

BOECHERA Á. Löve & D. Löve, Bot. Not. 128: 513. 1975.
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Tribe: Boechereae Al-Shehbaz, Beilstein & E.A. Kellogg, Pl. Syst. Evol. 259: 111. 2006.
Name derivation: after Tyge Wittrock Böcher, 1909–1983, a Danish cytogenetist who worked on subarctic flowering plants

Type species: *Boechera holboellii* (Hornemann) Á. Löve & D. Löve (based on *Arabis holboellii* Hornemann).

Herbs, sexual or apomictic, perennial or rarely biennial; caudex (when present) simple or branched. **Trichomes** simple or branched and stalked or sessile, 2–14-rayed, sometimes dendritic, not stellate. **Stems** simple or branched apically. **Basal leaves** petiolate, rosulate or not, simple, entire or dentate, rarely lyrate-pinnatifid; cauline leaves sessile or very rarely short petiolate, sometimes auriculate or sagittate, entire or dentate. **Inflorescences** ebracteate, sometimes in panicles, often elongated in fruit; fruiting pedicels erect, ascending, or divaricate, or reflexed, secund or not. **Sepals** ovate or oblong, base of lateral pair slightly saccate or not, margin membranous; petals white, pink, or purple; blade spatulate or oblanceolate, apex obtuse; claw shorter than sepals or undifferentiated from blade; stamens 6, tetradynamous; filaments not dilated at base; anthers ovate or oblong, obtuse at apex; pollen ellipsoid (sexual plants) or spheroid (apomictic); nectar glands confluent, subtending bases of all stamens; lateral glands semi-annular or annular; ovules and seeds 8–216 per fruit. **Fruits** dehiscent siliques, linear, rarely oblong or lanceolate, straight or falcate, variously oriented, latiseptate, sessile or rarely shortly stipitate, glabrous or rarely pubescent; valves papery, with an obscure or prominent midvein, smooth or torulose; replum rounded, visible; septum complete, membranous, veinless; style obsolete or distinct; stigma capitate, entire. **Seeds** uniseriate or rarely biseriate in each locule, winged, margined, or wingless, oblong or orbicular, flattened; seed coat smooth or minutely reticulate, rarely papillate, not mucilaginous when wetted; cotyledons accumbent.

About 110 species: United States, Canada, n Mexico; Russian Far East.

References: Al-Shehbaz (2003d, 2005c), Windham & Al-Shehbaz (2006, 2007a, 2007b).

A very complex genus and for detailed discussion of such complexity and taxonomic notes, as well as the putative parental species of the triploids, see the references above.

INTERACTIVE KEY TO THE SPECIES IS BEING PREPARED

Sexual diploid (72 spp.)

1. ACUTINA
2. arcuata
3. atrorubens
4. BODIENSIS
5. breweri
6. burkii
7. CALDERI
8. CALIFORNICA
9. canadensis
10. CASCADENSIS
11. cobrensis
12. collinsii
13. CONSANGUINEA
14. constancei
15. COVILLEI
16. crandallii
17. cusickii
18. davidsonii
19. dentata
20. DEPAUPERATA
21. dispar
22. DIVARICARPA
23. DREPANOLOBA
24. DUCHESNENSIS
25. ELKOENSIS
26. evadens
27. falcata
28. FALCATORIA
29. FALCIFRUCTA
30. fecunda
31. fendleri
32. fernaldiana
33. formosa
34. FRUCTICOSA
35. glareosa
36. glaucovalvula
37. GOODRICHII
38. GRACILENTA
39. gracilipes
40. GRAHAMII
41. gunnisoniana
42. HARRISONII

**APOMICTIC TRIPLOID (38
spp.)**

43. HASTATULA
44. hoffmannii
45. holboellii
46. HORIZONTALIS
47. howellii
48. INYOENSIS
49. johnstonii
50. koehleri
51. laevigata
52. LANGUIDA
53. lasiocarpa
54. lemmonii
55. lignifera
56. lincolnensis
57. lyallii
58. MACOUNII
59. microphylla
60. missouriensis
61. nevadensis
62. ophira
63. oxylobula
64. PADDOENSIS
65. pallidifolia
66. parishii
67. PAUCIFLORA
68. paupercula
69. PEIRSONII
70. pendulina
71. pendulocarpa
72. perennans
73. perstellata
74. PINETORUM
75. PINZLIAE
76. platysperma
77. polyantha
78. PORPHYREA
79. PRATINCOLA
80. puberula
81. pulchra
82. PUSILLA
83. pygmaea
84. QUEBECENSIS
85. rectissima
86. repanda
87. retrofracta
88. RIGIDISSIMA
89. rollei
90. rollinsiorum
91. RUBICUNDULA
92. SAXIMONTANA
93. schistacea
94. serotina
95. serpenticola
96. shevockii
97. shockleyi
98. sparsiflora
99. spatifolia
100. stricta
101. subpinnatifida
102. suffrutescens
103. texana
104. tiehmii
105. TULARENSIS
106. ultraalsa
107. villosa
108. williamsii
109. XYLOPODA

110. yorkii

1. *Boecheera acutina* (Greene) Windham & Al-Shehbaz, Harvard Pap. Bot. 12: 236. 2007; *Arabis acutina* Greene, Leafl. Bot. Observ. Crit. 2: 82. 1910. TYPE: United States, Oregon, Mount Thielson, Cascade Mts., 6 August 1897, *Frederick V. Coville & Elmer I. Applegate 434* (Lectotype: US; Isolectotypes: DS, RM, US, WILLU).

Arabis interposita Greene, Leafl. Bot. Observ. Crit. 2: 78. 1910; *A. drummondii* A. Gray var. *interposita* (Greene) Rollins, Res. Stud. State Coll. Wash. 4: 45. 1936; *A. divaricarpa* A. Nelson var. *interposita* (Greene) Rollins, Rhodora 43: 378. 1941. TYPE: United States, Oregon, Ashland Butte, Siskiyou Mts., and near Crater Lake, Cascade Mts., 14 July and 22 August 1902, *W. C. Cusick 2970* (holotype: US!; isotypes: GH!, NY1, OSC1).

Plants short-lived perennials or biennials, with or without caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1.5–6.0 dm, lower parts with many, sessile, 2–4-rayed trichomes 0.15–0.40 mm, upper parts sparsely pubescent or rarely glabrous. Leaves at stem bases oblanceolate, 1.5–6.0 mm wide, entire or rarely denticulate, ciliate proximally with simple trichomes to 0.5 mm, blade surfaces sparsely to moderately pubescent with sessile, 3–5(–6)-rayed trichomes 0.15–0.35 mm; cauline leaves 2–20(–38), often concealing stem proximally, the uppermost sparsely pubescent or glabrous, with auricles 0.3–2.0 mm. Inflorescences mostly unbranched, 5–20(–36)-flowered; fruiting pedicels 3–10 mm, erect to ascending, mostly straight, with appressed, branched trichomes or glabrous. Flowers ascending at anthesis; sepals pubescent; petals white or lavender, 5–7 × 0.9–1.3 mm, glabrous; ovules 46–100 per fruit. Fruits 2.5–7.5 cm × 1.2–1.8 mm, ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.3–1.0 mm. Seeds uniseriate, 1.8–2.2 × 1.0–1.4 mm; wing continuous, 0.1–0.4 mm wide.

Flowering: Jun–Jul.

Habitat: gravelly slopes in meadows and open forests.

Elevation: 1400–1850 m.

Distribution: United States (California, Idaho, Oregon).

Reproductive mode: triploid apomict.

2. *Boecheera arcuata* (Nuttall) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 64. 2006; *Streptanthus arcuatus* Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 77. 1838; *Arabis arcuata* (Nuttall) A. Gray, Proc. Amer. Acad. Arts 6: 187. 1864, non Shuttelworth ex Godet, Fl. Jura 1: 38. 1852; *A. holboellii* Hornemann var. *arcuata* (Nuttall) Jepson, Man. Fl. Pl. Calif. 430. 1925; *A. sparsiflora* Nuttall var. *arcuata* (Nuttall) Rollins, Res. Stud. State Coll. Wash. 4: 26. 1936. TYPE: United States, California, Santa Barbara, *T. Nuttall s.n.* (holotype, BM!; isotypes, GH!, K!, PH!).

Arabis maxima Greene, Pittonia 4: 192. 1900. TYPE: United States, California, not designated.

Plants mostly long-lived perennials, with well-developed, often woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, elevated on woody bases or produced at ground surface, arising from center of basal rosettes, (2–)3–8 dm, lower parts with many short-stalked, 2-rayed and simple trichomes to 1 mm, upper parts pubescent. Leaves at stem bases linear to oblanceolate, 2–7(–12) mm wide, entire or rarely denticulate, ciliate along petiole with trichomes to 1.5 mm, blade surfaces densely pubescent with short-stalked, 2–5-rayed (rarely some simple) trichomes 0.4–0.8 mm; cauline leaves 10–30(–45), often concealing stem proximally, the uppermost pubescent, with auricles 2–5(–6) mm. Inflorescences mostly unbranched, 12–50(–70)-flowered; fruiting pedicels 8–22 mm, divaricate-ascending or rarely horizontal, gently recurved or straight, with subappressed 2–4-rayed

trichomes. Flowers ascending at anthesis; sepals pubescent; petals purple, 9–14 × 2–4 mm, glabrous or with a few trichomes abaxially; ovules 90–250 per fruit. Fruits (6–)8–13 cm × 1.5–2.2 mm, divaricate-ascending or rarely horizontal, not appressed to rachises, not secund, usually curved, with parallel edges, glabrous or with a few scattered trichomes; style 0.01–0.50 mm. Seeds uniseriate or subbiseriate, 1.5–1.7 × 1.0–1.2 mm; wing continuous, 0.1–0.2 mm wide.

Flowering: Mar–Jun.

Habitat: rocky hillsides and cliffs in pine forests and chaparral.

Elevation: 300–1800 m.

Distribution: United States (California).

Reproductive mode: sexual diploid.

3. *Boechea atrorubens* (Suksdorf ex Greene) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 64. 2006; *Arabis atrorubens* Suksdorf ex Greene, Erythea 1: 223. 1893; *A. sparsiflora* Nuttall var. *atrorubens* (Suksdorf ex Greene) Rollins, Res. Stud. State Coll. Wash. 4: 26. 1936.

TYPE: United States, Washington, western Klickitat County, on rocky mountain summits, 17 May 1892, W. N. Suksdorf 2105 (holotype: WS!; isotypes: GH!, MO!, NY, 2U!, WS!).

Arabis atriflora Suksdorf, Deutsch. Bot. Monatsschr. 16: 211. 1898. TYPE: same as above.

Plants mostly short-lived perennials, with non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.8–6.0 dm, lower parts with scattered, simple and short-stalked, 2-rayed trichomes 0.10–0.15 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 4–10 mm wide, usually dentate, not ciliate, blade surfaces densely pubescent with short-stalked, 3–4-rayed trichomes 0.1–0.2 mm; cauline leaves 7–25, concealing stem proximally, the uppermost glabrous, with auricles 1–4 mm. Inflorescences mostly unbranched, 6–20-flowered; fruiting pedicels 5–10 mm, ascending, usually straight, glabrous or with spreading, simple trichomes. Flowers ascending at anthesis; sepals pubescent; petals dark reddish purple drying indigo, 7–9 × 1.5–2.0 mm, glabrous; ovules 80–100 per fruit. Fruits (4–)6–12 cm × 1.7–2.2 mm, ascending, not appressed to rachises, not secund, curved or straight, with parallel edges, glabrous; style 0.2–0.5 mm. Seeds uniseriate, 1.2–1.7 × 0.9–1.2 mm; wing distal and lateral, 0.1–0.2 mm wide.

Flowering: Apr–May.

Habitat: rocky summits and sandy loam on sagebrush slopes.

Elevation: ca. 600 m.

Distribution: United States (Oregon, Washington).

Reproductive mode: sexual diploid.

4. *Boechea bodiensis* (Rollins) Al-Shehbaz, Novon 13: 384. 2003; *Arabis bodiensis* Rollins, Contr. Gray Herb. 212: 113. 1982. TYPE: United States, California, Mono Co., 2 mi. NW of Masonic, 5.9 mi. from Bridgeport-Sweetwater highway, loose soil of old mine, 8100 ft., 3 Aug 1945, I. L. Wiggins & R. C. Rollins 536 (holotype, GH!; isotypes, DS!, GH!, UC!).

Plants long-lived, caespitose perennials with somewhat woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1.5–3.5 dm, lower parts with many short-stalked, 5–10-rayed trichomes to 0.7 mm, upper parts sparsely pubescent to glabrous. Leaves at stem bases narrowly oblanceolate, 1–3 mm wide, entire, ciliate proximally with trichomes to 0.7 mm, blade surfaces densely pubescent with short-stalked, 5–10-rayed trichomes 0.08–0.25 mm; cauline leaves 4–9, not concealing stem, the uppermost pubescent, with auricles 0.5–2.0 mm.

Inflorescences mostly unbranched, 8–25-flowered; fruiting pedicels 3–7 mm, ascending to divaricate-ascending, straight, with appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals lavender to purple, 4–5 × ca. 1 mm, glabrous; ovules 48–68 per fruit. Fruits 4.0–6.2 cm × 1.2–1.8 mm, divaricate-ascending, not appressed to rachises, not secund, straight or curved, with parallel edges, glabrous; style 0.1–0.2 mm. Seeds uniseriate, 1–1.5 × 0.8–1.2 mm; wing continuous, 0.1–0.15 mm wide.

Flowering: Jul–Aug.

Habitat: loose soil and crevices of igneous rock.

Elevation: 2400–2900 m.

Distribution: United States (California, Nevada).

Reproductive mode: apomictic triploid.

5. *Boechera breweri* (S. Watson) Al-Shehbaz, Novon 13: 384. 2003.

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, somewhat elevated on woody bases or produced at ground surface, arising from center of basal rosettes, 0.6–3.5(–4.5) dm, lower parts with many simple and long-stalked, 2-rayed (occasionally all simple) trichomes 0.4–1 mm, upper parts sparsely pubescent or glabrous. Leaves at stem bases oblanceolate, 3–7(–11) mm wide, entire or dentate, ciliate proximally with trichomes to 1 mm, blade surfaces densely pubescent with long-stalked, 2–4-rayed trichomes 0.4–0.8 mm; cauline leaves 5–15(–28), often concealing stem proximally, the uppermost pubescent, with auricles 0.5–3.0(–5.0) mm.

Inflorescences mostly unbranched, 7–20(–30)-flowered; fruiting pedicels 3–25 mm, ascending to divaricate-ascending, straight, with spreading, simple and 2-rayed trichomes or glabrous. Flowers ascending at anthesis; sepals pubescent; petals purple or rarely lavender, 7–12 × 2–4 mm, glabrous; ovules 48–96 per fruit. Fruits 3.5–10.0 cm × 1.5–2.2 mm, ascending to divaricate-ascending, not appressed to rachises, not secund, curved or rarely straight, with parallel edges, glabrous or rarely sparsely pubescent; style 0.05–0.30 mm. Seeds uniseriate, 1.2–1.7 × 1.0–1.2 mm; wing continuous, 0.1–0.2 mm wide.

Flowering: Mar–Jul.

Habitat: rocky outcrops, ledges and talus, woodlands.

Elevation: 300–2250 m.

Distribution: United States (California, Oregon).

Reproductive mode: sexual diploid.

Two subspecies: United States (California, Oregon).

KEY TO THE SUBSPECIES OF *BOECHERA BREWERI*

1. Stems 0.6–2 dm tall, pubescent distally; fruiting pedicels 3–8(–12) mm long, pubescent; fruits 3.5–7.5 cm long.....5a. subsp. *breweri*
1. Stems 1.8–3.5(–4.5) dm tall, glabrous distally; fruiting pedicels (7–)10–25 mm long, glabrous; fruit (4.5–)7–10 cm long.....5b. subsp. *shastaensis*

5a. *Boechera breweri* subsp. *breweri*. *Arabis breweri* S. Watson, Proc. Amer. Acad. Arts 11: 123. 1875. TYPE: United States, California, [Contra Costa Co.], rocky summit of eastern peak of Mt. Diablo, 4 May 1862, *W. H. Brewer 1086* (lectotype, designated by Rollins (1941: 408), GH!; isotypes, DS!, MO!, 2UC!, US!).

