopes, creosote bush desert; 0–1000 m; Calif., Oreg., Wash.; Mexico (Baja California).

C. L. Hitchcock (1936) and R. C. Rollins (1993) recognized three varieties within *Lepidium nitidum*, of which var. *howellii* was said to differ from var. *nitidum* by having puberulent (versus glabrous) fruit margins and stems densely (versus glabrous or sparsely to densely) pubescent. These characters do not covary, and some glabrate plants have puberulent fruit margins, whereas some very densely pubescent plants have glabrous fruits. As for var. *oreganum*, it is based on plants with divergent fruit wings, but this feature shows every degree of transition from divergent to non-divergent, and both those authors accepted in var. *nitidum* forms with slightly divergent fruit wings. The species is highly variable in leaf division, fruit size and shape, indumentum density, and flower morphology, especially in the number of stamens and presence or absence of petals. We prefer to maintain it without any further splitting.

C. L. Hitchcock (1945b) indicated that *Lepidium nitidum* occurs also in Chile but did not indicate whether the plant is introduced or native there. The material that he annotated and cited as *L. nitidum* from Chile clearly represents misidentified *L. chilense* Kunze ex Walpers. The latter always has two stamens, whereas *L. nitidum* usually has four, rarely six, and Hitchcock's report of two stamens in the latter species was likely based on misidentified plants of another species.

28. *Lepidium oblongum* Small, Fl. S.E. U.S., 468, 1331. 1903 [F] [W]



Lepidium greenei Thellung;
L. oblongum var. *insulare*
C. L. Hitchcock

Annuals; hirsute (trichomes cylindrical). **Stems** often several from base, erect to ascending or decumbent, branched distally, (5–)1–2.4(–3.2) dm. **Basal leaves** not rosulate; petiole (0.5–)1–3 cm; blade 1- or 2-pinnatifid, 0.7–3.5 cm, margins (of lobes) entire or dentate. **Cauline leaves** usually sessile, rarely shortly petiolate; blade obovate to oblanceolate (in outline), 0.8–2 cm × 2–9 mm, base cuneate, auriculate or not, margins dentate to lacinate or pinnatifid. **Racemes** elongated in fruit; rachis hirsute, trichomes mostly straight, cylindrical. **Fruiting pedicels** divaricate to horizontal, usually slightly recurved, rarely straight, (terete), 2–3.5(–5) × 0.2–0.3 mm, puberulent adaxially or, rarely, throughout. **Flowers:** sepals (tardily deciduous to somewhat persistent), ovate to broadly oblong, 0.7–1 × 0.4–0.6 mm; petals (absent or rudimentary), white,

linear-oblongate, 0.1–0.7 × 0.05–0.15 mm, claw absent; stamens 2, median; filaments 0.7–1 mm; anthers 0.15–0.2 mm. Fruits orbicular to broadly obovate or elliptic, 2.2–3.5 × 2–3 mm, apically winged, apical notch 0.2–0.3 mm deep; valves thin, smooth, not veined, glabrous or sparsely puberulent (along margin); style to 0.1 mm, included in apical notch. Seeds ovate, 1.2–1.6 × 0.7–1 mm.

Flowering Mar–Aug. Prairies, pastures, floodplains, waste grounds, llanos, disturbed areas, roadsides, flats, calcareous sand, alluvial terraces; 0–1200 m; Ariz., Ark., Calif., Kans., La., Miss., Mo., N.Mex., Okla., Tex.; Mexico (Baja California, Coahuila, Hidalgo, Nuevo León, Puebla, San Luis Potosí, Tamascaltepec, Veracruz); Central America (El Salvador, Guatemala).

Hitchcock distinguished var. *insulare* from var. *oblongum* on the basis of having fruits smaller (2–2.5 versus 2.5–3 mm) and rotund to obovate (versus elliptic or obovate-elliptic) and fruiting pedicels puberulent (versus glabrous) abaxially. The shape and size of fruits almost never covary, and some of the insular plants (e.g., *Trask* 28, GH) have the largest fruits; some populations from Arizona, Oklahoma, and Texas have smaller and perfectly orbicular fruits. As for the pubescence of fruiting pedicels, some of the inland plants cited by Hitchcock as *L. oblongum* (e.g., *Brewer* 27, GH) have pedicels pubescent abaxially.

A recent report of *Lepidium bonariense* naturalized in Skagit County, Washington, was based on misidentified *L. oblongum*; all the vouchers for it belong to the latter species. *Lepidium oblongum* often has several stems from base, usually auriculate distalmost leaves, and fruits 2–3 mm wide. By contrast, *L. bonariense* has single stems from base, non-auriculate distalmost leaves, and fruits 2.7–3.5 mm wide.

29. *Lepidium ostleri* S. L. Welsh & Goodrich, Great Basin Naturalist 40: 80, fig. 3. 1980 [C] [E] [F]



Perennials; (pulvinate, caudex woody, many-branched, covered with persistent petiolar remains); densely (grayish) puberulent. **Stems** simple from base (caudex branch), erect to ascending, unbranched distally, (0.1–)0.3–0.8 dm. **Basal leaves** not rosulate; petiole often undifferentiated, (expanded base to 2 mm); blade (somewhat fleshy), linear to linear-oblongate (when margins entire), or spatulate in outline (when apically 3–5-lobed, lobes obovate to oblong), 3–12(–15) cm × 5–15 mm, margins entire. **Cauline leaves** sessile; similar to basal, smaller, base not auriculate. **Racemes** slightly elongated in fruit; rachis puberulent, trichomes straight or curved,

cylindrical. **Fruiting pedicels** divaricate-ascending to subhorizontal, straight or slightly curved, (not winged), (2.5–)3–5(–6.5) × 0.4–0.5 mm, densely puberulent throughout. **Flowers:** sepals orbicular to broadly obovate, 1.5–2(–2.5) × 1–1.5(–2) mm; petals white to pale purple, suborbicular to obovate, 2–3.5 × 1.5–2.5(–2.8) mm, claw to 0.5 mm; stamens 6; filaments 1.5–1.8 mm, (glabrous); anthers 0.3–0.5 mm. **Fruits** ovate, 2.5–3.5(–4) × 2–2.5(–3) mm, apically winged, apical notch 0.05–0.2 mm deep; valves thin, smooth, not veined, glabrous; style 0.3–0.6 mm, exerted beyond apical notch. **Seeds** ovate, 1.2–1.5 × 0.9–1.1 mm.