Arabis breweri var. *figularis* Jepson, Fl. Calif. 2: 65. 1936. TYPE: United States, California, Mendocino County, Potter Valley, April 1898, *C. A. Purpus s.n.* (holotype, JEPS!).

Arabis epilobioides Greene, Repert. Sp. Nov. Regni Veg. 5: 242. 1908. TYPE: United States, California, Lake County, near summit of Mt. Sanhedrin, 24 Jul 1902, A. A. Heller s.n. (holotype, US!; isotypes, DS!, E!, GH!, MO!, NY!).

Stems 0.6–2 dm, often densely pubescent proximally, moderately to sparsely pubescent distally. Inflorescences with fruiting pedicels 3–8(–12) mm, moderately to sparsely pubescent. Fruits 3.5–7.5 cm.

Flowering: Mar–Jul.

Habitat: rocky outcrops, ledges and talus.

Elevation: 500–2250 m.

Distribution: United States (California, Oregon).

5b. *Boechea breweri* subsp. *shastaensis* Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 65.

2006. TYPE: United States, California, California: Shasta, intersection of sections 30, 29, 31, and 32, T36N, R2W(NW 1/4 sect. 32), Bollibokka Mt. Quad., Shasta-Trinity National Forest, 2700 ft, moist cracks of limestone outcrop, N exposure, 13 May 1980, B. Williams 359 (holotype, UC!).

Arabis austinae Greene, Repert. Sp. Nov. Regni Veg. 5: 242. 1908; *A. breweri* S. Watson var. *austinae* (Greene) Rollins, Rhodora 43: 409. 1941. TYPE: United States, California, [Butte County], Little Chico Canyon, March and Apr 1896, R. M. Austin s.n. (holotype, NDG!).

Arabis rostellata Greene, Leaf. Bot. Observ. Crit. 2: 71. 1910. TYPE: United States, Oregon: [Josephine County], Mt. Grayback, 15 Jun 1904, C. V. Piper 5156 (holotype, US!; isotypes, GH!, WILLU).

Stems 1.8–3.5(–4.5) dm, moderately to sparsely pubescent proximally, usually glabrous distally. Inflorescences with fruiting pedicels (7–)10–25 mm, glabrous or with a few scattered hairs. Fruits (4.5–)7–10 cm. $2n = 14$.

Flowering: Mar–Jun.

Habitat: rocky areas in woodlands.

Elevation: 300–1200 m.

Distribution: United States (California, Oregon).

6. *Boechea burkii* (Porter) Windham & Al-Shehbaz, Harvard Pap. Bot. 12: 237. 2007; *Arabis laevigata* Muhlenberg ex Willdenow var. *burkii* Porter, Bull. Torrey Bot. Club 17: 15. 1890; *A. burkii* (Porter) Small, Man. Fl. Southeast. U.S. 572. 1933. TYPE: United States, Pennsylvania. Franklin County: Mercersburg, 1852, Isaac Burk s.n. (holotype, PH!; Isotype: GH!).

Plants biennials, without evident caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per plant, arising near ground surface from center of basal rosettes, (2–)3–7 dm, glabrous and often glaucous throughout. Leaves at stem bases oblanceolate to obovate, 4–10 mm wide, dentate, not ciliate, blade surfaces glabrous or sparsely pubescent subapically with simple trichomes 0.3–0.8 mm; cauline leaves 18–28, often concealing stem proximally, the uppermost glabrous, without auricles. Inflorescences mostly unbranched, 20–50-flowered; fruiting pedicels 4–12 mm, ascending to divaricate-ascending, usually straight, glabrous. Flowers ascending at anthesis; sepals glabrous; petals white, 3–5 × 0.5–0.7 mm, glabrous; ovules 64–80 per fruit. Fruits 5–10 cm × 1.5–1.8 mm, divaricate-ascending, not appressed to rachises, not secund, curved or rarely straight, with parallel edges, glabrous; style 0.2–0.6 mm. Seeds uniseriate, 1.5–1.8 × 1.2–1.4 mm; wing continuous, 0.3–0.5 mm wide distally.

Flowering Apr–May.

Habitat: rocky areas, wooded slopes, and river banks.

Distribution: United States (Maryland, Pennsylvania, Tennessee, Virginia, West Virginia).

Reproductive mode: sexual diploid.

7. *Boechera calderi* (G. A. Mulligan) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 259. 2007; *Arabis calderi* G. A. Mulligan, Rhodora 97: 144. 1996. TYPE: Canada, British Columbia. Indian River at Mile 34 from Alaska Highway on Atlin road, common on open grassy flats on bench above river, ca. 59°54' N, 133°48' W, 9 Jun 1960, *J. A. Calder & J. M. Gillett 25180* (holotype, DAO!).

Plants mostly short-lived perennials, with non-woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1.0–4.5 dm, glabrous throughout. Leaves at stem bases oblanceolate, 1.5–6.0 mm wide, entire, ciliate at petiole base with trichomes to 0.8 mm, blade surfaces sparsely pubescent with sessile, malpighiaceae (mostly at margin) and 3–4-rayed trichomes 0.15–0.40 mm; cauline leaves 5–17, often concealing stem proximally, the uppermost glabrous, with auricles 1–3 mm. Inflorescences unbranched, 10–25-flowered; fruiting pedicels 5–10 mm, erect, straight, glabrous. Flowers erect at anthesis; sepals glabrous; petals purple, 6–9 × 1.5–2.5 mm, glabrous; ovules 64–134 per fruit. Fruits 3.5–6.5 cm × 1.8–2.5 mm, erect, appressed to rachis, not secund, straight, with parallel edges, glabrous; style obsolete or to 0.2 mm. Seeds biseriate to subbiseriate, 1.8–2.2 × 1–1.8 mm; wing continuous, 0.2–0.5 mm wide. Flowering: Jun–Aug.

Habitat: exposed rocky ridges, meadows, and open forests near timberline.

Elevation: 1500–3500 m.

Distribution: Canada (Alberta, British Columbia, Northwest Territories, Yukon), United States (California, Idaho, Montana, Oregon, Washington, Wyoming).

Reproductive mode: apomictic triploid.

8. *Boechera californica* (Rollins) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 260. 2007; *Arabis sparsiflora* Nutt. var. *californica* Rollins, Rhodora 43: 402. 1941. TYPE: United States, California, San Diego County, on dry hills near Campo, 24 May 1903, *LeRoy Abrams 3563* (holotype, GH!; isotypes, E!, MO!, POM!, US!).

Plants mostly long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, elevated above ground surface on woody bases, arising from center of basal rosettes, (2–)3.5–13 dm, lower parts with abundant, short-stalked, 2–4 rayed trichomes 0.3–0.9 mm, upper parts moderately to sparsely pubescent. Leaves at stem bases linear to oblanceolate, 3–10(–13) mm wide, entire to denticulate, ciliate on petiole with trichomes to 1.3 mm, blade surfaces densely pubescent with short-stalked, 4–8-rayed trichomes 0.2–0.5 mm; cauline leaves 12–35(–55), often concealing stem proximally, the uppermost pubescent, with auricles 1–5(–6) mm. Inflorescences mostly unbranched, 30–120-flowered; fruiting pedicels 4–20 mm, descending to horizontal, recurved or rarely straight, with appressed, 3–7-rayed trichomes. Flowers divaricate-ascending at anthesis; sepals pubescent; petals purple (rarely pinkish), 9–14 × 1.5–3.0 mm, glabrous or with scattered trichomes abaxially; ovules 140–180 per fruit. Fruits (6–)8–12 cm × 1.5–2.5 mm, widely pendent, not appressed to rachises, not secund, curved or rarely straight, with parallel edges, glabrous or with occasional scattered trichomes; style 0.05–0.30 mm. Seeds uniseriate or subbiseriate, 1.7–2 × 1.2–1.7 mm; wing continuous, 0.2–0.4 mm wide.

Flowering: Mar–Jun.

Habitat: rocky slopes and gravelly soil in desert chaparral and oak woodland.
Elevation: 350–2300 m.
Distribution: Mexico (Baja California), United States (California).
Reproductive mode: apomictic triploid.

9. *Boechea canadensis* (Linnaeus) Al-Shehbaz, *Novon* 13: 384. 2003; *Arabis canadensis* Linnaeus, *Sp. Pl.* 2: 665. 1753. TYPE: “Habitat in America septentrionali” [Lectotype designated by Reveal in Cafferty & Jarvis 2002: 531, *Clayton 400*, Herb. Linn. No. 842.12, left specimen (LINN; isolectotype, BM!)]

Arabis falcata Michaux, *Fl. Bor.-Amer.* 2: 31. 1803; not A. Richard, *Tent. Fl. Abyss.* 1: 17. 1847; nor (Turczaninow) Berkutenko, *Bot. Zhurn. (Moscow & Leningrad)* 61: 1597. 1976. TYPE: United States,

Arabis mollis Rafinesque, *Amer. Monthly Mag. & Crit. Rev.* 2: 43. 1817, not *A. mollis* Stevens, *Mem. Soc. Nat. Mosc.* 3: 270. 1812. TYPE: United States, not located.

Turritis ovata Pursh, *Fl. Amer. Sept.* 2: 438. 1814; *A. ovata* (Pursh) Poiré, *Encycl. Suppl.* 5: 557. 1817. *Arabis hirsuta* (Linnaeus) Scopoli var. *ovata* (Pursh) Torrey & A. Gray, *Fl. N. Amer.* 1: 80. 1838; TYPE: United States, not located.

Plants biennials, without evident caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems 1 per plant, arising near ground surface from center of basal rosettes, 2.5–10.0(–12.5) dm, lower parts with few to many simple trichomes to 1 mm, upper parts glabrous or sparsely pubescent. Leaves at stem bases obovate to oblanceolate, 10–30 mm wide, dentate, ciliate proximally with simple trichomes to 1 mm, blade surfaces moderately pubescent with simple trichomes 0.5–1.5 mm, these mixed with smaller, 2–3-rayed trichomes; cauline leaves 12–20, pubescent, often concealing stem proximally, the uppermost sparsely pubescent, lacking auricles or the lowermost with auricles 0.5–2.0(–5.0) mm. Inflorescences occasionally branched, 15–65(–82)-flowered; fruiting pedicels 6–13(–17) mm, descending to horizontal, curved or rarely straight, with subappressed, mostly 2-rayed trichomes or glabrous. Flowers divaricate-ascending to horizontal at anthesis; sepals pubescent; petals white, 3–5 × 0.7–1.2 mm, glabrous; ovules 40–62 per fruit. Fruits 4–10 cm × 2.5–4.0 mm, pendent to horizontal, not appressed to rachises, often secund, curved, with parallel edges, glabrous; style 0.3–0.8(–1.1) mm. Seeds uniseriate, 1.7–3.5 × 1.5–2.2 mm; wing continuous, 0.4–1.0 mm wide distally. $2n = 14$.

Flowering: Apr–Jul.

Habitat: bluffs, rocky slopes, ravines, and open woods.

Elevation: 0–1150 m.

Distribution: Canada (Quebec), United States (Alabama, Arkansas, Connecticut, District of Columbia, Florida, Georgia, Illinois, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Texas, Vermont, Virginia, West Virginia, Wisconsin).

Reproductive mode: Sexual diploid.

10. *Boechea cascadiensis* Windham & Al-Shehbaz, *Harvard Pap. Bot.* 11: 260. 2007; *Arabis microphylla* Nuttall var. *thompsonii* Rollins, *Rhodora* 43: 429. 1941, not *Boechea thompsonii* (S. L. Welsh) N. H. Holmgren in N. H. Holmgren et al., *Intermountain Fl.* 2b: 374. 2005. TYPE: United States, Washington, Kittitas County, alpine meadows of Table Mt., 5000 ft [1515 m], 3 July 1933, *J. W. Thompson 9266* (holotype, GH!; isotypes; MO!, NY!, US!).

Plants long-lived, caespitose perennials, with somewhat woody caudices; lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising

near ground surface from center of basal rosettes, 0.5–2.2 dm, lower parts with few simple and short-stalked, 2–3-rayed trichomes 0.1–0.2 mm, upper parts glabrous. Leaves at stem bases linear-oblongate, 0.7–2.0 mm wide, entire, ciliate proximally with trichomes to 0.4 mm, blade surfaces densely pubescent with short-stalked, (2–)3–6-rayed trichomes 0.05–0.2(–0.3) mm; cauline leaves 4–6, not concealing stem, the uppermost glabrous, with auricles 0.5–1 mm. Inflorescences unbranched, 3–11-flowered; fruiting pedicels 3–8 mm, ascending to divaricate-ascending, straight, glabrous. Flowers ascending at anthesis; sepals glabrous or sparsely pubescent; petals lavender, 5–6 × 1.0–1.7 mm, glabrous; ovules 58–80 per fruit. Fruits 3.5–6.2 cm × 1.2–1.5 mm, ascending to divaricate-ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.8–1.5 mm. Seeds uniseriate, 1.1–1.3 × 0.9–1.0 mm; wing continuous, 0.05–0.1 mm wide.

Flowering: Jun.

Habitat: basaltic cliffs and rocky slopes in subalpine areas.

Elevation: ca. 1900 m.

Distribution: United States (Oregon, Washington).

Reproductive mode: apomictic triploid.

11. *Boechera cobrensis* (M. E. Jones) Dorn, Vasc. Pl. Wyoming, ed. 3. 375. 200; *Arabis cobrensis* M. E. Jones, Contr. W. Bot. 12: 1. 1908. TYPE: United States, Nevada, Elko Co., Cobre, clay hills, 6000 ft., 16 Jun 1906, *M. E. Jones s.n.* (holotype, POM!; isotypes, BM!, CAS!, MO!, OSC!, POM!, UC!, US!).

Arabis canescens Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 83. 1838, not Brocchi. Bibliot. Ital. 29: 90. 1823. TYPE: United States, Rocky Mountains, *T. Nuttall s.n.* (holotype, BM!; isotypes, GH!, K!, NY!, PH!).

Plants long-lived, often caespitose perennials, with somewhat woody caudices, usually lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground level from center of basal rosettes, (1.2–)2.5–6.0 dm, lower parts with abundant, short-stalked, 4–10-rayed trichomes 0.1–0.2 mm, upper parts sparsely pubescent to glabrous. Leaves at stem bases linear to narrowly oblanceolate, 1–4 mm wide, entire, ciliate near petiole bases with simple trichomes to 0.6 mm, blade surfaces densely pubescent with short-stalked, 4–10-rayed trichomes 0.1–0.2 mm; cauline leaves 5–10, not concealing stem, the uppermost usually sparsely pubescent, with auricles 1.0–1.5 mm. Inflorescences often sparingly branched, 10–25-flowered; fruiting pedicels 4–17 mm, divaricate-ascending to horizontal, often straight proximally, usually strongly recurved or reflexed distally, with appressed, branched trichomes or rarely glabrous. Flowers divaricate-ascending at anthesis; sepals pubescent; petals white to lavender, 3.5–6.0 × 0.7–1.0 mm, glabrous; ovules 34–64 per fruit. Fruits 2.5–5.5 cm × 1.7–2.5 mm, pendent, not appressed to rachises, not secund, straight or slightly curved, with parallel edges, glabrous; style 0.05–0.20 mm. Seeds uniseriate, 1.4–1.8 × 1.0–1.2 mm; wing continuous, 0.25–0.50 mm wide. $2n = 14$.

Flowering: May–Jun.

Habitat: sandy soil, usually under shelter of shrubs in semi-desert communities.

Elevation: 1200–2800 m.

Distribution: United States (California, Idaho, Nevada, Oregon, Wyoming).

Reproductive mode: sexual diploid.

12. *Boechera collinsii* (Fernald) Á. Löve & D. Löve, Taxon 31: 125. 1982; *Arabis collinsii* Fernald, Rhodora 7: 32. 1905; *A. holboellii* Hornemann var. *collinsii* (Fernald) Rollins,

Rhodora 43: 445. 1941; *A. retrofracta* Graham var. *collinsii* (Fernald) B. Boivin, Canad. Field-Naturalist 65: 17. 1951. TYPE: Canada, Quebec, Rimouski County, E of Baptiste Michaud's, Bic, 16 & 18 Jul 1904, J. F. Collins & M. L. Fernald s.n. (holotype, GH!; isotypes, CAN!, DAO!, NY!).

Plants mostly short-lived perennials, with non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, (1.5–)2.5–8.0 dm, lower parts with abundant, simple and short-stalked, 2-rayed trichomes to 1 mm, upper parts sparsely pubescent or glabrous. Leaves at stem bases oblanceolate, 1–7 mm wide, entire to dentate, ciliate along petioles with simple trichomes to 0.7 mm, blade surfaces moderately to densely pubescent with short-stalked, 5–8-rayed trichomes 0.15–0.4 mm; cauline leaves (8–)15–40, concealing stem proximally, the uppermost usually sparsely pubescent, with auricles 1–3 mm. Inflorescences mostly unbranched, (15–)30–90-flowered; fruiting pedicels 4–13 mm, reflexed, abruptly recurved at base but otherwise straight, glabrous or with few, mostly simple trichomes. Flowers descending to pendent at anthesis; sepals pubescent; petals white or rarely lavender, 4–6 × 0.8–1.5 mm, glabrous; ovules 70–126 per fruit. Fruits 3.5–6.0 cm × 0.9–1.5 mm, strongly reflexed, usually appressed to rachises, rarely somewhat secund, straight, with parallel edges, glabrous; style 0.2–0.5 mm. Seeds uniseriate, 1.0–1.4 × 0.8–1.0 mm; wing continuous (rarely absent), to 0.1 mm wide. $2n = 14$.

Flowering: May–Jun.

Habitat: rocky and gravelly hillsides, prairies, open woods, and floodplains.

Elevation: 600–1400 m.

Distribution: Canada (Alberta, Manitoba, Quebec, Saskatchewan), United States (Idaho, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Wyoming).

Reproductive mode: sexual diploid.

13. *Boechea consanguinea* (Greene) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 261.

2007; *Arabis consanguinea* Greene, Pittonia 4: 190. 1900; *A. holboellii* Hornemann var. *consanguinea* (Greene) G. A. Mulligan, Rhodora 97: 155. 1996. TYPE: United States, Colorado. Conejos Co.: Los Pinos, 7000 ft [2121 m], 18 May 1899, C. F. Baker³⁴¹ (holotype, NDG!; isotypes, E!, K!, MO!, 2NDG!, NY!, POM!, RM!, US!).

Plants short-lived perennials or biennials, with or without caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1.5–5.0 dm, lower parts with abundant, short-stalked 2–6-rayed trichomes 0.2–0.5 mm, upper parts glabrous to sparsely pubescent. Leaves at stem bases oblanceolate, 2–10 mm wide, usually dentate, occasionally ciliate near petiole bases with mostly spurred trichomes to 0.7 mm, blade surfaces moderately to densely pubescent with short-stalked, 4–8-rayed trichomes 0.1–0.4 mm; cauline leaves 15–36, occasionally concealing stem proximally, the uppermost sparsely pubescent, with auricles 1–3 mm. Inflorescences mostly unbranched, 20–55-flowered; fruiting pedicels 8–14 mm, reflexed to divaricate-descending, usually curved downward, with subappressed, branched trichomes or rarely glabrous. Flowers divaricate-descending at anthesis; sepals pubescent; petals pale lavender, 5.0–8.5 × 1–2 mm, glabrous; ovules 100–128 per fruit. Fruits 4–6 cm × 1–2 mm, reflexed to pendent, rarely appressed to rachises, not secund, straight or slightly curved, with parallel edges, glabrous; style 0.05–0.50 mm. Seeds biseriate to subbiserial, mature seeds not seen.

Flowering: May.

Habitat: rocky slopes and sandy soil in ponderosa pine, pinyon-juniper, and sagebrush communities.

Elevation: 1900–2450 m.

Distribution: United States (Colorado, New Mexico, Utah).

Reproductive mode: apomictic triploid.

14. *Boechea constancei* (Rollins) Al-Shehbaz, Novon 13: 384. 2003; *Arabis constancei*

Rollins, Contr. Gray Herb. 201: 5. 1971. TYPE: United States, California, Plumas Co., 7.6 mi. SE of Quincy (at Spring Garden overpass) on road to Blairsden, near rocks on open serpentine, WSW facing gentle slope, 4100 ft., 11 Jul 1969, L. Constance & T. I. Chuang 3875 (holotype, GH!; isotype, UC!).

Arabis suffrutescens S. Watson var. *perstylosa* Rollins. TYPE: United States, California, Plumas Co., above the Middle Fork of the Feather River, 7.3 miles SE Quincy, 4000 ft, 9 Jun 1938, L. Constance 2309 (holotype, GH!; isotypes, DS!, NY!, UC!, WS!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, elevated above ground surface on woody bases, arising from center of basal rosettes, 1.2–3.0 dm, glabrous throughout. Leaves at stem bases narrowly oblanceolate, 1.5–4.0 mm wide, entire, ciliate with simple and fewer, stalked, 2-rayed trichomes 0.3–0.8 mm, blade surfaces glabrous; cauline leaves 6–12, not concealing stem, the uppermost glabrous, lacking auricles. Inflorescences unbranched, 5–15-flowered; fruiting pedicels 4–12 mm, arched, strongly recurved proximally, glabrous. Flowers divaricate-ascending at anthesis; sepals glabrous; petals creamy white, 6–8 × 1.5–2 mm, glabrous; ovules 18–28 per fruit. Fruits 4.0–7.5 cm × 3.0–3.5 mm, pendent, not appressed to rachises, usually secund, straight or slightly curved, often with somewhat undulate (non-parallel) edges, glabrous; style 2.5–5.0 mm. Seeds uniseriate, 3–4 × 2.5–3 mm; wing continuous, 0.5–1.0 mm wide. $2n = 14$.

Flowering: May.

Habitat: steep ridges and serpentine slopes.

Elevation: 1200–1900 m.

Distribution: United States (California/Plumas County).

Reproductive mode: sexual diploid.

15. *Boechea covillei* (Greene) Windham & Al-Shehbaz, Harvard Pap. Bot. 12: 237. 2007;

Arabis covillei Greene, Repert. Sp. Nov. Regni Veg. 5: 243. 1908. TYPE: United States, California, Tulare Co., near the lake on the trail to the White Chief Mine, 1000 ft above Mineral King, 6 Aug 1891, F. V. Coville & F. Funston 1492 (lectotype designated by Rollins (1941: 474), US!; isolectotypes, GH!, K!, NY!).

Arabis leibergii Greene, Repert. Sp. Nov. Regni Veg. 5: 243. 1908. TYPE: United States, Oregon, Lake Co., Grayhart Buttes [Gearheart Mt.], 2420 m, 7 Aug 1896, F. V. Coville & J. B. Leiberg 262 (holotype, US!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.5–2.5 dm, glabrous throughout. Leaves at stem bases oblanceolate, 1.5–5.0 mm wide, entire, ciliate proximally with simple trichomes to 0.4 mm and distally with short-stalked 2–3(–4)-rayed trichomes 0.15–0.40 mm, blade surfaces glabrous; cauline leaves 2–7, not concealing stem, the uppermost glabrous, with auricles 0.2–1 mm or rarely lacking. Inflorescences unbranched, 2–9-flowered; fruiting pedicels 6–20 mm, ascending to suberect, straight, glabrous. Flowers ascending at anthesis; sepals glabrous; petals lavender to

purplish, 5–6 × 1–2 mm, glabrous; ovules 18–30 per fruit. Fruits 3.5–5.0 cm × 3–5 mm, ascending to suberect, rarely appressed to rachises, not secund, straight, with slightly undulate (rarely parallel) edges, glabrous; style 0.2–1.0 mm. Seeds uniseriate, 4–5 × 3–4 mm; wing continuous, 1.0–1.5 mm wide.

Flowering: Jul–Aug.

Habitat: rocky slopes in alpine meadows and open coniferous forests.

Elevation: 2200–3500 m.

Distribution: United States (California, Nevada, Oregon).

Reproductive mode: apomictic triploid.

16. *Boechea crandallii* (B. L. Robinson) W. A. Weber, *Phytologia* 51: 369. 1982; *Arabis crandallii* B. L. Robinson, *Bot. Gaz.* 28: 135. 1899. TYPE: United States, Colorado, Montrose Co., Cimarron, 7000 ft., 18 May 1898, *C. S. Crandall* 6 (holotype, GH!; isotype, NY!).

Arabis stenoloba Greene TYPE: United States, Colorado, Montrose Co., Cimarron, 6900 ft, 6 Jun 1901, *C. F. Baker* 21 (holotype, NDG!; isotypes, E!, GH!, K!, MO!, NY!, POM!, RM!, 2US!, WS!).

Plants long-lived, often caespitose perennials, with somewhat woody caudices, usually lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–5 per caudex branch, arising near ground surface from margin of basal rosettes, (1.0–)1.5–4.0 dm, lower parts with abundant, short-stalked, 5–8-rayed trichomes 0.1–0.2 mm, upper parts moderately to sparsely pubescent. Leaves at stem bases narrowly oblanceolate, 1.5–3.0(–5.0) mm wide, entire, ciliate along petiole base with simple trichomes to 0.6 mm, blade surfaces densely pubescent with short-stalked, 5–8-rayed trichomes 0.1–0.2 mm; cauline leaves 5–14, not concealing stem, the uppermost pubescent, with auricles 0.1–0.5 mm. Inflorescences mostly unbranched, 10–30-flowered; fruiting pedicels 5–10 mm, ascending to divaricate-ascending, straight, with branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals usually white, 5–7 × 1–2 mm, glabrous; ovules 56–84 per fruit. Fruits 3.0–5.5 cm × 0.9–1.2 mm, ascending to divaricate-ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.1–0.5 mm. Seeds uniseriate, 0.8–1.0 × 0.6–0.9 mm; wing continuous (rarely absent), to 0.1 mm wide. $2n = 14$.

Flowering: May–Jun.

Habitat: rocky slopes and gravelly soil in sagebrush, mountain shrub, and open conifer forest.

Elevation: 2000–2650 m.

Distribution: United States (Colorado).

Reproductive mode: sexual diploid.

17. *Boechea cusickii* (S. Watson) Al-Shehbaz, *Novon* 13: 384. 2003; *Arabis cusickii* S.

Watson, *Proc. Amer. Acad. Arts* 17: 363. 1882. TYPE: United States, Oregon, Union Co., rocky ridges, early spring 1879, *W. C. Cusick* 727 (holotype, GH!; isotypes, K!, NY!, OSC!, US!).

Plants long-lived, often caespitose perennials, with mostly woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1.0–2.5(–3.8) dm, lower parts with abundant, simple trichomes 0.5–1.5 mm, upper parts sparsely pubescent or glabrous. Leaves at stem bases linear to narrowly oblanceolate, 0.5–2.0 mm wide, entire, ciliate with simple trichomes 1.0–1.7 mm, blade surfaces moderately pubescent with simple and long-stalked, 2-rayed trichomes 0.5–

1.7 mm; cauline leaves 10–30, often concealing stem proximally, the uppermost sparsely pubescent, with auricles to 0.5 mm or lacking. Inflorescences mostly unbranched, 5–14-flowered; fruiting pedicels 4–15(–20) mm, ascending, straight, glabrous or with few simple trichomes. Flowers ascending at anthesis; sepals pubescent; petals white to lavender, 6–10 × 2–3 mm, glabrous; ovules 56–106 per fruit. Fruits 4–8(–9.5) cm × 2.3–3.0 mm, ascending to divaricate-ascending, not appressed to rachises, not secund, straight or curved, with parallel edges, glabrous; style 0.1–0.5 mm. Seeds uniseriate, 1.5–2.5 × 1.5–2.0 mm; wing continuous, 0.1–0.2 mm wide.

Flowering: Apr–May.

Habitat: basaltic bluffs, rocky slopes, rock crevices, gravelly hillsides, sagebrush hills, outcrops of volcanic rock.

Elevation: 600–1800 m.

Distribution: United States (Idaho, Nevada, Oregon, Washington).

Reproductive mode: sexual diploid.

18. *Boechea davidsonii* (Greene) N. H. Holmgren, Intermountain Fl. 2b: 368. 2005; *Arabis davidsonii* Greene, Leafl. Bot. Observ. Crit. 2: 159. 1911; *A. lyallii* S. Watson var. *davidsonii* (Greene) Smiley, Univ. Calif. Publ. Bot. 9: 205. 1921. TYPE: United States, California, Inyo County, moist rocks, below Sabrina Lake, Bishop Creek, 11 Jul 1911, *A. Davidson 2728* (holotype, NDG!; isotypes, POM!, UC!).

Arabis bruceae M. E. Jones, Contr. W. Bot. 14: 37. 1912. TYPE: United States, California, Hills near Davis Creek, Jun 1898, *Mrs. R. M. Austin & Mrs. C. C. Bruce 2251* (lectotype designated by Rollins (1941: 364), POM!)

Arabis cognata Jepson, Man. Fl. Pl. Calif. 429. 1925. TYPE: United States, California, Plumas Co., Mt. Elwell, 7800 ft, 11 Jul 1912, *C. M. Wilder s.n.* (holotype, JEPS!; isotypes, E!, US!).

Arabis davidsonii var. *parva* Rollins, Harvard Pap. Bot. 4: 43. 1993. TYPE: United States, California, Tulare Co., 24 air miles ENE of Kernville, crest of ridge S of Chimney Creek Campground, granitic rocks, T24S, R36E, sect. 20, center of E 1/2, ca. 7500 ft, 9 Jun 1986, *B. Ertter, B. Holland & V. Dains 6363* (holotype, GH!; isotypes, MO!, UC!).

Plants long-lived, caespitose perennials, with woody caudices, the caudex branches thickly covered by crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.6–2.3 dm, glabrous throughout. Leaves at stem bases oblanceolate, 3.5–14 mm wide, entire or very rarely slightly dentate, not ciliate, blade surfaces glabrous; cauline leaves 3–10, not concealing stem, glabrous, without auricles. Inflorescences mostly unbranched, 4–24-flowered; fruiting pedicels 3–18 mm, ascending, straight, glabrous. Flowers ascending at anthesis; sepals glabrous; petals white to lavender, 6–10 × 2.5–4.0 mm, glabrous; ovules 28–50 per fruit. Fruits 2.5–7.0 cm × 1.5–2.5 mm, ascending to divaricate-ascending, not appressed to rachises, not secund, straight to slightly curved, with parallel edges, glabrous; style 0.1–0.8 mm. Seeds uniseriate, 1.8–2.2 × 0.8–1.7 mm; wing distal or continuous, 0.1–0.5 mm wide.

Flowering: Apr–Jul.

Habitat: ledges and crevices of rock outcrops.

Elevation: 1200–3400 m.

Distribution: United States (California, Nevada, Oregon).

Reproductive mode: sexual diploid.