Flowering May–Jun. White limestone outcrops and gravel, pinyon-juniper, sagebrush, or pine communities; of conservation concern; 1700–2100 m; Utah.

Lepidium ostleri is known only from the San Francisco Mountains in Beaver County.

30. *Lepidium oxycarpum* Torrey & A. Gray, Fl. N. Amer. 1: 116. 1838 [E] [F]



Nasturtium oxycarpum (Torrey & A. Gray) Kuntze

Annuals; glabrous or puberulent. **Stems** several from base, usually erect to ascending, rarely decumbent, branched, 0.4–1.5(–2) dm. **Basal leaves** (soon withered); not rosulate; petiole 0.5–1.5(–2) cm; blade margins entire or pinnatifid (lobes 2–5 pairs, linear to filiform), 1.5–5 cm × 0.5–2 mm. **Cauline leaves** petiolate; blade linear, 0.1–0.3 cm × 0.5–2 mm, base attenuate, not auriculate, margins entire. **Racemes** considerably elongated, (lax) in fruit; rachis glabrous or puberulent, trichomes straight, cylindrical. **Fruiting pedicels** divaricate to horizontal or descending, usually recurved, rarely straight, (terete or slightly flattened), 2–4(–6) × 0.2–0.3 mm, glabrous or puberulent adaxially. **Flowers:** sepals oblong, 0.6–0.8 × 0.4–0.5 mm; petals absent; stamens 4, median; filaments 0.6–0.7; anthers ca. 0.1 mm. **Fruit** ovate, 2.4–3.6 × 1.8–2.5 mm, apically winged, apical notch (V-shaped), 0.3–0.8 mm deep; valves thin, smooth, strongly reticulate-veined, glabrous; style obsolete or to 0.1 mm, included in apical notch. **Seeds** oblong, 1.4–1.8 × 0.8–0.9 mm.

Flowering Mar–May. Borders of vernal pools, grassy fields, roadsides ditches, alkaline flats, margins of salt marshes; 0–400 m; Calif.

Lepidium oxycarpum apparently did not persist in British Columbia following its introduction there over 110 years ago (G. A. Mulligan 2002b). That record is based on *Macoun s.n.* (GH, MO, NY, US), which was collected on 31 May 1893 from the vicinity of Victoria, Vancouver Island.

31. *Lepidium papilliferum* (L. F. Henderson) A. Nelson
& J. F. Macbride, Bot. Gaz. 56: 474. 1913 [C] [E] [F]



Lepidium montanum Nuttall var.
papilliferum L. F. Henderson, Bull.
Torrey Bot. Club 27: 342. 1900;
L. montanum subsp. *papilliferum*
(L. F. Henderson) C. L. Hitchcock

Annuals or biennials; puberulent, (trichomes clavate). **Stems** several from base, ascending, branched (several) distally, (0.3–)0.5–2.3(–4) dm. **Basal leaves** (soon deciduous), not rosulate; blade often bipinnately divided. **Cauline leaves** attenuate to petiolelike base, to 1 cm; blade pinnatifid to pinnatisect, obovate to oblanceolate in outline (lobes oblong to linear), 0.5–4 cm × 3–15 mm (smaller distally), base not auriculate, margins (of lobes) entire or dentate. **Racemes** slightly elongated, (dense) in fruit; rachis puberulent, trichomes straight or curved, clavate. **Fruiting pedicels** divaricate to horizontal, straight or recurved, (not winged), (2.5–)3–6(–7.5) × 0.2–0.3 mm, puberulent adaxially or throughout. **Flowers**: sepals ovate to broadly oblong, 1.5–2.2 × 0.8–1.1 mm; petals white, orbicular to spatulate, 2.5–3.7(–4) × 1.5–2.5 mm, claw 0.8–1.5 mm; stamens 6; filaments 1.5–2 mm, (trichomes clavate); anthers 0.4–0.6 mm. **Fruits** orbicular to broadly ovate, 2.2–3.6 × 2–3.4 mm, apically winged, apical notch 0.1–0.3 mm deep; valves thin, smooth, often not veined, glabrous; style 0.2–0.8 mm, exserted beyond apical notch. **Seeds** ovate, 1.2–1.8 × 0.9–1.1 mm.

Flowering May–Jun. Sagebrush plains, desert flats, edge of playa; of conservation concern; 600–1700 m; Idaho.

Lepidium papilliferum is distributed in Ada, Canyon, Elmore, Gem, Owyhee, and Payette counties.

32. *Lepidium paysonii* Rollins, Cruciferae Continental
N. Amer., 577. 1993 [E]



Perennials; (caudex woody, to 6 mm diam.); densely puberulent. **Stems** several from base (caudex), erect or ascending to decumbent, branched distally, 0.5–2.3 dm. **Basal leaves** not rosulate; petiole 1–2.5 cm; blade oblanceolate (rarely with 1 or 2 lateral lobes), 1–3.5 cm × 3–7 mm, margins

serrate-dentate. **Cauline leaves** shortly petiolate or sessile; blade narrowly oblanceolate to linear, 0.7–3.5 cm × 1–4 mm, base attenuate, not auriculate, margins entire or distally serrulate. **Racemes** elongated in fruit; rachis puberulent, trichomes curved, cylindrical. **Fruiting pedicels** divaricate to horizontal, slightly recurved, (terete), 2–4(–5.5) × 0.15–0.2 mm, densely

puberulent throughout. **Flowers**: sepals oblong, 0.6–0.9 × 0.3–0.4 mm; petals (absent or rudimentary), white, oblanceolate, 0.3–0.6 × 0.1–0.2 mm, claw absent; stamens 2, median; filaments 0.6–0.7 mm; anthers 0.1–0.2 mm. **Fruits** elliptic, 2.4–2.8 × 1.6–2 mm, apically winged, apical notch 0.2–0.3 mm deep; valves thin, smooth, not veined, puberulent (at least along margin); style obsolete or to 0.1 mm, included in apical notch. **Seeds** oblong, 1.3–1.4 × 0.7–0.8 mm.

Flowering Jun–Jul. Dry open woods, dry grounds; Colo., Idaho, Wyo.

Lepidium paysonii is known in Idaho from Bear Lake County, and in Wyoming from Park and Sublette counties.

Placing *Lepidium paysonii* in the synonymy of *L. densiflorum* var. *pubicarpum*, N. H. Holmgren (2005b) depended on the presence in both taxa of minute papillae at the fruit valve margin. However, *L. paysonii* is a perennial with elliptic fruits widest at the middle, curved rachis trichomes, and fruiting pedicels puberulent throughout. By contrast, *L. densiflorum* is a biennial or annual with obovate fruits widest beyond the middle, straight rachis trichomes, and fruiting pedicels usually puberulent adaxially, rarely glabrate; in our opinion, the two species are not closely related.

33. *Lepidium perfoliatum* Linnaeus, Sp. Pl. 2: 643.

1753 [F] [I] [W]



Nasturtium perfoliatum (Linnaeus)
Besser

Annuals or biennials; (glaucous), glabrous or sparsely pubescent proximally. **Stems** simple from base, erect, branched distally, (0.7–)1.5–4.3(–5.6) dm. **Basal leaves** rosulate; petiole (0.5–)1–2(–4) cm; blade 2- or 3-pinnatifid or pinnatisect (lobes linear to oblong), (1–)3–8(–15) cm, margins entire. **Cauline leaves** sessile; blade ovate to cordate or suborbicular, (0.5–)1–3(–4) cm × (5–)10–25(–35) mm, base deeply cordate-amplexicaul, not auriculate, margins entire. **Racemes** considerably elongated in fruit; rachis glabrous. **Fruiting pedicels** divaricate-ascending to horizontal, straight, (terete), 3–6(–7) × 0.2–0.3 mm, glabrous. **Flowers**: sepals oblong, 0.8–1(–1.3) × 0.5–0.8 mm; petals pale yellow, narrowly spatulate, 1–1.5(–1.9) × 0.2–0.5 mm, claw 0.5–1 mm; stamens 6; filaments 0.6–0.9 mm, (glabrous); anthers 0.1–0.2 mm. **Fruits** orbicular to rhombic or broadly obovate, 3–4.5(–5) × 3–4.1 mm, apically winged, apical notch 0.1–0.3 mm deep; valves thin, smooth, not or obscurely veined, glabrous; style 0.1–0.4 mm, subequaling or slightly exserted beyond apical notch. **Seeds** (dark brown), ovate, 1.6–2(–2.3) × 1.2–1.4 mm. $2n = 16$.

Flowering Mar–Jun. Waste places, dry sandy slopes, pinyon-juniper woodlands, sagebrush flats, open deserts, roadsides, pastures, meadows, open grasslands, alkaline flats and sinks, fields, disturbed sites; 0–2500 m; introduced; Alta., B.C., Man., Ont., Sask.; Ariz., Ark., Calif., Colo., Conn., Ga., Idaho, Ind., Iowa, Kans., Maine, Mass., Mich., Miss., Mo., Mont., Nebr., Nev., N.Mex., N.Y., N.C., Ohio, Okla., Oreg., Pa., S.Dak., Tenn., Utah, Wash., Wis., Wyo.; Europe; Asia; n Africa; introduced also in Mexico (Baja California), South America (Argentina), Australia.

34. *Lepidium pinnatifidum* Ledebour, Fl. Ross. 1: 206.

1841 [F] [I]



Annuals; puberulent. **Stems** simple from base, erect, (paniculately) branched beyond base or distally, 2–6 dm. **Basal leaves** (soon withered, often before anthesis); not rosulate; blade dentate to pinnatifid. **Cauline leaves** shortly petiolate to sessile; blade narrowly

oblanceolate to linear, 1–3.3 cm × 1–4 mm, base attenuate, not auriculate, margins entire. **Racemes** (often paniculate), considerably elongated in fruit; rachis glabrous or puberulent, trichomes straight, cylindrical. **Fruiting pedicels** divaricate-ascending to horizontal, straight, (terete), 2–3.5 × 0.1–0.15 mm, puberulent adaxially. **Flowers**: sepals oblong, 0.7–0.8 × 0.3–0.4 mm; petals (rudimentary), white, linear, 0.4–0.6 × 0.05–0.1 mm, claw absent; stamens 4, median and lateral; filaments 0.6–0.8 mm; anthers ca. 0.2 mm. **Fruits** orbicular to broadly elliptic, 1.8–2 × 1.7–1.8 mm, apically not winged, apical notch 0.05–0.1 mm deep; valves thin, smooth, not veined, sparsely pilose; style ca. 0.1 mm, equaling apical notch. **Seeds** oblong, 1–1.2 × 0.7–0.8 mm.