19. *Boechea dentata* (Rafinesque) Al-Shehbaz & Zarucchi, Harvard Pap. Bot. 13: 293. 2008; *Shortia dentata* Rafinesque, Autik. Bot. 17. 1840; *Iodanthus dentatus* (Rafinesque) Greene, Pittonia 3: 254. 1897; *Arabis dentata* Torrey & A. Gray, Fl. N. Amer. 1: 80. 1838, not Clairville, Man. Herbor. Suisse 223. 1811; *A. perstellata* E. Braun var. *shortii* Fernald, Rhodora 48: 208. 1946; *A. shortii* (Fernald) Gleason, Phytologia 4: 23. 1952; *Boechea shortii* (Fernald) Al-Shehbaz, Novon 13: 389. 2003; *Sisymbrium dentatum* Torrey in Short, 3rd suppl. Cat. Pl. Kentucky. 338. 1833, not Allioni, Fl. Pedem. 1: 275. 1785. TYPE: United States, Kentucky, sandy banks of the Ohio River, *C. W. Short s.n.* (lectotype designated by Mulligan (1996: 143): DWC; isolectotype, GH!).

Arabis dentata var. *phalacrocarpa* M. Hopkins, Rhodora 39: 169. 1937; *A. shortii* var. *phalacrocarpa* (M. Hopkins) Steyermark, Rhodora 62: 130. 1960. TYPE: United States, Missouri, St. Clair Co., along shaded limestone bluffs of Osage River, *E. J. Palmer 35650* (holotype, GH!).

Plants biennials, with or without caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–4 per plant or caudex branch, arising near ground surface from margin of basal rosettes or laterally below sterile shoot, 2–6 dm, lower parts with short-stalked, 2–4-rayed trichomes 0.15–0.40 mm, upper parts sparsely pubescent or glabrous. Leaves at stem bases obovate to oblanceolate, (6–)10–45 mm wide, dentate, not ciliate, blade surfaces sparsely pubescent with simple trichomes 0.4–1.0 mm adaxially and with short-stalked, 3–4-rayed trichomes 0.15–0.40 mm abaxially; cauline leaves 4–20, rarely concealing stem, the uppermost sparsely pubescent, with auricles 1–8 mm. Inflorescences sparingly branched, 14–66-flowered; fruiting pedicels 1–6 mm, divaricate-ascending to slightly descending, straight, glabrous or with appressed, branched trichomes. Flowers divaricate at anthesis; sepals glabrous or sparsely pubescent; petals white or cream, 2.0–3.5 × 0.7–1.0 mm, glabrous; ovules 14–44 per fruit. Fruits 1.3–4.2 cm × 0.7–0.8 mm, divaricate-ascending to slightly descending, not appressed to rachises, not secund, straight or slightly curved, with parallel edges, sparsely pubescent throughout or rarely glabrous; style 0.1–0.5 mm. Seeds uniseriate, 0.7–1.1 × 0.5–0.6 mm; wingless.

Flowering Apr–Jun.

Habitat: bluffs and rocky ledges, wooded slopes, and floodplains.

Elevation: 100–250 m.

Distribution: United States (Alabama, Arkansas, District of Columbia, Illinois, Indiana, Iowa, Kentucky, Kansas, Maryland, Michigan, Minnesota, Missouri, Nebraska, New York, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Virginia, West Virginia, Wisconsin).

Reproductive mode: sexual diploid.

20. *Boechea depauperata* (A. Nelson & P. B. Kennedy) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 262. 2007; *Arabis depauperata* A. Nelson & P. B. Kennedy, Proc. Biol. Soc. Wash. 19: 36. 1906; *A. lemmonii* S. Watson var. *depauperata* (A. Nelson & P. B. Kennedy) Rollins, Madroño 3: 360. 1936. TYPE: United States, Nevada, Washoe Co.: summit of Mt. Rose, 10,800 ft [3273 m], 17 Aug 1905, *P. B. Kennedy 1167* (holotype, RM; isotypes, GH, UC).

Plants mostly long-lived, caespitose perennials, with woody caudices; lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.5–1.5(–2.0) dm, lower parts with abundant, short-stalked, 4–8-rayed trichomes 0.07–0.4 mm, upper parts sparsely pubescent or rarely glabrous. Leaves at stem bases narrowly oblanceolate, 0.7–3(–5) mm wide, entire, occasionally ciliate proximally with trichomes to 0.4 mm, blade surfaces densely pubescent with short-stalked, 5–8-rayed trichomes 0.05–0.25 mm; cauline leaves 3–7, not concealing stem, the uppermost

pubescent or rarely glabrous, with auricles 0.5–1.5 mm. Inflorescences unbranched, 9–23-flowered; fruiting pedicels 1.5–7 mm, divaricate-ascending, straight, with appressed, branched trichomes or rarely glabrous. Flowers ascending at anthesis; sepals pubescent; petals lavender to purplish, 3.5–5.0 × 0.8–1.2 mm, glabrous; ovules 32–44 per fruit. Fruits 1.7–3.5(–4.5) cm × 1.0–1.5 mm, divaricate-ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.05–0.20 mm. Seeds uniseriate, 1.2–1.5 × 1.0–1.2 mm; wing continuous, 0.10–0.15 mm wide.

Flowering Jun–Jul.

Habitat: exposed ridges and talus slopes in subalpine and alpine habitats.

Elevation: 2650–3900 m.

Distribution: United States (California, Nevada).

Reproductive mode: apomictic triploid.

21. *Boechea dispar* (M. E. Jones) Al-Shehbaz, *Novon* 13: 384. 2003; *Arabis dispar* M. E. Jones, *Contr. W. Bot.* 8: 41. 1898. TYPE: United States, California, Inyo Co., Panamint Mts., Pleasant Canyon, 5500 ft., 6 May 1897, *M. E. Jones s.n.* (holotype, POM!; isotypes, MO!, POM!, US!, UTC).

Arabis juniperina M. E. Jones, *Contr. W. Bot.* 15: 68. 1929. TYPE: United States, Cactus Flat in Cushebury Canyon, 12 May 1926, M. E. Jones, POM!).

Arabis nardina Greene, *Leafl. Bot. Observ. Crit.* 2: 70. 1910. TYPE: United States, California, Inyo Co., Mill Canyon, Panamint Mts., near Willow Creek, 1950 to 2300 m, 20 May 1891, F. V. Coville & F. Funston 776 (holotype, US!; isotype, GH!).

Arabis salubris M. E. Jones, *Contr. W. Bot.* 14: 37. 1912. TYPE: United States, California, not located.

Plants mostly long-lived perennials, often with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.9–3.0 dm, lower parts with abundant, short-stalked, 5–12-rayed trichomes 0.1–0.3 mm, upper parts sparsely pubescent to glabrescent. Leaves at stem bases linear-oblongate, 2–5 mm wide, entire, not ciliate, blade surfaces densely pubescent with short-stalked, 5–12(–16)-rayed trichomes 0.1–0.3 mm; cauline leaves 1–5, not concealing stem, the uppermost pubescent, without auricles. Inflorescences unbranched, 4–15(–20)-flowered; fruiting pedicels 4–15(–25) mm, ascending, straight, with appressed, branched trichomes.

Flowers ascending at anthesis; sepals pubescent; petals purple to lavender, 5–6 × 1.0–1.5 mm, glabrous; ovules 44–52 per fruit. Fruits 4.0–7.3 cm × 2.7–4.0 mm, divaricate-ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.05–0.10 mm. Seeds uniseriate, 1.9–2.3 mm in diam.; wing continuous, 0.3–0.5 mm wide.

Flowering: Apr–May.

Habitat: rocky slopes and gravelly soil in desert scrub and pinyon-juniper communities.

Elevation: 1450–2300 m.

Distribution: United States (E California/ Inyo, Mono, and San Bernardino counties; Nevada/Nye County).

Reproductive mode: sexual diploid.

22. *Boechea divaricarpa* (A. Nelson) Á. Löve & D. Löve, *Bot. Not.* 128: 513. 1976; *Arabis divaricarpa* A. Nelson, *Bot. Gaz.* 30: 193. 1900. TYPE: United States, Wyoming, Park Co., Yellowstone National Park, stony and sandy banks of Yellowstone Lake, Aug 1899, *Aven Nelson & Elias Nelson* 6622 (lectotype designated by Hopkins (1937: 132), RM!; isolectotypes, GH!, MO!).

Arabis stokesiae Rydberg, Fl. Rocky Mts. 361, 1062. 1918. TYPE: United States, Utah, Salt Lake Co., Wasatch Mts., Parley's Canyon, 8 Jun 1901, S. G. Stokes s.n. (holotype, NY!; isotypes, DS!, US!).

Plants short-lived perennials or biennials, with or without caudices; lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, (1.5–)3–9 dm, lower parts glabrous or with sessile, 2–4-rayed (a few simple) trichomes to 0.7 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 2–10 mm wide, entire or rarely denticulate, ciliate on petioles with simple trichomes to 0.8 mm, blade surfaces sparsely to densely pubescent with sessile, 2–6-rayed trichomes 0.1–0.4 mm; cauline leaves (10–)15–56, concealing stem proximally, the uppermost glabrous, with auricles 1–5 mm. Inflorescences mostly unbranched, 12–40(–65)-flowered; fruiting pedicels 5–12 mm, divaricate-ascending to horizontal, straight, glabrous. Flowers divaricate-ascending at anthesis; sepals glabrous or with scattered trichomes; petals purple or rarely lavender, 6–9 × 1.5–3.0 mm, glabrous; ovules 114–142 per fruit. Fruits (4.5–)5.5–11 cm × 1.7–2.5 mm, divaricate-ascending to horizontal, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.05–0.20 mm. Seeds uniseriate to subbiseriate, 1.4–2.0 × 1.0–1.5 mm; wing continuous, 0.1–0.2 mm wide. $2n = 21$.

Flowering: May–Jul.

Habitat: rock outcrops, talus slopes and gravelly hillsides in sagebrush, mountain shrub, and open conifer forests.

Elevation: 900–2500 m.

Distribution: United States (California, Idaho, Montana, Nevada, Utah, Washington, Wyoming).

Reproductive mode: apomictic triploid.

23. *Boechera drepanoloba* (Greene) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 263. 2007; *Arabis drepanoloba* Greene, Pittonia 3: 306. 1898; *A. lemmonii* S. Watson var. *drepanoloba* (Greene) Rollins, Rhodora 43: 384. 1941. TYPE: Canada, Alberta, Banff National Park, Devil's Head Lake, 51°15' N, 115°25' W, 6 Aug 1891, J. Macoun 1719a (holotype, NDG!; isotypes, CAN!, NY!, US!).

Arabis oreophila Rydberg, Bull. Torrey Bot. Club 34: 437. 1907; *A. drummondii* A. Gray var. *oreophila* (Rydberg) M. Hopkins, Rhodora 39: 141. 1937. TYPE: United States, Utah, Wasatch/Salt Lake Cos., divide between Big Cottonwood Canyon and Heber Valley, 5 Jul 1905, P. A. Rydberg & E. C. Carlton 6678 (holotype, NY!).

Plants short- to long-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1–4 dm, lower parts glabrous or with few sessile or subsessile, 2–3-rayed trichomes 0.1–0.3 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 2–6 mm wide, entire, ciliate on petioles with submalpighiaceous or simple trichomes to 0.6 mm, blade surfaces sparsely to densely pubescent with subsessile, 2–6-rayed trichomes 0.1–0.3 mm; cauline leaves 3–15, often concealing stem proximally, the uppermost usually glabrous, with auricles 0.7–2.5 mm. Inflorescences mostly unbranched, 5–25-flowered; fruiting pedicels 4–8 mm, horizontal to ascending, straight or curved, glabrous. Flowers ascending at anthesis; sepals glabrous or with scattered trichomes; petals purple to lavender, 6–8 × 1.5–2.5 mm, glabrous; ovules 44–76(–104) per fruit. Fruits 3.0–5.8 cm × 2.0–3.5 mm, horizontal to ascending, secund, straight to slightly curved, with parallel edges, glabrous; style 0.05–0.50 mm. Seeds subbiseriate, 1.5–2.2 × 1.2–1.6 mm; wing continuous, 0.3–0.7 mm wide.

Flowering: Jul–Aug.

Habitat: rocky slopes and talus in alpine and subalpine habitats.

Elevation: 2050–3800 m.

Distribution: Canada (Alberta), United States (Alaska, Colorado, Idaho, Montana, Oregon, Utah, Washington, Wyoming).

Reproductive mode: apomictic triploid.

24. *Boechea duchesnensis* (Rollins) Windham, Al-Shehbaz & Allphin, Harvard Pap. Bot. 12: 239. 2007; *Arabis pulchra* M. E. Jones ex S. Watson var. *duchesnensis* Rollins, Syst. Bot. 6: 59. 1981; *Boechea pulchra* (M. E. Jones ex S. Watson) W. A. Weber var. *duchesnensis* (Rollins) Dorn, Brittonia 55: 3. 2003. TYPE: United States, Utah, Duchesne Co., 3.8 miles east of Duchesne, stony hillside in juniper area, 30 May 1979, *Reed C. Rollins & Kathryn W. Rollins 79113* (holotype, GH!; isotypes, 2BRY!, MO!, NY!, RM!, US!).

Plants mostly long-lived perennials, often with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, elevated on woody bases or produced near ground surface, arising from center of basal rosettes, 1.5–4.5 dm, lower parts with abundant, short-stalked, 2–7-rayed trichomes 0.2–0.5 mm (occasionally mixed with a few large trichomes proximally), upper parts sparsely pubescent. Leaves at stem bases linear-oblongate, 2–5 mm wide, entire or denticulate, ciliate on petiole base with simple trichomes to 1 mm, blade surfaces densely pubescent with short-stalked, 4–8-rayed trichomes 0.15–0.40 mm; cauline leaves 3–8, not concealing stem, the uppermost sparsely pubescent, with auricles 0.7–2.0 mm. Inflorescences mostly unbranched, 11–22-flowered; fruiting pedicels 7–14 mm, horizontal, straight or slightly curved, with appressed, branched trichomes. Flowers divaricate-ascending at anthesis; sepals pubescent; petals whitish to pale lavender, 7–10 × 1.5–3.0 mm, glabrous; ovules 72–92 per fruit. Fruits 3.5–5.0 cm × 1.7–2.0 mm, horizontal, not appressed to rachises, not secund, usually straight, with parallel edges, glabrous proximally, pubescent distally; style 0.1–0.3 mm. Seeds subbiseriate, 1.1–1.3 × 0.7–1.0 mm; wing continuous, ca. 0.1 mm wide.

Flowering: May.

Habitat: sandy soil on rocky slopes, mostly in pinyon-juniper woodland.

Elevation: 1300–1800 m.

Distribution: United States (Colorado, New Mexico, Utah).

Reproductive mode: Apomictic triploid.

25. *Boechea elkoensis* Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 263. 2007. TYPE: United States, Nevada, Elko Co., on slope overlooking Island Lake in the Ruby Mts., ca. 2.71 km NE of the summit (11,215 ft [3399 m]) of Mt. Fitzgerald, Humboldt National Forest, 40°37'01" N, 115°22'56" W, in rocky granitic soil on SE-facing slope, 9850 ft [2985 m], 14 Jul 1999, *M. D. Windham & M. K. Windham 99-274* (holotype, UT!; isotypes, DUKE!, MO!).

Plants mostly long-lived perennials often with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems 1–5 per caudex branch, arising near ground surface from margin or center of basal rosettes, 1–3 dm, lower parts with few, subsessile, 2–5-rayed trichomes 0.1–0.4 mm, upper parts glabrous or very sparsely pubescent. Leaves at stem bases narrowly oblanceolate, 2–6 mm wide, entire, ciliate at petiole bases with simple trichomes to 0.4 mm, blade surfaces moderately pubescent with sessile or subsessile, 2–5-rayed trichomes 0.1–0.4 mm; cauline leaves 3–6, not concealing stem, the uppermost glabrous or sparsely pubescent along margins, with auricles 0.2–0.5 mm or rarely lacking. Inflorescences unbranched, 4–11-flowered; fruiting pedicels 4–8 mm, erect to ascending, straight, glabrous or rarely with a few appressed, branched trichomes. Flowers erect to ascending at anthesis; sepals glabrous; petals lavender or rarely whitish, 4–7 × 1.2–2.0 mm, glabrous; ovules 26–42 per fruit. Fruits 3–7

cm × 2–3 mm, erect to ascending, often appressed to rachises, not secund, straight, often with slightly undulate (non-parallel) edges, glabrous; style 0.05–0.03 mm. Seeds uniseriate, 2.5–3.5 × 1.8–2.5 mm; wing continuous, 0.4–0.9 mm wide.