Flowering May–Jun. Waste places, disturbed sites; 0–600 m; introduced, Calif.; e Europe; w Asia.

Lepidium pinnatifidum apparently has not become a serious weed of the Californian flora.

35. *Lepidium ramosissimum* A. Nelson, Bull. Torrey

Bot. Club 26: 124. 1899 [F]



Lepidium bourgeauanum Thellung;
L. densiflorum Schrader var.
bourgeauanum (Thellung) C. L.
Hitchcock; *L. divergens* Osterhout;
L. fletcheri Rydberg;
L. ramosissimum var.
bourgeauanum (Thellung) Rollins;
L. ramosissimum var. *divergens*
(Osterhout) Rollins;

L. ramosissimum var. *robustum* Thellung

Perennials; puberulent, (trichomes cylindrical). **Stems** simple from base, erect, branched (several) distally, (0.6–)1–5.3(–7.7) dm. **Basal leaves** (soon withered); not rosulate; petiole 1–4 cm; blade oblanceolate or pinnatifid, 2–5 cm × 8–15 mm, margins (of lobes) entire serrate or dentate. **Cauline leaves** shortly petiolate or sessile; blade oblanceolate or (distal) linear, (0.6–)1.2–4.8 (–6) cm × 1–8(–10) mm, base attenuate to cuneate, not auriculate, margins dentate, (distal) entire, or, rarely, lobed. **Racemes** slightly elongated in fruit; rachis puberulent, trichomes curved, cylindrical to subclavate. **Fruiting pedicels** divaricate-ascending to horizontal, straight or recurved, (terete), (1.6–)2–3.8(–5) × 0.2–0.3 mm, usually puberulent adaxially, rarely throughout. **Flowers**: sepals oblong, 0.6–0.9(–1.1) × 0.3–0.4 mm; petals (absent or rudimentary), white, linear, 0.2–0.8(–1) × 0.05–0.1 mm, claw absent; stamens 2, median; filaments 0.6–0.9 mm; anthers 0.15–0.2 mm. **Fruits** elliptic, 2.2–3.2 × 1.7–2.1 mm, apically winged, apical notch 0.1–0.3(–0.4) mm deep; valves thin, smooth, not veined, glabrous or puberulent at least along margin; style usually obsolete, rarely to 0.1 mm, included in apical notch. **Seeds** oblong, 1.2–1.6 × 0.8–0.9 mm. $2n = 32, 64$.

Flowering Jun–Aug. Sagebrush communities, pine woodlands, waste grounds, roadsides, railroad embankments, alkaline flats, abandoned fields; 0–2900 m; Alta., B.C., Man., N.B., Nfld. and Labr. (Nfld.), N.W.T., Ont., Que., Sask., Yukon; Alaska, Calif., Colo., Idaho, Maine, Minn., Mont., Nebr., Nev., N.Mex., N.Dak., S.Dak., Tex., Utah, Wyo.; Mexico (Chihuahua).

As noted by R. C. Rollins (1993, p. 581), the varieties of *Lepidium ramosissimum* are “weak at best.” They are based largely on the branching habit and, most importantly, on the presence versus absence of trichomes on the fruit valve. In some collections (e.g., Scoggan 4233, GH; Boivin *et al.*, 13221, GH), both puberulent- and glabrous-fruited forms occur. It is almost certain that the same situation exists not only in other populations of this species, but in other North American *Lepidium*. It is also clear that some populations might consist entirely of one of the two forms, but it is highly unlikely that this variation has any geographical basis. Therefore, we believe that the separation of varieties solely on the basis of presence or absence of the fruit trichomes is taxonomically meaningless.

We are reluctantly including *Lepidium divergens* in the synonymy of *L. ramosissimum* because we have not seen its type; the topotypes that we studied have broadly obovate to suborbicular fruits that appear more at home in the *L. densiflorum* or *L. virginicum* complexes.

36. *Lepidium ruderales* Linnaeus, Sp. Pl. 2: 645. 1753

[F] [I] [W]



Lepidium texanum Buckley;
L. virginicum Linnaeus subsp.
texanum (Buckley) Thellung

Annuals or biennials; (fetid); puberulent (trichomes cylindrical). Stems simple from base, erect ascending, branched (several) distally, (0.5-)1-3.5 (-5.5) dm. **Basal leaves** rosulate; petiole 1-3.2(-5.3) cm; blade (1- or) 2- or 3-pinnatisect (lobes oblong), (1.5-)3-5(-7.2) cm, margins (of lobes) usually entire, rarely dentate. **Cauline leaves** sessile; blade linear, (0.4-)1-2(-3) cm × 0.5-2.5(-3.5) mm, base cuneate, not auriculate, margins entire. **Racemes** considerably elongated in fruit; rachis puberulent, trichomes straight, cylindrical. **Fruiting pedicels** divaricate to horizontal, straight, (terete), (1.5-)2-4(-5) × 0.1-0.15 mm, puberulent. **Flowers:** sepals oblong, 0.5-0.9(-1) × 0.2-0.4 mm; petals (absent or rudimentary), white, linear, 0.2-0.5 × 0.1 mm, claw absent; stamens 2, median; filaments 0.7-0.8 mm; anthers 0.1-0.2 mm. **Fruits** elliptic, (1.5-)1.8-2.5(-3) × 1.5-2(-2.3) mm, apically winged, apical notch 0.1-0.2 mm deep; valves thin, smooth, not veined, glabrous; style obsolete or to 0.1 mm, included in apical notch. **Seeds** oblong to ovate-oblong, 1-1.5 × 0.6-0.8 mm. $2n = 16, 32$.