Flowering: Jul.

Habitat: gravelly soil among rocks in open forests and subalpine meadows.

Elevation: 2050–3150 m.

Distribution: United States (California, Nevada).

Reproductive mode: apomictic triploid.

26. *Boechera evadens* Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 66. 2006. TYPE: United States, California, Tulare Co., occasional to common on a small rocky metamorphic outcrop adjacent to the Sherman Pass, Blackrock Forest Service road approx. 1 mile west of Bald Mtn., 8480 ft, 4 Jul 1977, *J. R. Shevock 5602* (holotype, CAS!).

Plants long-lived, caespitose perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1–2.5 dm, lower parts with abundant, short-stalked, 2–5-rayed trichomes 0.2–0.6 mm and a few simple trichomes to 1 mm, upper parts glabrous. Leaves at stem bases narrowly oblanceolate, 1.5–3.0 mm wide, entire, ciliate along petioles with simple trichomes to 1 mm, blade surfaces densely pubescent with short-stalked, 4–8-rayed trichomes 0.1–0.2 mm; cauline leaves 3–5, not concealing stem, the uppermost pubescent, with auricles 0.5–1 mm. Inflorescences unbranched, 10–22-flowered; fruiting pedicels 4–8 mm, divaricate-ascending, straight, with few appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals white, 3–4 × 0.5–0.8 mm, glabrous; ovules 46–52 per fruit. Fruits 3–4 cm × 1.2–1.5 mm, divaricate-ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style ca. 0.1 mm. Seeds uniseriate, 1.0–1.1 × 0.9–1.0 mm; wing continuous, ca. 0.1 mm wide.

Flowering: Jun.

Habitat: rock outcrops.

Elevation: ca. 2600 m.

Distribution: United States (California/Tulare County).

Notes: known only from the holotype specimen.

Reproductive mode: sexual diploid.

27. *Boechera falcata* (Turczaninow) Al-Shehbaz, Novon 15: 520. 2005. Basionym: *Turritis falcata* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 13: 63. 1840. *Arabis falcata* (Turczaninow) Berkutenko, Bot. Zhurn. (Moscow & Leningrad) 61: 1597. 1976, non *A. falcata* Michaux, Fl. Bor. Amer. 2: 31. 1803, nec *A. falcata* A. Richard, Tent. Fl. Abyss. 1: 17. 1847; *A. turczaninowii* Ledebour, Fl. Rossica 1: 123. 1841. TYPE: Russia. Kamchatka: Ochotensem, between Czernoliesk and Allach-Jun, 1835, *Ilia Kuznetzoff s.n.* (holotype, LE!).

Plants short- to long-lived perennials, occasionally with woody caudices, with persistent remains of leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 2–6 dm, lower glabrous or sparsely with simple and stalked, 2-rayed trichomes 0.3–0.8 mm, upper parts glabrous. Leaves at stem bases oblanceolate to oblong, 2–8 mm wide, coarsely dentate, ciliate along petiole with trichomes to 0.4–0.8 mm, blade surfaces pubescent with stalked, 4–9-rayed trichomes 0.2–0.4 mm; cauline leaves 6–14, not concealing stem, entire, the uppermost glabrous or sparsely pubescent, with auricles 0.5–1.5 mm. Inflorescences unbranched; fruiting pedicels 1–3 cm, divaricate-ascending,

straight, glabrous. Flowers ascending at anthesis; sepals subapically pubescent; petals lavender to purplish, 7–10 × 1.75–2.5 mm, glabrous. Fruits 4.5–6 cm × 2–3 mm, divaricate-ascending, not appressed to rachises, not secund, usually strongly curved, with parallel edges, glabrous; style 0.2–0.6 mm. Seeds uniseriate, suborbicular, to 2 mm diam.; wing continuous. $2n = 14$.

Flowering: Jun–Jul.

Habitat: arid rubble talus, forests, rocky areas.

Distribution: Russia (E Siberia, Far East).

Reproductive mode: sexual diploid.

28. *Boechea falcatoria* (Rollins) Dorn, *Brittonia* 3: 2003; *Arabis falcatoria* Rollins, *Contr.*

Gray Herb. 212: 106. 1982. TYPE: United States, Utah, Box Elder Co., in marble chip rock, 3.7 miles north of Grouse Creek, on road to Oakley, Idaho, 9 Jun 1981, *Reed C. & Kathryn W. Rollins 81259* (holotype, GH!; isotypes, BRY, MO!, NY!, RM!, RSA!, UC!, US!, UTC).

Plants short- to long-lived perennials, occasionally with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 2–7 per caudex branch, arising near ground surface from margin of basal rosettes, 0.5–2(–3) dm, lower parts with abundant, simple and stalked, 2-rayed trichomes 0.3–0.8 mm, upper parts glabrous. Leaves at stem bases narrowly oblanceolate, 1–3 mm wide, entire, ciliate with trichomes to 1 mm, blade surfaces pubescent with stalked, 2–4-rayed trichomes 0.3–0.8 mm; cauline leaves 3–7(–10), not concealing stem, the uppermost glabrous, with auricles 0.2–1 mm. Inflorescences unbranched, 6–15-flowered; fruiting pedicels 3–9 mm, horizontal to divaricate-ascending, straight, glabrous. Flowers ascending at anthesis; sepals pubescent; petals white or lavender, 5–7 × 1.5–2.5 mm, glabrous; ovules 50–84 per fruit. Fruits 3.5–6.5 cm × 1.7–2.0 mm, horizontal to divaricate-ascending, not appressed to rachises, not secund, usually strongly curved, with parallel edges, glabrous; style 0.05–0.50 mm. Seeds uniseriate, 1.5–2.0 × 1.1–1.5 mm; wing continuous, 0.1–0.2 mm wide.

Flowering: May–Jun.

Habitat: rock outcrops and gravelly soil in sagebrush and mountain shrub communities.

Elevation: 2000–2200 m.

Distribution: United States (Utah/Box Elder County).

Reproductive mode: apomictic triploid.

29. *Boechea falcifruca* (Rollins) Al-Shehbaz, *Novon* 13: 385. 2003; *Arabis falcifruca* Rollins, *Contr.*

Gray Herb. 212: 106. 1982. TYPE: United States, Nevada, Elko Co., Near US hwy 93, between Thousand Springs and Jackpot, 37 miles S of Jackpot, 18 Jun 1979, *R.C. & K.W. Rollins 79267* (holotype, GH!; isotypes, E!, MO!, NY!).

Plants mostly long-lived perennials, often with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1.5–4.5 dm, lower parts with abundant, short-stalked, 4–9-rayed trichomes 0.05–0.20 mm, upper parts glabrous or sparsely pubescent. Leaves at stem bases linear to narrowly oblanceolate, 1–4 mm wide, entire, ciliate at petiole base with simple trichomes to 0.5 mm, blade surfaces densely pubescent with short-stalked, 4–9-rayed trichomes 0.05–0.20 mm; cauline leaves 5–9, not concealing stem, the uppermost sparsely pubescent, with auricles 0.5–1.0 mm. Inflorescences sparingly branched, 10–18-flowered; fruiting pedicels 6–12 mm, divaricate-descending, gently curved downward, with appressed, branched trichomes. Flowers divaricate-ascending at anthesis; sepals pubescent; petals lavender, 5–7 × 0.7–1.2 mm, glabrous; ovules 62–80 per fruit. Fruits 4.5–6.0 cm × 1.2–1.5 mm, divaricate-

descending, not appressed to rachises, not secund, gently curved, with parallel edges, glabrous; style 0.5–1.0 mm. Seeds uniseriate, 1.2–1.7 × 0.8–1.2 mm; wing mostly distal, 0.05–0.10 mm wide.

Flowering: May–Jun.

Habitat: rocky slopes and sandy soil in sagebrush or pinyon-juniper woodland.

Elevation: 1550–1800 m.

Distribution: United States (Nevada/Elko and Lander counties).

Reproductive mode: apomictic triploid.

30. *Boecheera fecunda* (Rollins) Dorn, Brittonia 55: 3. 2003; *Arabis fecunda* Rollins, Contr.

Gray Herb. 214: 1. 1984. TYPE: United States, Montana, Ravalli Co., Big game range E of Corvallis, 4000, 13 Jun 1976, *Jaculyn Cory 1611* (holotype, MONTU; isotype, GH!).

Plants mostly long-lived perennials, often with woody caudices; lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems 1 to several per caudex branch, slightly elevated on woody bases or arising near ground surface from center and margin of basal rosettes, 0.8–3 dm, with abundant, short-stalked, 5–10-rayed trichomes 0.1–0.2 mm throughout. Leaves at stem bases linear-oblongate, 1–5 mm wide, entire or with few teeth subapically, not ciliate, blade surfaces densely pubescent with short-stalked, 5–10-rayed trichomes 0.1–0.2 mm; cauline leaves 5–18, concealing stem proximally, the uppermost ones densely pubescent, with auricles 0.5–2.5 mm. Inflorescences mostly unbranched, 8–35-flowered; fruiting pedicels 5–15 mm, erect to ascending, straight, with appressed, branched trichomes. Flowers erect to ascending at anthesis; sepals pubescent; petals purplish, 8–12 × 2.5–4.5 mm; ovules 34–68 per fruit. Fruits 3.0–5.8 cm × 1.4–1.8 mm, erect to ascending, often appressed to rachises, not secund, straight, with parallel edges, densely pubescent throughout; style 1–1.5 mm. Seeds uniseriate, 1.0–1.5 × 0.8–1.2 mm; wing continuous, 0.5–0.1 mm wide.

Flowering: Apr–Jun.

Habitat: rocky ground in sagebrush areas.

Elevation: 1200–1800 m.

Distribution: United States (Montana/Ravalli and Silver Bow counties).

Reproductive mode: sexual diploid.

31. *Boecheera fendleri* (S. Watson) W. A. Weber, Phytologia 51: 370. 1982; *Arabis holboellii*

Hornemann var. *fendleri* S. Watson in A. Gray & Watson, Syn. Fl. N. Amer. 1(1): 164. 1895;

A. fendleri (S. Watson) Greene, Pittonia 3: 156. 1897. TYPE: United States, New Mexico, from Santa Fe E to Rabbit Ear Creek, 10–20 Aug 1847, *A. Fendler 27* (lectotype by Greene (Pittonia 3: 156, 1897), GH!; isotype, MO!, NY!, UC!, US!).

Plants short- to long-lived perennials, with mostly non-woody caudices, occasionally with crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems 1–7 per caudex branch, arising near ground surface from center of basal rosettes or laterally below sterile shoots, 1.5–5.5(–8) dm, lower parts with many simple and long-stalked, 2-rayed trichomes 0.2–0.9 mm, upper parts glabrous. Leaves at stem bases broadly oblanceolate, 5–15(–20) mm wide, dentate, ciliate with simple trichomes to 1.2 mm, blade surfaces glabrous or pubescent with simple and long-stalked, 2-rayed (rarely a few 3-rayed) trichomes 0.2–0.6 mm; cauline leaves 8–25, often concealing stem proximally, the uppermost often glabrous, with auricles 0.8–3 mm.

Inflorescences mostly unbranched, 6–40(–74)-flowered; fruiting pedicels 9–18(–23) mm, horizontal to divaricate-ascending, curved or angled downward, glabrous or very rarely with a few spreading, simple trichomes. Flowers ascending at anthesis; sepals sparsely hirsute; petals

lavender or rarely white, 5–9 × 1–2 mm; ovules 98–128 per fruit. Fruits 3.0–5.8 cm × 1.5–2.0 mm, widely pendent, not appressed to rachises, not secund, curved to nearly straight, with parallel edges, glabrous; style 0.2–0.5 mm. Seeds biseriate, 0.9–1.2 × 0.6–0.8 mm; wing distal (occasionally absent), 0.05–0.15 mm wide. $2n = 14$.

Flowering: Apr–Jul.

Habitat: rocky slopes in pine forests, pinyon-juniper woodlands, and scrub oak.

Elevation: 1800–2800 m.

Distribution: United States (Arizona, Colorado, New Mexico, Nevada, Utah).

Reproductive mode: sexual diploid.

32. *Boechera fernaldiana* (Rollins) W. A. Weber, *Phytologia* 51: 370. 1982.

Plants long-lived, caespitose perennials, with somewhat woody caudices, occasionally with crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, slightly elevated on woody bases or arising near ground surface from center of basal rosettes, 1.0–3.8 dm, lower parts with many, short-stalked, 4–8-rayed trichomes 0.04–0.10 mm, these sometimes mixed with stalked 2-rayed trichomes to 0.5 mm, upper parts usually sparsely pubescent. Leaves at stem bases narrowly oblanceolate, 1–4 mm wide, entire, ciliate along petioles with simple trichomes to 1 mm, blade surfaces densely pubescent with short-stalked, 4–8-rayed trichomes 0.04–0.10 mm; cauline leaves 5–10, not concealing stem, the uppermost usually sparsely pubescent, with auricles 0.3–2.0 mm. Inflorescences mostly unbranched, 10–20-flowered; fruiting pedicels 5–20 mm, divaricate-ascending, straight, with a few appressed, branched trichomes. Flowers ascending at anthesis; sepals glabrous to sparsely pubescent; petals white or purple, 7–12 × 1.5–4.0 mm, glabrous; ovules 30–72 per fruit. Fruits 3.5–6.5(–7.5) cm × 1.0–1.6 mm, divaricate-ascending, not appressed to rachises, not secund, straight or curved, with parallel edges, glabrous; style 0.1–1.0 mm. Seeds uniseriate, 1.0–1.2 × 0.8–1.0 mm; wing continuous, ca. 0.1 mm wide.

Flowering: April–Jul.

Habitat: igneous and sandstone rock outcrops, talus, and rocky slopes, sagebrush and pinyon-juniper woodlands.

Elevation: 1500–3350 m.

Distribution: United States (Colorado, Nevada, Utah).

Reproductive mode: sexual diploid.

Two subspecies: w U.S.A.

KEY TO THE SUBSPECIES OF *BOECHERA FERNALDIANA*

1. Petals purple to lavender; sepals purplish, moderately to sparsely pubescent; Nevada32a. subsp. *fernaldiana*
1. Petals white; sepals greenish, glabrous or rarely sparsely pubescent; Colorado and Utah32b. subsp. *vivariensis*

32a. *Boechera fernaldiana* subsp. *fernaldiana*. *Arabis fernaldiana* Rollins, *Rhodora* 43: 430.

1941. TYPE: United States, Nevada, Nye Co., Toiyabe Mts., E slope of Toiyabe Dome, among rocks & around sagebrush, 10,000 ft., 13 Jul 1938, R. C. Rollins & T. S. Chambers 2520 (holotype, GH!; isotypes, DS!, MO!, NY!, UC!, US!, UTC).

Arabis canescens Nuttall var. *stylosa* S. Watson, *Bot. Calif.* 2: 431. 1880; *A. fernaldiana* var. *stylosa* (S. Watson) Rollins, *Rhodora* 43: 431. 1941. TYPE: United States, Nevada, E Humboldt Mts, 8000 ft, Aug 1868, S. Watson 70 (lectotype designated by Rollins (1941: 431), GH!; isolectotype, NY!).

Petals purple to lavender; sepals purplish, moderately to sparsely pubescent.
Flowering: May–Jul.
Habitat: igneous rock outcrops, talus, and rocky slopes in sagebrush areas.
Elevation: 2200–3350 m.
Distribution: United States (Nevada).