Flowering Apr-Jul. Fields, pastures, waste places, roadsides, gardens; 0-300 m; introduced; Alta., B.C., Man., N.B., Nfld. and Labr. (Nfld.), N.S., Ont., P.E.I., Que., Sask.; Ala., Ark., Calif., Del., Fla., Ind., La., Maine, Md., Mass., Mich., N.H., N.J., N.Mex., N.Y., N.C., Ohio, Oreg., Pa., R.I., Tenn., Tex.; Eurasia; introduced also in South America, Australia.

37. *Lepidium sativum* Linnaeus, Sp. Pl. 2: 644. 1753

[F] [I]



Annuals; (often glaucous), usually glabrous, rarely sparsely pilose. **Stems** simple from base, erect, branched distally, (1-)2-8 (-10) dm. **Basal leaves** (withered by anthesis); not rosulate; petiole 1-4 cm; blade 1- or 2-pinnatifid or pinnatisect (lobes ovate to oblong), 2-8(-10) cm, margins

(of lobes) entire or dentate. **Cauline leaves** petiolate; blade similar to basal, usually less divided, rarely undivided, (distal) often linear, bases not auriculate, margins entire. **Racemes** considerably elongated in fruit; rachis glabrous. **Fruiting pedicels** suberect to ascending, appressed to rachis, straight, (terete or slightly flattened), 1.5-4(-6) × 0.4-0.6 mm, glabrous. **Flowers:** sepals oblong-obovate, 1-1.8 × 0.5-0.8 mm; petals white or

lavender, spatulate to obovate, 2-3.5(-4) × 0.7-1.4 mm, claw 1-1.4 mm; stamens 6; filaments (median pairs) 1.5-2 mm, (glabrous); anthers 0.4-0.5 mm. **Fruits** broadly ovate or ovate-oblong, (4-)5-6.4(-7) × 3-4.5 (-5.6) mm, apically broadly winged, apical notch 0.2-0.8 mm deep; valves thin, smooth, not veined, glabrous; style 0.1-0.5(-0.8) mm, usually included in, rarely subequaling, apical notch. **Seeds** (reddish brown), ovate-oblong, 2-2.7(-3) × 1-1.5 mm, (3-lobed). $2n = 16, 32$.

Flowering Apr-Aug. Gardens, old fields, vacant lots, disturbed areas, railroad embankments, waste grounds, roadsides, cultivated areas; introduced; Alta., B.C., Man., Nfld. and Labr. (Nfld.), N.W.T., N.S., Ont., P.E.I., Que., Sask.; Conn., Idaho, Iowa, Maine, Md., Mass., Mich., N.H., N.Y., Ohio, Oreg., Pa., R.I., Tenn., Wash., Wyo.; Europe; sw Asia; perhaps ne Africa; introduced also in South America (Argentina), Australia.

Lepidium sativum is cultivated as a salad green and is sporadically naturalized, though never as an aggressive weed. It is seldom collected; the above range may be incomplete.

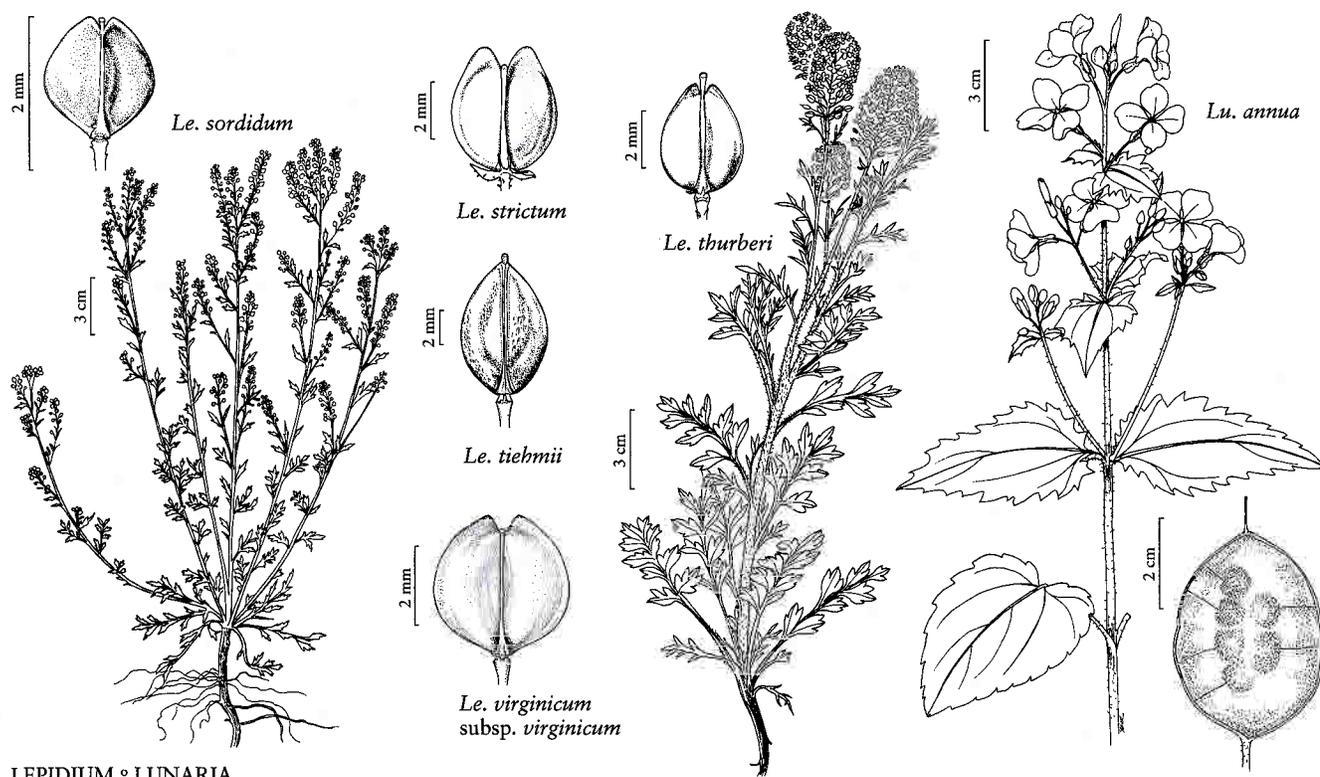
38. *Lepidium sordidum* A. Gray, Smithsonian Contr.