32b. *Boechea fernaldiana* (Rollins) W. A. Weber subsp. ***vivariensis*** (S. L. Welsh) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 67. 2006; *Arabis vivariensis* S. L. Welsh, Great Basin Naturalist 46: 263. 1986; *Boechea vivariensis* (S. L. Welsh) W. A. Weber, Phytologia 67: 425. 1989. TYPE: United States, Utah, Uintah County, Jones Hole, National Fish Hatchery, T3S, R25E, sect. 1, 6000 ft, sandy calcareous gravel, Morgan form., 16 May 1979, S. L. Welsh & E. Neese 18341 (holotype, BRY!; isotypes, BRY!, CAS!, GH!, NY!, RM!, RSA!, UC!, US!).

Petals white; sepals greenish, glabrous or rarely sparsely pubescent.
Flowering: April–Jun.
Habitat: sandstone rock outcrops, rocky slopes, and sandy soil, mostly in pinyon-juniper woodland.
Elevation: 1500–2350 m.
Distribution: United States (Colorado/Moffat County; Utah/ Uintah County).

33. *Boechea formosa* (Greene) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 68. 2006; *Arabis formosa* Greene, Pittonia 4: 198. 1900. TYPE: United States, New Mexico, San Juan County, hills about Aztec, 5500 ft, 28 Apr 1899, C. F. Baker 345 (holotype, NDG!; isotypes, E!, GH!, K!, MO!, 2NDG!, NY!, 2RM!, RSA!, UC!, US!).

Arabis pulchra M. E. Jones ex S. Watson var. *pallens* M. E. Jones, Contr. W. Bot. 14: 42. 1912; *Boechea pulchra* (M. E. Jones ex S. Watson) W. A. Weber subsp. *pallens* (M. E. Jones) W. A. Weber, Phytologia 51: 371. 1982. *B. pulchra* var. *pallens* (M. E. Jones) Dorn, Vasc. Pl. Wyoming, ed. 3. 376. 2001. TYPE: United States, Colorado, Mesa Co., Westwater, 6 May 1891, M. E. Jones s.n. (lectotype, designated by Rollins (1941: 460), POM!; isolectotypes, GH!, MO!, NY!, ORE!, US!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, elevated above ground surface on woody bases, arising from center of leaf tuft, 2.0–5.5 dm, lower parts with abundant, short-stalked, 4–7-rayed trichomes 0.1–0.4 mm, upper parts similarly pubescent. Leaves at stem bases linear to linear-oblongate, 2–3(–4) mm wide, entire, occasionally ciliate near petiole base with simple or 2-rayed trichomes to 0.8 mm, blade surfaces densely pubescent with short-stalked, 4–8-rayed trichomes 0.1–0.3 mm; cauline leaves 7–18, concealing stem proximally, the uppermost densely pubescent, lacking auricles. Inflorescences mostly unbranched, 6–26-flowered; fruiting pedicels 5–10(–20) mm, horizontal to descending, usually recurved, with appressed, branched trichomes. Flowers divaricate at anthesis; sepals pubescent; petals white to pale lavender, 8–18 × 2.5–4.4(–5.5) mm, glabrous; ovules 72–98 per fruit. Fruits 4.3–7.0 cm × 1.6–3.0 mm, divaricate-descending to reflexed, usually not appressed to rachises, rarely somewhat secund, straight, with parallel edges, pubescent throughout; style ca. 0.1 mm. Seeds biseriate, 1.2–1.6 × 1.0–1.2 mm; wing continuous, 0.1–0.2 mm wide. $2n = 14$.

Flowering: Apr–Jun.
Habitat: rocky slopes and sandy soil in blackbrush, sagebrush, and pinyon-juniper communities.
Elevation: 1300–1900 m.
Distribution: United States (Arizona, Colorado, New Mexico, Utah, Wyoming).

Reproductive mode: sexual diploid

34. *Boecheera fructicosa* (A. Nelson) Al-Shehbaz, *Novon* 13: 385. 2003; *Arabis fructicosa* A. Nelson, *Bot. Gaz.* 30: 190. 1900. TYPE: United States, Wyoming, Yellowstone National Park, Undine Falls, dry roadsides, 6 Jul 1899, A. & E. Nelson 5681 (holotype, RM!; isotypes, GH!, MO!, NY!, US!).

Plants short-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems 3 to many per caudex branch, arising near ground surface from margin of basal rosettes, 3.5–6.0 dm, lower parts with short-stalked, 2–4-rayed trichomes 0.2–0.3 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 3–7 mm wide, dentate, ciliate proximally with simple trichomes to 0.3 mm, blade surfaces pubescent with short-stalked, 4–8-rayed trichomes 0.05–0.2 mm; cauline leaves 5–10, not concealing stem, the uppermost glabrous, with auricles 0.5–1 mm. Inflorescences mostly unbranched, 10–18-flowered; fruiting pedicels 5–10 mm, divaricate-descending, straight, glabrous. Flowers divaricate-ascending at anthesis; sepals pubescent; petals lavender, 4–6 × 1.0–1.5 mm, glabrous; ovules 60–70 per fruit. Fruits 4–6 cm × 1.5–1.8 mm, divaricate-descending, not appressed to rachises, not secund, curved, with parallel edges, glabrous; style 0.1–0.4 mm. Seeds uniseriate, 1.5–2.0 × 1.0–1.3 mm; wing distal, ca. 0.1 mm wide.

Flowering: Jun–Jul.

Habitat: dry, disturbed soil.

Distribution: United States (NW Wyoming).

35. *Boecheera glareosa* Dorn, *Brittonia* 55: 1. 2003. TYPE: United States, Utah, Uintah Co., ca. 14 mi. E of Jensen, 40°21.077'N, 109°04.117'W, 6700 ft. (2040 m), 12 May 2002, R. D. Dorn 9106 (holotype, RM!; isotype, MO!, NY!).

Plants short- to long-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–6 per caudex branch, arising near ground surface from margin of basal rosettes, 0.8–4 dm, lower parts with abundant, simple and short-stalked, 2-rayed trichomes 0.3–0.6 mm, upper parts glabrous. Leaves at stem bases narrowly oblanceolate, 1–5 mm wide, entire or few toothed, ciliate proximally with simple trichomes to 0.9 mm, blade surfaces densely pubescent with simple and short-stalked, 2- or 3-rayed trichomes 0.3–0.5 mm; cauline leaves 3–6, not concealing stem, the uppermost glabrous, with auricles 0.3–0.6 mm. Inflorescences mostly unbranched, 7–15-flowered; fruiting pedicels 4–10 mm, divaricate-ascending to horizontal, straight or gently recurved, glabrous or with few, spreading trichomes. Flowers ascending at anthesis; sepals pubescent; petals lavender, 3.5–6.0 × 1.0–1.5 mm, glabrous; ovules 50–80 per fruit. Fruits 2.5–4.0 cm × 1.2–1.5 mm, divaricate-ascending to horizontal, not appressed to rachises, not secund, usually curved, with parallel edges, glabrous; style 0.05–0.30 mm. Seeds uniseriate, 1.0–1.5 × 0.7–1.0 mm; wing usually distal, ca. 0.1 mm wide.

Flowering: May–Jun.

Habitat: conglomerate and limestone outcrops in pinyon-juniper and mountain shrub-conifer communities.

Elevation: 2050–2600 m.

Distribution: United States (Colorado, Utah).

Reproductive mode: sexual diploid.

36. *Boecheera glaucovalvula* (M. E. Jones) Al-Shehbaz, *Novon* 13: 385. 2003; *Arabis glaucovalvula* M. E. Jones, *Contr. W. Bot.* 8: 40. 1898. TYPE: United States, California, Darwin Mesa, Argus Mts., 5000 ft, 8 May 1897, *M. E. Jones s.n.* (holotype, POM!; isotypes, BM!, DS!, GH!, MO!, 2NY!, PH!, 2POM!, RM!, 2UC!, 2US!, UTC).

Plants short- to long-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, (0.6–)1.0–4.5 dm, lower parts with abundant, short-stalked, 4–8-rayed trichomes 0.1–0.4 mm, upper parts similarly pubescent. Leaves at stem bases linear to linear-oblongate, 2–4(–6) mm wide, entire, usually ciliate at petiole base with simple or spurred trichomes to 1.5 mm, blade surfaces densely pubescent with short-stalked, 4–8-rayed trichomes 0.1–0.4 mm; cauline leaves 6–10, not concealing stem, the uppermost densely pubescent, lacking auricles. Inflorescences mostly unbranched, (5–)10–25-flowered; fruiting pedicels 2–10 mm, reflexed, strongly curved at the base, with appressed, branched trichomes. Flowers divaricate at anthesis; sepals pubescent; petals light purple to lavender, 6–9 × 1.5–2.5 mm, glabrous; ovules 24–62 per fruit. Fruits (1.8–)2.5–4.5 cm × 5–8 mm, strongly reflexed, occasionally appressed to rachises, often secund, straight, with parallel edges, glabrous; style 0.2–0.6 mm. Seeds biseriate, 5–6 × 4–5 mm; wing continuous, 1.8–2.5 mm wide. $2n = 14$.

Flowering: Mar–Apr.

Habitat: rocky slopes and gravelly soil, usually under shelter of desert shrubs.

Elevation: 600–1600 m.

Distribution: California, Nevada.

Reproductive mode: sexual diploid.

37. *Boecheera goodrichii* (S. L. Welsh) N. H. Holmgren in N. H. Holmgren et al., *Intermountain Fl.* 2b: 364. 2005; *Arabis goodrichii* S. L. Welsh in S. L. Welsh et al., *Utah Fl.*, ed. 3. 255. 2005. TYPE: United States, Utah, Beaver [as Millard] Co., Mountain Home Range, T27S, R19W, S3, 31 miles SSW of Garrison, 9050 ft., 2 Aug 1983, *S. Goodrich 19802* (holotype, BRY!).

Plants short-lived perennials to biennials, with or without caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 2.6–7.4(–10.2) dm, lower parts with abundant, short-stalked, 4–8-rayed trichomes 0.1–0.5 mm, these sometimes mixed with 2- or 3-rayed trichomes to 1 mm, upper parts sparsely pubescent or rarely glabrous. Leaves at stem bases oblanceolate, 3–8(–10) mm wide, entire or shallowly dentate, ciliate near petiole bases with simple trichomes to 1 mm, blade surfaces moderately to densely pubescent with short-stalked, 4–8-rayed trichomes 0.15–0.4 mm; cauline leaves 22–72, concealing stem proximally, the uppermost sparsely pubescent or glabrous, with auricles 1–4 mm. Inflorescences mostly unbranched, 25–112-flowered; fruiting pedicels (10–)15–28 mm, divaricate-descending, straight or gently curved, with a few appressed, branched trichomes or rarely glabrous. Flowers divaricate-ascending at anthesis; sepals pubescent; petals white to lavender, 6–8 × 1.0–1.5 mm, glabrous; ovules 100–136 per fruit. Fruits 4.5–6.5 cm × 1.5–2.9 mm, pendent, not appressed to rachises, not secund, straight or gently curved, with parallel edges, glabrous; style to 0.2 mm. Seeds biseriate or subbiserial, 1.0–1.4 × 0.9–1.0; wing continuous, 0.05–0.15 mm.

Flowering: Apr–May.

Habitat: rocky slopes in sagebrush, pinyon-juniper woodland, and oak thickets.

Elevation: 1350–2250 m.

Distribution: United States (Nevada, Utah).

Reproductive mode: apomictic triploid.

38. *Boecheera gracilentia* (Greene) Windham & Al-Shehbaz, Harvard Pap. Bot. 12: 240. 2007; *Arabis gracilentia* Greene, Pittonia 4: 194. 1900. TYPE: United States, New Mexico, Santa Fe Co., canyon, 1 mile SE of Santa Fe, 7400 ft, 21 May 1897, A. A. Heller & E. G. Heller 3562 (holotype, NDG!; isotype, GH!, NY!).

Arabis selbyi Rydberg, Bull. Torrey Bot. Club 31: 557. 1904; *Boecheera selbyi* (Rydberg) W. A. Weber, Phytologia 51: 371. 1982. TYPE: U.S.A. Colorado. Ouray Co.: canyons and adjoining meadows, west of Ouray, 2300–2800 m, 9 Sep 1901, L. M. Underwood & A. D. Selby 207 (holotype, NY!).

Arabis perennans var. *thorneae* S. L. Welsh, Utah Fl., ed. 3. 259. 2003; *Boecheera selbyi* var. *thorneae* (S. L. Welsh) N. Holmgren, Brittonia 56: 246. 2004. Uintah: Green River Formation, Mahogany Member, Threemile Creek Road, 1.7 mile E of landing strip, T12S, R25E, S8, 6290 ft., 27 May 1982, K. Thorne, B. Neely & C. Fulmer 1832 (holotype, BRY).

Plants short- or (rarely) long-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems 1–9 per caudex branch, arising near ground surface from margin or center of basal rosettes, (1.5–)2.5–5.5 dm, lower parts with many short-stalked, 2–4-rayed trichomes 0.1–0.5 mm and a few simple trichomes to 0.8 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 2–9 mm wide, shallowly dentate or occasionally entire, ciliate proximally with simple and spurred trichomes to 1.2 mm, blade surfaces moderately to densely pubescent with short-stalked, 4–6(–8)-rayed trichomes 0.1–0.5 mm; cauline leaves 4–9, not concealing stem, the uppermost usually glabrous, with auricles 1–3 mm. Inflorescences mostly unbranched, 7–20-flowered; fruiting pedicels (7–)10–18 mm, divaricate-ascending, gently curved downward, glabrous. Flowers ascending at anthesis; sepals pubescent; petals lavender, 6–7 × 1.5–2.0 mm, glabrous; ovules 60–96 per fruit. Fruits (3.0–)4.5–7.0 cm × 1.7–2.0 mm, widely pendent or rarely horizontal, not appressed to rachises, not secund, slightly curved, with parallel edges, glabrous; style 0.1–0.3 mm. Seeds subbiseriate, 1.2–1.8 × 0.9–1.2 mm; wing continuous, 0.1–0.25 mm wide.

Flowering: Apr.–May.

Habitat: rocky slopes and sandy soil in pinyon-juniper woodland and mountain shrub communities.

Elevation: 1900–2300 m.

Distribution: United States (Arizona, Colorado, New Mexico, Utah).

Reproductive mode: apomictic triploid.

39. *Boecheera gracilipes* (Greene) Dorn, Brittonia 55: 3. 2003; *Arabis gracilipes* Greene, Pittonia 4: 193. 1900. TYPE: United States, Arizona: Flagstaff, May 1893, N. C. Wilson s.n. (lectotype designated by Rollins (1941: 399), NDG; isolectotype, NDG!).

Arabis arcuata (Nuttall) A. Gray var. *longipes* S. Watson in A. Gray & S. Wats., Syn. Fl. N. Amer. 1(1): 164. 1895; *A. perennans* S. Watson var. *longipes* (S. Watson) Jepson, Fl. Calif. 2: 70. 1936. TYPE: United States, Arizona, Mohave Co., near Fort Mohave, Apr 1884, J. G. Lemmon 4184 (holotype, GH!).

Plants short-lived perennials or biennials, with or without caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes or (rarely) laterally below sterile shoots, 2.5–8.5 dm, lower parts with abundant simple or spurred trichomes 0.9–1.5 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 5–12 mm wide, shallowly dentate, occasionally ciliate near petiole bases, blade surfaces sparsely to densely pubescent with short- to long-stalked, 2–3-rayed

trichomes mostly 0.3–0.6 mm; cauline leaves 30–65, often concealing stem proximally, the uppermost usually glabrous, with auricles 0.8–3.0 mm. Inflorescences mostly unbranched, (12–)15–50-flowered; fruiting pedicels (15–)20–47 mm divaricate-ascending or horizontal, recurved, glabrous. Flowers ascending at anthesis; sepals pubescent; petals white to pale lavender, 6–9 × 0.6–1.0 mm, glabrous; ovules 130–210 per fruit. Fruits (2.5–)3.0–7.5 cm × 1.5–2.8 mm, widely pendent, not appressed to rachises, not secund, curved, with parallel edges, glabrous; style 0.2–0.5 mm. Seeds biseriate, 1.2–1.4 × 0.7–0.9 mm; wing continuous or distal, to 0.2 mm wide.