Knowl. 3(5): 10. 1852 [F]

*Lepidium granulare* Rose

Annuals; puberulent, (trichomes clavate). **Stems** simple or several from base, erect to decumbent, branched (several) distally, 0.5-2.4(-3.2) dm. **Basal leaves** (soon withered); not rosulate; petiole 0.8-2.5 cm; blade 1- or 2-pinnatifid, 3-5.6 cm, margins (of lobes) entire or dentate. **Cauline leaves** petiolate; blade pinnatifid (similar to basal), 0.7-2 cm × 2-10 mm, base attenuate to cuneate, not auriculate, margins dentate to incised or pinnately lobed. **Racemes** (paniculate), elongated, (often dense) in fruit; rachis puberulent, trichomes straight or curved, clavate. **Fruiting pedicels** ascending to divaricate, straight or slightly recurved, (terete), (1.4-)1.6-2.3(-2.9) × 0.1-0.15 mm, puberulent adaxially. **Flowers:** sepals (tardily deciduous), oblong, 0.5-0.7 × 0.3-0.4 mm; petals (absent or rudimentary), white, linear, 0.2-0.4 × 0.05 mm, claw absent; stamens 2, median; filaments 0.5-0.8 mm; anthers 0.1-0.15 mm. **Fruits** ovate-elliptic, 1.7-2.1 × 1.2-1.6 mm, apically winged, apical notch 0.1-0.2 mm deep; valves thin, smooth, not or weakly veined, glabrous; style 0.1-0.15 mm, included in or equaling apical notch. **Seeds** oblong, 0.8-1 × 0.5-0.6 mm.

Flowering May-Jul. Alluvial fans, sandy flats, rocky hillsides, grassy valleys, canyons; 1500-1900 m; Tex.; Mexico (Chihuahua, Durango, Federal District, Hidalgo, Sinaloa, Zacatecas).



LEPIDIUM • LUNARIA

39. *Lepidium strictum* (S. Watson) Rattan ex B. L.
Robinson in A. Gray et al., Syn. Fl. N. Amer. 1(1,1):
129. 1895 [F] [I]



Lepidium oxycarpum Torrey &
A. Gray var. *strictum* S. Watson in
W. H. Brewer et al., Bot. California
1: 46. 1876; *L. reticulatum*
Howell

Annuals; hirsute. **Stems** often several from base, usually ascending or decumbent to prostrate, rarely erect, branched distally, (0.4-)0.7-1.7(-2) dm. **Basal leaves** not rosulate; petiole 0.5-3 cm; blade 2-pinnatifid (lobes lanceolate to oblong), 1.5-5.6 cm, margins (of lobes) entire. **Cauline leaves** shortly petiolate; blade pinnatifid, 0.8-3 cm × 0.3-8 mm, base cuneate to attenuate, not auriculate, margins (of lobes) entire. **Racemes** elongated, (dense) in fruit; rachis puberulent, trichomes straight, cylindrical. **Fruiting pedicels** suberect and subappressed at base, recurved and becoming divaricate distally, strongly curved, (often flattened and narrowly winged), (1-)1.4-2.5(-3) × 0.2-0.4 mm, puberulent adaxially. **Flowers**: sepals (persistent), oblong, 0.7-1(-1.2) × 0.3-0.4 mm; petals (rudimentary), white, linear, 0.2-0.5 × 0.05 mm, claw absent; stamens 2, median; filaments 0.5-0.8 mm; anthers 0.1-0.15 mm. **Fruits** ovate-orbicular to ovate, 2.5-3.3 × 2-3 mm, apically winged, apical notch 0.3-0.6 mm deep; valves

(enclosing seeds), thin, smooth, reticulate-veined, glabrous or puberulent on margin; style obsolete or to 0.1 mm, included in apical notch. **Seeds** oblong, 1.2-1.6 × 0.7-0.8 mm. $2n = 32$.

Flowering Apr-Jun. Waste grounds, woodlands, hillsides; introduced; Calif., Oreg.; South America (Chile).

Lepidium strictum was reported from Utah (C. L. Hitchcock 1936) and Colorado (W. A. Weber 1989), but we have been unable to verify those records. The species is easily distinguished by a combination of reticulate-veined fruits, persistent sepals, flattened and narrowly winged fruiting pedicels, and filiform nectaries.

40. *Lepidium thurberi* Wooton, Bull. Torrey Bot. Club
25: 259. 1898 [F]



Annuals; pubescent, (trichomes cylindrical, to 1 mm, and much shorter, clavate ones). **Stems** often simple from base, erect, branched (several) distally, (0.8)1.2-4.9(-6) dm. **Basal leaves** (often withered at anthesis); rosulate; petiole 1-3 (-4.5) cm; blade pinnatifid (lobes oblong to ovate or lanceolate), (1.4-)2.2-7(-10) cm, margins (of lobes) dentate-sinuate. **Cauline leaves** shortly petiolate; 1.5-6 cm × 6-25 mm, base not

auriculate, margins (of lobes) entire or dentate. Racemes considerably elongated in fruit; rachis pilose, trichomes straight, cylindrical (to 1 mm) with much smaller, clavate ones, sometimes one type present. Fruiting pedicels divaricate-ascending to horizontal, straight or slightly recurved, (terete), 4–8(–10) × 0.2–0.3 mm, puberulent or pilose adaxially. Flowers: sepals suborbicular to broadly ovate, 1–1.6 × 0.7–1 mm; petals white, broadly obovate to suborbicular, 3–4 × 1.2–2.2 mm, claw 0.7–1.3 mm; stamens 6; filaments (median pairs) 1–1.6 mm, (glabrous); anthers 0.4–0.5 mm. Fruits broadly ovate to orbicular, 2–2.9 × 2–2.8 mm, apically winged, apical notch 0.1–0.2 mm deep; valves thin, smooth, not veined, glabrous; style 0.3–0.8 mm, exerted beyond apical notch. Seeds ovate-oblong, 1.3–1.6 × 0.8–1.1 mm.

Flowering Apr–Aug. Salt flats, mesquite and creosote bush communities, playas, stream banks, sandy deserts, washes, clay bottoms, bluffs, gravelly granitic sand, grasslands, alluvial fans, roadsides, silty terraces, washes, gravelly flats; 600–1800 m; Ariz., Calif., N.Mex.; Mexico (Chihuahua, Coahuila, Sonora).

41. *Lepidium tiehmii* (Rollins) Al-Shehbaz, Novon 12: 9. 2002 [C][E][F]



Stroganowia tiehmii Rollins, Syst. Bot. 7: 215, fig. 1. 1982

Perennials; (caudex woody, to 1 cm diam., covered with persistent petiolar remains); glabrous throughout. Stems simple from base (caudex branch), erect, branched distally, 1–7.5 dm. Basal leaves rosulate; petiole (1.5–)2.5–10(–13) cm; blade oblong to lanceolate, (2.5–)4.5–9(–14) cm × 15–40 mm, margins entire. Cauline leaves shortly petiolate; blade oblanceolate, (much smaller than basal), base attenuate-cuneate, not auriculate, margins entire. Racemes (paniculate), considerably elongated in fruit. Fruiting pedicels divaricate-ascending, straight, (terete), 8–15 × 0.4–0.5 mm. Flowers: sepals oblong, 2.5–3(–4) × 1.2–1.8 mm; petals creamy white to pale yellow, obovate to oblanceolate, 4–5.5(–6.5) × 2–3.3 mm, claw 1.5–2.2 mm; stamens 6; filaments (median pairs) 3.5–4.5 mm; anthers 1–1.2 mm. Fruits obovate to somewhat rhomboid, 7–11 × 5–6.5 mm, apically not winged, apical notch absent; valves thin, smooth, obscurely veined; style 0.2–0.6 mm. Seeds oblong, 3.7–4.5 × 1.6–2 mm.

Flowering Apr–Jun. Rocky crevices and slopes in sagebrush communities; of conservation concern; 1400–1800 m; Nev.

Lepidium tiehmii is known from mountain ranges in Douglas and Lyon counties. It was described and has been maintained (N. H. Holmgren 2005b) in *Stroganowia*, a genus now united with *Lepidium*

(I. A. Al-Shehbaz et al. 2002) that otherwise is disjunct and restricted to the central Asian states of the Former Soviet Union and adjacent western China. In our opinion, the similarity of this species to those Asian ones formerly placed in *Stroganowia* is superficial and is the result of convergence rather than descent.

The cotyledonary type was erroneously reported as conduplicate (R. C. Rollins 1993; N. H. Holmgren 2005b). In the several seeds that we dissected it was always incumbent.

42. *Lepidium virginicum* Linnaeus, Sp. Pl. 2: 645. 1753

[F][W]



Annuals; puberulent, (trichomes cylindrical). Stems simple from base, erect, branched distally, (0.6–)1.5–5.5(–7) dm. Basal leaves (withered by anthesis); not rosulate; petiole 0.5–3.5 cm; blade obovate, spatulate, or oblanceolate, (1–)2.5–10(–15) cm × 5–30(–50) mm, margins pinnatifid to lyrate or dentate. Cauline leaves shortly petiolate; blade oblanceolate or linear, 1–6 cm × (1–)3–10 mm, base attenuate to subcuneate, not auriculate, margins serrate or entire. Racemes considerably elongated in fruit; rachis usually puberulent, rarely glabrous, trichomes curved, cylindrical. Fruiting pedicels divaricate-ascending to nearly horizontal, straight or slightly recurved, (slender, terete or flattened), 2.5–4(–6) × 0.15–0.4 mm, puberulent adaxially or, rarely, throughout or glabrous. Flowers: sepals oblong to ovate, (0.5–)0.7–1(–1.1) × 0.4–0.7 mm; petals (rarely rudimentary), white, spatulate to oblanceolate, 1–2(–2.5) × 0.3–0.8(–1) mm, claw undifferentiated or to 0.8 mm; stamens 2, median; filaments 0.6–1.2 mm; anthers 0.1–0.2 mm. Fruits orbicular or nearly so, 2.5–3.5(–4) mm diam. (widest at middle), apically winged, apical notch 0.2–0.5 mm deep; valves thin, smooth, not veined, glabrous; style 0.1–0.2 mm, included in apical notch. Seeds ovate, 1.3–1.9(–2.1) × 0.7–1(–1.2) mm; (cotyledons accumbent or incumbent).