Flowering: Apr–Jun.

Habitat: basalt, limestone, and sandy soils in ponderosa pine forest and pinyon-juniper woodland.

Elevation: 1750–2300 m.

Distribution: United States (Arizona, Nevada, Utah).

Reproductive mode: sexual diploid.

40. *Boechera grahamii* (Lehmann) Windham & Al-Shehbaz, Harvard Pap. Bot. 12: 241. 2007;

Turritis grahamii Lehmann, Del. Sem. Hort. Hamb. 7. 1831 (also in Linnaea 6: Litt. 74. 1831); based on *T. patula* Graham, Edinburgh New Philos. J. [7]: 350. 1829, not *T. patula* Ehrhart, Beitr. 7: 159. 1792; *Arabis patula* Torrey, Bot. U.S. and Mex. Bound. Surv. 1: 32. 1859, not *A. patula* Weinmann, Cat. Hort. Dorp. 18. 1810, nor *A. patula* Host, Fl. Austr. 2: 271. 1831. TYPE: Rocky Mts., *Drummond s.n.* (Lectotype designated by Windham & Al-Shehbaz (2007: 241), K!).

Turritis brachycarpa Torrey & A. Gray, Fl. N. Amer. 1: 79. 1838; *Arabis drummondii* A. Gray var. *brachycarpa* (Torrey & A. Gray) A. Gray, Manual, ed. 5. 69. 1867; *A. confinis* S. Watson var. *brachycarpa* (Torrey & A. Gray) S. Watson & J. M. Coulter in A. Gray, Manual, ed. 6. 67. 1890; *A. brachycarpa* (Torrey & A. Gray) Britton, Mem. Torrey Bot. Club. 5: 174. 1894, not Ruprecht, Fl. Caucas. 73. 1869; *A. holboellii* Hornemann var. *brachycarpa* (Torrey & A. Gray) S. L. Welsh, Utah Fl., ed. 3. 256. 2003; *Boechera brachycarpa* (Torrey & A. Gray) Dorn, Vasc. Pl. Wyoming, ed. 3. 375. 2001; *Turritis drummondii* (A. Gray) Lunell var. *brachycarpa* (Torrey & A. Gray) Lunell, Amer. Midl. Naturalist 5: 236. 1919; TYPE: United States, Michigan, Gratiot Co., Fort Gratiot [Point Huron], *Z. Pitcher s.n.* (lectotype designated by Holmgren (2004: 245), NY!).

Arabis confinis S. Watson, Proc. Amer. Acad. Arts 22: 466. 1887. TYPE: Canada, Manitoba, Lake Winnipeg Valley, 1857, *E. Bourgeau s.n.* (lectotype designated by Windham & Al-Shehbaz (2007: 241), GH!; isotype, E!).

Arabis bourgovii Rydberg, Mem. N.Y. Bot. Gard. 1: 186. 1900. TYPE: Same as *Turritis patula* Graham.

Arabis dacotica Greene, Leaflet Bot. Observ. Crit. 2: 80. 1910; *A. divaricarpa* A. Nelson var. *dacotica* (Greene) B. Boivin, Amer. Midl. Nat. 54: 510. 1955. TYPE: United States, South Dakota, Fort Meade, *W. H. Forwood 28* (holotype, US!).

Arabis divaricarpa A. Nelson var. *stenocarpa* M. Hopkins, Rhodora 39: 133. 1937; *A. patula* Torrey var. *stenocarpa* (M. Hopkins) Farwell, Papers Mich. Acad. Sci. 26: 14. 1941. TYPE: Canada, Quebec, Rimouski Co., slaty ridges east of the village, Bic, 4 Jul 1907, *M. L. Fernald & J. F. Collins 1057* (holotype, GH!; isotype, CAN!).

Arabis divaricarpa var. *hemicylindrica* B. Boivin, Amer. Midl. Nat. 54: 510. 1955; *A. boivinii* G. A. Mulligan, Rhodora 97: 157. 1996. TYPE: Canada, Saskatchewan, District de Maple Creek, 10 miles au sud, Carmichael, monts Cypres, ecorre de la coulee du ruisseau Bone, 9 Jul 1952, *B. Boivin & J. F. Alex 9738* (holotype, DAO!; isotypes, GH!, MT).

Plants short-lived perennials to biennials, with or without caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, (1.2–)2.0–12.0 dm, lower parts glabrous or with simple and sessile or subsessile, 2–3(–6)-rayed trichomes to 1 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 1.5–10(–20) mm wide, entire to dentate, ciliate proximally with simple trichomes to 1 mm, blade surfaces sparsely to densely pubescent with sessile or subsessile, 2–4(–7)-rayed trichomes 0.2–0.6 mm; cauline leaves (10–)13–52, often concealing stem proximally, the uppermost glabrous, with auricles 1–5 mm. Inflorescences mostly unbranched, 16–88-flowered; fruiting pedicels 5–22(–30) mm, divaricate-ascending to descending, gently curved downward or rarely straight, glabrous. Flowers divaricate at anthesis; sepals glabrous or pubescent; petals white or rarely lavender, 5.5–8.0 × 1.0–2.0 mm, glabrous; ovules 84–146 per fruit. Fruits 3.5–9.0 cm × 1.0–1.8 mm, divaricate-ascending to pendent, not appressed to rachises, not secund, straight or slightly curved, with parallel edges, glabrous; style 0.05–0.5 mm. Seeds uniseriate to subbiseriate, 1.0–1.8 × 0.8–1.2 mm; wing continuous, 0.1–0.25 mm wide. $2n = 21$.

Flowering: May–Aug.

Habitat: rocky slopes and sandy soil in prairies and open forests.

Elevation: 100–3150 m.

Distribution: Canada (Alberta, British Columbia, Manitoba, Northwest Territories, Ontario, Quebec, Saskatchewan, Yukon), United States (Alaska, Colorado, Michigan, Minnesota, Montana, New York, Dakota, South Dakota, Vermont, Washington, Wisconsin, Wyoming).

Reproductive mode: apomictic triploid.

41. *Boechera gunnisoniana* (Rollins) W. A. Weber, *Phytologia* 51: 370. 1982; *Arabis gunnisoniana* Rollins, *Rhodora* 43: 434. 1941. TYPE: United States, Colorado, Gunnison Co., barren rocky knoll near Saguache Creek, 6 miles E of Gunnison, 8000 ft (2400 m), 21 May 1938, *Reed C. Rollins 2090* (holotype, GH!; isotype, BM!, BRY!, CAN!, DAO!, E!, MO!, NY!, OSC!, 2PH!, RM!, UC!, WS!).

Plants mostly long-lived, caespitose perennials often with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–6 per caudex branch, arising near ground surface from margin of basal rosettes, 0.8–2(–2.5) dm, lower parts with abundant short-stalked, 2–4-rayed trichomes 0.08–0.3 mm and fewer simple trichomes, upper parts sparsely pubescent or rarely glabrous. Leaves at stem bases linear-oblanceolate, 1–3(–4) mm wide, entire, ciliate proximally with trichomes to 0.8 mm, blade surfaces densely pubescent with short-stalked, 3–6-rayed trichomes 0.08–0.3 mm; cauline leaves 3–9, not concealing stem, the uppermost glabrous or sparsely pubescent, with auricles 0.2–1 mm. Inflorescences mostly unbranched, 7–15-flowered; fruiting pedicels 4–7 mm, divaricate, straight or slightly curved, glabrous or with few appressed, branched trichomes. Flowers divaricate-ascending at anthesis; sepals pubescent; petals white or lavender, 4–6 × 1–2 mm, glabrous; ovules 36–54 per fruit. Fruits 2.5–4.0 cm × 1.0–1.5 mm, horizontal to divaricate-descending, not appressed to rachises, not secund, straight to slightly curved, with parallel edges, glabrous; style 0.1–0.2 mm. Seeds uniseriate, 1.0–1.2 × 0.8–1.0 mm; wing continuous, 0.10–0.15 mm wide. $2n = 14$.

Flowering: May–Jun.

Habitat: rocky slopes and knolls with sagebrush.

Elevation: 2100–2700 m.

Distribution: United States (Colorado/Gunnison County).

Reproductive mode: sexual diploid.

42. *Boecheera harrisonii* (S. L. Welsh) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 266. 2007; *Arabis harrisonii* S. L. Welsh in S. L. Welsh et al., Utah Fl., ed. 3. 256. 2003; *Boecheera microphylla* (Nuttall) Dorn var. *harrisonii* (S. L. Welsh) N. H. Holmgren, Brittonia 56: 246. 2004. TYPE: United States, Utah, Utah Co.: South Fork Provo Canyon, 2 miles [3.2 km] east of Vivian Park, 5300 m, 6 May 1950, *B. F. Harrison 11474* [11747 in protologue] (holotype, BRY!; isotypes, BRY!, GH!).

Plants long-lived, somewhat caespitose perennials, often with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 3–7 per caudex branch, arising near ground surface from margin of basal rosettes, 0.5–2.5 dm, lower parts with few short-stalked, 2–3-rayed trichomes 0.06–0.2 mm or rarely glabrous, upper parts glabrous. Leaves at stem bases narrowly oblanceolate, 2–4 mm wide, entire or somewhat dentate, ciliate near petiole bases with simple trichomes to 0.5 mm, blade surfaces sparsely pubescent with short-stalked, 2–5-rayed trichomes 0.1–0.25 mm; cauline leaves 3–7, not concealing stem, the uppermost glabrous, with auricles 0.5–1.5 mm. Inflorescences mostly unbranched, 5–12-flowered; fruiting pedicels 8–12 mm, divaricate-ascending, straight, glabrous. Flowers ascending at anthesis; sepals pubescent; petals lavender, 5.0–7.5 × 0.8–1.5 mm, glabrous; ovules 64–86 per fruit. Fruits 3.0–4.7 cm × 1.0–1.5 mm, divaricate-ascending or (rarely) nearly horizontal, not appressed to rachises, not secund, curved to straight, with parallel edges, glabrous; style 0.2–0.5 mm. Seeds uniseriate, 1.1–1.3 × 0.8–1.1 mm; wing continuous but narrower at seed margin, 0.08–0.1 mm wide.

Flowering: May–Jun.

Habitat: limestone and quartzite cliffs.

Elevation: 1500–1600 m.

Distribution: United States (Utah/Utah and Wasatch counties).

Reproductive mode: apomictic triploid.

43. *Boecheera hastatula* (Greene) Al-Shehbaz, Novon 13: 386. 2003; *Arabis hastatula* Greene, Leaflet Bot. Observ. Crit. 2: 79. 1910. TYPE: United States, Oregon, Imnaha National Forest, North of Bald Knob, 600 ft, 25 Jun 1907, *A. W. Sampson & G. A. Pearson 64* (holotype, US!).

Plants short- to long-lived perennials, often with woody caudices, lacking crowded, persistent leaf bases; apomictic (with spheroid pollen) or sexual (with ellipsoid pollen). Stems 1–4 per caudex branch, arising near ground surface from margin of basal rosettes, 1–3 dm, glabrous throughout. Leaves at stem bases linear-oblanceolate to oblanceolate, 1–3(–5) mm wide, entire or minutely toothed, rarely ciliate near petiole bases with few simple trichomes to 0.8 mm, blade surfaces pubescent with short-stalked, 3–6-rayed trichomes 0.07–0.20 mm or glabrous; cauline leaves 4–15, not concealing stem, the uppermost glabrous, with auricles 0.5–2.5 mm.

Inflorescences mostly unbranched, 12–40-flowered; fruiting pedicels 4–8 mm, reflexed, abruptly recurved near base, glabrous. Flowers divaricate to pendent at anthesis; sepals pubescent; petals lavender, 5–6 × ca. 1 mm; glabrous; ovules 46–60 per fruit. Fruits 3.0–4.2 × 1.0–1.5 mm, reflexed to closely pendent, usually appressed to rachises, often secund, straight, with parallel edges, glabrous. Seeds uniseriate, 1.0–1.3 × 0.8–1.0; wing continuous, 0.05–0.10 mm.

Flowering: Jun–Jul.

Habitat: igneous rock outcrops.

Elevation: 1950–2100.

Distribution: United States (Oregon/Baker and Wallowa counties).

Reproductive mode: apomictic triploid.

44. *Boecheera hoffmannii* (Munz) Al-Shehbaz, *Novon* 13: 386. 2003; *Arabis maxima* Greene var. *hoffmannii* Munz, *Bull. S. Calif. Acad. Sci.* 31: 63. 1932; *A. hoffmannii* (Munz) Rollins, *Madroño* 3: 360. 1936. TYPE: United States, California, Santa Barbara Co., Santa Cruz Island: ledges in sea cliff, just E of Dick's Harbor, 28 Feb 1932, R. Hoffmann 653 (holotype, POM!).

Plants long-lived perennials, with woody caudices, occasionally with crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, often elevated above ground surface on woody base, arising from center of basal rosettes, 5–7 dm, lower parts glabrous or with few short-stalked, 2–3-rayed trichomes 0.15–0.40 mm, upper parts glabrous to sparsely pubescent. Leaves at stem narrowly oblanceolate, 3–8 mm wide, coarsely dentate, ciliate with simple and 2-rayed trichomes to 0.6 mm, blade surfaces sparsely to densely pubescent with short-stalked, 2–7-rayed trichomes 0.15–0.40 mm; cauline leaves 15–65, concealing stem, the uppermost pubescent, with auricles 1–4 mm. Inflorescences occasionally branched, 30–70-flowered; fruiting pedicels 10–45 mm, divaricate-ascending, straight, glabrous. Flowers ascending at anthesis; sepals pubescent; petals white or pale lavender, 8–10 × 1.5–2.0 mm, glabrous; ovules 170–220 per fruit. Fruits 6–10 cm × 2.5–3.0 mm, divaricate-ascending to horizontal, not appressed to rachises, not secund, curved or rarely straight, with parallel edges, glabrous; style 0.05–0.50 mm. Seeds biseriate, 1.2–1.6 × 0.9–1.2 mm; wing continuous, 0.1–0.2 mm wide.

Flowering Feb–Mar.

Habitat: ledges on sea cliffs and crevices of volcanic outcrop in chaparral community.

Elevation: 0–100 m.

Distribution: United States (California/Santa Cruz Island in Santa Barbara County).

Reproductive mode: sexual diploid.

45. *Boecheera holboellii* (Hornemann) Á. Löve & D. Löve, *Bot. Not.* 128: 513. 1975; *Arabis holboellii* Hornemann in Oeder, *Fl. Danica* 11(Heft 32): 5, pl. 1879. 1827; *Erysimum holboellii* (Hornem.) Kuntze, *Revis. Gen. Pl.* 2: 933. 1891. TYPE: Greenland. “In rupibus Insulae Disco ad Jacobshaven,” *C. Holböel s.n.* (lectotype designated by Windham & Al-Shehbaz (2006: 69), C!; isolectotype, C!).

Arabis holboellii var. *tenuis* Böcher, *Svensk. Bot. Tidskr.* 48: 38. 1954; *Boecheera tenuis* (Böcher) Á. Löve & D. Löve, *Bot. Not.* 128: 513. 1975. TYPE: Greenland, not seen.