Subspecies 2 (2 in the flora): North America, Mexico; introduced in South America, Europe, Asia, s Africa, Australia.

Lepidium virginicum is perhaps the only species in the genus with accumbent cotyledons; the other species have incumbent cotyledons, except for Australian ones with diplocolobal cotyledons. This contradicts N. H. Holmgren's (2005b) assertion that the genus characteristically has accumbent cotyledons.

Examination of thousands of specimens provides good evidence (e.g., Florida: *Lakela et al.* 27038, GH; Missouri: *Raven & Raven* 27501, GH, MO) that *Lepidium virginicum* hybridizes with *L. densiflorum*.

The ranges of both species overlap in much of the flora area, and this intergradation is, perhaps, the reason behind the recognition of some infraspecific taxa in both species. Molecular studies, along with a critical evaluation of morphology, are needed. Typical *L. virginicum* is easily distinguished by having well-developed or, rarely, rudimentary petals, accumbent cotyledons, orbicular fruits, and raceme rachises with curved cylindrical trichomes. By contrast, *L. densiflorum* has rudimentary or, often, no petals, incumbent cotyledons, obovate fruits, and raceme rachises with straight, often subclavate trichomes.

Of the seven varieties recognized by C. L. Hitchcock (1945) and R. C. Rollins (1993) in *Lepidium virginicum*, three do not occur in the flora area, and they most likely belong to other species. The four present in our area clearly fall into two groups. The first, which corresponds to the species lectotype, has accumbent cotyledons and terete fruiting pedicels. The second group, which includes the holotypes of vars. *medium*, *pubescens*, and *robinsonii*, has incumbent cotyledons and flattened fruiting pedicels. The type of var. *medium* has completely glabrous raceme rachises and fruiting pedicels, but most authors (e.g., Hitchcock 1936, 1945; Rollins) assigned this varietal name to glabrous plants regardless of whether they have accumbent or incumbent cotyledons. Indeed, the cotyledonary position and indumentum absence (or presence) do not always covary, and some glabrous plants have accumbent cotyledons (e.g., *Demaree* 47912 (GH), from Arkansas) or incumbent cotyledons (e.g., *Demaree* 43698 (GH) from Arizona). Therefore, var. *medium* does not merit recognition. As for var. *robinsonii*, it was based solely on being shorter plants with or without divided leaves. We believe that delimitation is artificial; such plants occur sporadically in the ranges of the two groups noted above. With the elimination of vars. *medium* and *robinsonii*, *L. virginicum* consists of two infraspecific taxa recognized herein as subspecies.

1. Cotyledons accumbent; fruit valves glabrous; fruiting pedicels terete, 0.15–0.2 mm wide 42a. *Lepidium virginicum* subsp. *virginicum*
1. Cotyledons incumbent or obliquely so; fruit valves glabrous or puberulent; fruiting pedicels flattened (at least proximal to apex), (0.2–)0.3–0.4 mm wide 42b. *Lepidium virginicum* subsp. *menziesii*

42a. *Lepidium virginicum* Linnaeus
subsp. *virginicum* [F]



Lepidium virginicum var. *linearifolium* Farwell

Fruiting pedicels terete, 0.15–0.2 mm wide. Fruit valves glabrous. Cotyledons accumbent. $2n = 32$. Flowering Mar–Sep. Fields, roadsides, waste places, disturbed sites, fields, grassy areas; 0–1000 m; B.C., Nfld. and Labr.

(Nfld.), N.S., Ont., P.E.I., Que.; Ala., Ariz., Ark., Calif., Colo., Conn., Del., D.C., Fla., Ga., Ill., Ind., Iowa, Kans., Ky., La., Maine, Md., Mass., Mich., Minn., Miss., Mo., Mont., Nebr., N.H., N.J., N.Mex., N.Y., N.C., Ohio, Okla., Pa., R.I., S.C., Tenn., Tex., Vt., Va., Wash., W.Va., Wis.; Mexico; introduced in South America, Europe, Asia, s Africa, Australia.

42b. *Lepidium virginicum* Linnaeus subsp. *menziesii*
(de Candolle) Thellung, Mitt. Bot. Mus. Univ. Zürich 28: 230. 1906



Lepidium menziesii de Candolle, Syst. Nat. 2: 539. 1821;
L. bernardinum Abrams;
L. californicum Nuttall;
L. glaucum Greene; *L. hirsutum* Rydberg; *L. idahoense* A. Heller;
L. intermedium var. *pubescens* Greene; *L. medium* Greene;
L. medium var. *pubescens* (Greene)

B. L. Robinson; *L. occidentale* Howell; *L. robinsonii* Thellung; *L. simile* A. Heller; *L. virginicum* var. *californicum* Jepson; *L. virginicum* var. *medium* (Greene) C. L. Hitchcock; *L. virginicum* var. *menziesii* (de Candolle) C. L. Hitchcock; *L. virginicum* var. *pubescens* (Greene) Thellung; *L. virginicum* var. *robinsonii* (Thellung) C. L. Hitchcock

Fruiting pedicels flattened (at least proximal to apex), (0.2–)0.3–0.4 mm wide. Fruit valves glabrous or puberulent. Cotyledons incumbent or obliquely so. $2n = 32$.

Flowering Mar–Jun. Roadsides, bottomlands, gravelly and sandy shores, waste grounds, stream banks, grassy meadows, dry flats and stream beds, abandoned fields, woods, cliffs, plains, pastures, sagebrush and other desert shrub communities, dry mountain slopes; 700–2600 m; B.C.; Ariz., Calif., Colo., Idaho, Mont., Nev., N.Mex., Oreg., Tex., Utah, Wash., Wyo.; Mexico.