Plants short-lived perennials or biennials, with or without caudices, lacking crowded, persistent leaf bases; apomictic (with spheroid pollen) or sexual (with ellipsoid pollen). Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 2–6.7 dm, lower parts with many short-stalked, 4–8-rayed trichomes 0.1–0.3 mm, upper parts glabrous to sparsely pubescent. Leaves at stem bases oblanceolate, 2–5 mm wide, entire, occasionally ciliate near petiole bases with mostly simple trichomes to 0.7 mm, blade surfaces sparsely to moderately pubescent with short-stalked, 4–8-rayed trichomes 0.1–0.3 mm; cauline leaves 7–40, often concealing stem proximally, the uppermost glabrous or sparsely pubescent, with auricles 1–4 mm. Inflorescences mostly unbranched, 10–60-flowered; fruiting pedicels 5–10 mm, descending to reflexed, most abruptly recurved near base, glabrous or with few appressed, branched trichomes. Flowers divaricate to pendent at anthesis; sepals pubescent; petals white, 4–8 × 1–2 mm, glabrous; ovules and 80–102 per fruit. Fruits 3.5–6.5 × 2.0–2.5 mm, descending to reflexed, not appressed to rachises, strongly secund, often curved, with parallel edges, glabrous. Seeds uniseriate to subbiseriate, 1.4–1.7 × 1.0–1.2; wing continuous, to 0.2 mm. $2n = 14, 21$.

Flowering: Jul–Aug.

Habitat: rocky slopes and gravelly soil near coast.

Elevation: 100–300 m.

Distribution: Greenland.

Reproductive mode: Both sexual diploid and apomictic autotriploid.

46. *Boechera horizontalis* (Greene) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 266. 2007; *Arabis horizontalis* Greene, Leaflet Bot. Observ. Crit. 2: 74. 1910; *A. suffrutescens* S. Watson var. *horizontalis* (Greene) Rollins, Res. Stud. State Coll. Wash. 4: 50. 1936. TYPE: United States, Oregon, Oregon. Klamath Co.: Crater Lake, along the trail to the boat landing, 1 Aug 1897, Frederick V. Coville & Elmer I. Applegate 334 (holotype, US!; isotypes, RM!, US!).

Plants long-lived, caespitose perennials, with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, somewhat elevated on woody bases or arising near ground surface from center of basal rosettes, 1–3.5 dm, lower parts with few short-stalked, 3–6-rayed trichomes 0.1–0.3 mm, upper parts glabrous. Leaves at stem bases narrowly oblanceolate, 1–5 mm wide, entire, ciliate near petiole bases with simple trichomes to 0.4 mm, blade surfaces densely pubescent with short-stalked, 3–6-rayed trichomes 0.1–0.3 mm; cauline leaves 3–13, often concealing stem proximally, the uppermost glabrous, with auricles 0.5–1.5 mm. Inflorescences mostly unbranched, 5–32-flowered; fruiting pedicels 4–11 mm, horizontal to descending, straight or slightly curved downward, glabrous. Flowers divaricate-ascending at anthesis; sepals pubescent; petals lavender to purple, 5–6 × 1.5–2.0 mm, glabrous; ovules 40–54 per fruit. Fruits 2–4 cm × 2–3 mm, horizontal or descending, not appressed to rachises, secund, straight, with slight undulate (non-parallel) edges, glabrous; style 0.2–0.5 mm. Seeds uniseriate, 2.0–2.5 × 1.7–2.0 mm; wing continuous, 0.5–1.0 mm wide.

Flowering: Jul–Aug.

Habitat: dry pumice slopes.

Distribution: United States (Oregon/vicinity of Crater Lake).

Reproductive mode: apomictic triploid.

47. *Boechera howellii* (S. Watson) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 69. 2006; *Arabis howellii* S. Watson, Proc. Amer. Acad. Arts 25: 124. 1890; *A. platysperma* A. Gray var. *howellii* (S. Watson) Jepson, Man. Fl. Pl. Calif. 432. 1925. TYPE: United States, Oregon, Jackson County, Siskiyou Mountains, Ashland Butte, 19 Jul 1887, T. Howell 664 (lectotype, designated by Jepson (Fl. Calif. 2: 72. 1936), GH!; isolectotypes, CAN!, MO!, NDG!, 5NY!, 2ORE!, 2PH!, US!).

Arabis conferta Greene, Repert. Sp. Nov. Regni Veg. 5: 243. 1908. TYPE: United States, California, Tuolumne Co., mountain slopes N Little Kern River, 10–11000 ft, Sep 1897, C. A. Purpus 5231 (holotype, US!; isotypes, E!, GH!, K!, MO!, UC!).

Arabis inamoena Greene var. *acutatus* Jepson, Fl. Calif. 2: 72. 1936. TYPE: United States, California, Tuolumne Co., Young's Lake, 9900 ft, 31 Jul 1927, F. W. Peirson 7610 (holotype, JEPS!).

Arabis platyloba Greene, Pittonia 4: 198. 1900. TYPE: United States, California, Lassen Co., Lake Solfataro, Lassen' Peak, Jul 1896, Mrs. R. M. Austin (holotype, NDG!; isotypes, MO!, JEPS!, US!).

Arabis platysperma var. *imparata* Jepson, Fl. Calif. 2: 72. 1936. TYPE: United States, California, Lassen Co., Lake Solfataro, Lassen' Peak, Jul 1896, Mrs. R. M. Austin (holotype, JEPS!; isotypes, MO!, NDG!, US!).

Plants long-lived perennials, with mostly woody caudices, lacking crowded, persistent leaf bases; sexual, ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.6–2(–3) dm, glabrous throughout. Leaves at stem bases narrowly oblanceolate, 1–7 mm wide, entire, ciliate proximally with simple and a few short-stalked, 2-rayed trichomes 0.1–0.4 mm, blade surfaces glabrous; cauline leaves 2–4, not concealing stem, the uppermost glabrous or (rarely) ciliate proximally, with auricles 0.2–1 mm or rarely lacking. Inflorescences unbranched, 2–5-flowered; fruiting pedicels 4–10 mm, ascending, straight, glabrous. Flowers erect to ascending at anthesis; sepals glabrous; petals white to dark lavender, 4–8 × 1.0–2.5 mm, glabrous; ovules 10–20 per fruit. Fruits 2.5–6.5 cm × 3–7 mm, suberect to ascending, usually not appressed to rachises, not secund, straight to curved, often with somewhat undulate (non-parallel) edges, glabrous; style 0.05–0.30 mm. Seeds uniseriate, 3–6 × 2–4 mm; wing continuous, 1.3–2.5 mm wide.

Flowering: Jun–Aug.

Habitat: rock outcrops, talus slopes and gravelly soil in alpine and subalpine habitats.

Elevation: 1800–3800 m.

Distribution: United States (California, Nevada, Oregon).

Reproductive mode: apomictic triploid.

48. *Boechea inyoensis* (Rollins) Al-Shehbaz, *Novon* 13: 386. 2003; *Arabis inyoensis* Rollins, *Rhodora* 43: 457. 1941; *Boechea selbyi* (Rydberg) W. A. Weber var. *inyoensis* (Rollins) N. H. Holmgren, *Brittonia* 56: 246. 2004. TYPE: United States, sand, in the Sierra foothills near the county hospital at Big Pine, 15 May 1906, A. A. Heller 8259 (holotype, GH!; isotypes, CAS!, E!, MO!, NY!, UC!, US!).

Arabis holboellii Hornemann var. *derensis* S. L. Welsh in S. L. Welsh et al., *Utah Fl.*, ed. 3. 257. 2003. TYPE: United States, Utah, Millard Co., rocky foothills, Whitesage Valley, 5700 ft, 11 May 1935, B. F. Harrison 6357 (holotype, BRY!; isotype, BRY!).

Plants short-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex, arising near ground surface from center of basal rosettes, (1.0–)2.5–6.5 dm, lower parts with abundant short-stalked, 7–12-rayed trichomes 0.1–0.2 mm, upper parts densely to sparsely pubescent. Leaves at stem bases oblanceolate, 1–4(–8) mm wide, entire, ciliate on petioles with simple trichomes to 1 mm, blade surfaces densely pubescent with short-stalked, 3–10-rayed trichomes 0.2–0.7 mm; cauline leaves (7–)12–35, concealing stem proximally, the uppermost densely pubescent, with auricles 0.5–2 mm. Inflorescences mostly unbranched, 10–65-flowered; fruiting pedicels 5–15 mm, divaricate-ascending to horizontal, straight or slightly curved downward, with few appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals lavender to purplish, 5–8 × 1.2–2.0 mm, glabrous; ovules 74–134 per fruit. Fruits 3.7–6.5 cm × 1.5–2.2 mm, divaricate-ascending to widely pendent, not appressed to rachises, not secund, curved or rarely straight, with parallel edges, glabrous; style 0.05–0.20 mm. Seeds subbiseriate or rarely uniseriate, 1.7–2.0 × 1–1.5 mm; wing continuous, 0.1–0.2 mm wide. $2n = 21$.

Flowering: Apr–Jun.

Habitat: limestone and volcanic rock outcrops and clay soils in desert scrub and pinyon-juniper woodland.

Elevation: 1400–2400 m.

Distribution: United States (California, Nevada, Utah).

Reproductive mode: apomictic triploid.

49. *Boecheera johnstonii* (Munz) Al-Shehbaz, Novon 13: 386. 2003; *Arabis johnstonii* Munz, Bull. S. Calif. Acad. Sci. 31: 63. 1932. TYPE: United States, California: Riverside County, San Jacinto Mts., Kenworthy, Thomas Valley, dry rocky slopes, 4500 ft, 19 May 1922, P. A. Munz & I. M. Johnston 5485 (holotype, POM !; isotypes, CAS !, GH !).

Arabis hirshbergiae S. Boyd, Aliso 17: 203. 1998; *Boecheera hirshbergiae* (S. Boyd) Al-Shehbaz, Novon 13: 386. 2003. TYPE: United States, California, San Diego County, Cuyamaca Mts., east of Cuyamaca Reservoir along Sunrise Highway (S-1), 0.5 miles southeast of junction with Hwy 79, about 50 feet north of the road near the Pedro Fages Trail Marker, ca. 33°00'N, 116°30'W, 1400 m, 19 Mar 1995, J. Hirshberg s.n. (holotype, RSA !; Isotype, GH !).

Plants long-lived, caespitose perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.5–2 dm, lower parts with abundant short-stalked, 4–10-rayed trichomes 0.07–0.15 mm, upper parts sparsely to densely pubescent. Leaves at stem bases narrowly oblanceolate, 1.5–4.0 mm wide, entire, not ciliate, blade surfaces densely pubescent with short-stalked, 6–14-rayed trichomes 0.07–0.15 mm; cauline leaves 4–10, often concealing stem proximally, the uppermost densely pubescent, lacking auricles. Inflorescences unbranched, 10–18-flowered; fruiting pedicels 5–14 mm, divaricate-ascending, straight, with appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals purple, 9–14 × 2–4 mm, glabrous; ovules 26–34 per fruit. Fruits 4–6 cm × 2.5–4.0 mm, divaricate-ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style (0.7–)1.0–2.0 mm. Seeds uniseriate, 1.9–2.7 × 1.5–2.2 mm; wing continuous, 0.3–0.7 mm wide.

Flowering: Feb–Mar.

Habitat: rocky areas and gravelly soil in chaparral and oak-pine savanna.

Elevation: 1300–1700 m.

Distribution: United States (California/ San Diego and Riverside counties).

Reproductive mode: sexual diploid.

50. *Boecheera koehleri* (T. J. Howell) Al-Shehbaz, Novon 13: 386. 2003; *Arabis koehleri* T. J. Howell, Fl. Northw. Amer. 1: 44. 1897. TYPE: United States, Oregon, Douglas Co., Cost Mts., along Umpqua River at Roseburg, cliffs, 17 Apr 1887, T. J. Howell s.n. (holotype, ORE!; isotypes, GH!, MO!, NDG!, 4NY!, US!, WTU).

Arabis arbuscula Greene, Leaflet Bot. Observ. Crit. 2: 77. 1910. TYPE: United States, Oregon, Josephine Co., Eight Dollars Mt., 18 Jun 1904, C. V. Piper 5065 (holotype, US!; isotype, GH!).

Arabis koehleri var. *stipitata* Rollins, Rhodora 43: 426. 1941. TYPE: United States, Oregon, Josephine Co., Near Waldo on Camp Chicago Trail, 19 April 1934, A. Eastwood & J. T. Howell 1695 (holotype, GH!; isotypes, CAS!, GH!).

Plants long-lived perennials, with woody caudices, with many peg-like persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, elevated above ground surface on woody bases, arising from center of basal rosettes, 0.8–4.5 dm, lower parts with stalked, 2–4-rayed trichomes to 0.5 mm, these mixed with simple trichomes to 1 mm, upper parts glabrous. Leaves at stem bases narrowly oblanceolate, 1–3 mm wide, entire, ciliate proximally with simple trichomes to 1 mm, blade surfaces moderately to sparsely pubescent with stalked, 2–4-rayed trichomes 0.1–0.3(–0.5) mm; cauline leaves 3–17(–30), rarely concealing stem, the uppermost glabrous, with auricles 0.5–2.5 mm. Inflorescences mostly unbranched, 6–20(–35)-flowered; fruiting pedicels 10–18 mm, divaricate-ascending to horizontal, straight, glabrous or with few appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals deep purple to magenta, 8–12 × 2.5–4.0 mm, glabrous; ovules 58–94 per fruit. Fruits 5.0–7.5 cm ×

1.8–2.5 mm, divaricate-ascending to widely pendent, not appressed to rachises, not secund, curved or rarely straight, with parallel edges, glabrous; style 0.05–0.20 mm. Seeds uniseriate, 1.3–1.8 × 1.2–1.5 mm; wing continuous, 0.1–0.2 mm wide.

Flowering: Apr–May.

Habitat: serpentine and limestone outcrops.

Elevation: 100–500 m.

Distribution: United States (California, Oregon).

Reproductive mode: sexual diploid.

51. *Boechera laevigata* (Muhlenberg ex Willdenow) Al-Shehbaz, *Novon* 13: 386. 2003; *Turritis laevigata* Muhlenberg ex Willdenow, *Sp. Pl.* 3(2): 543. 1801; *A. laevigata* (Muhlenberg ex Willdenow) Poiret, *Encycl. Suppl.* 1: 411. 1810. TYPE: United States, Pennsylvania: without locality, *G. H. E. Muhlenberg s.n.* (holotype, PH).

Arabis hastata Eaton, *Man. Bot.*, ed. 2, 141. 1818. TYPE: United States, not located.

Arabis heterophylla Nuttall in Torrey & A. Gray, *Fl. N. Amer.* 1: 81. 1838; *A. laevigata* var. *heterophylla* (Nuttall) Farwell, *Ann. Rep. Michigan Acad. Sci.* 19: 248. 1917. TYPE: United States, “near Paris, Maine or in the vicinity of the White Mountains of New Hampshire”, no specimens located.

Arabis lyrifolia de Candolle, *Syst. Nat.* 2 : 244. 1821, nom. superfl., listing the earlier-published *Turritis lyrata* in synonymy.

Turritis lyrata Rafinesque, *Amer. Monthly Mag. & Crit. Rev.* 2: 44. 1817. TYPE: United States, Catskill Mountains, *Rafinesque s.n.* (holotype, not located).

Plants biennials, without evident caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems 1 per plant, arising near ground surface from center of basal rosettes, (1.5–)3–11 dm, glabrous throughout. Leaves at stem bases obovate to oblanceolate, (4–)10–40 mm wide, serrate or dentate, often minutely ciliate-mucronate on teeth, blade surfaces glabrous or very sparsely pubescent with simple trichomes 0.1–0.6 mm; cauline leaves 7–15, often concealing stem proximally, the uppermost glabrous, with auricles 3–12(–17) mm.

Inflorescences occasionally branched, 16–45-flowered; fruiting pedicels 5–23 mm, suberect to divaricate-ascending, straight to slightly curved, glabrous. Flowers ascending at anthesis; sepals glabrous; petals white, 3–5 × 1.0–1.5 mm, glabrous; ovules 50–80 per fruit. Fruits (4.0–)6.0–11.7 cm × 1–2 mm, divaricate-ascending, not appressed to rachises, rarely somewhat secund, curved, with parallel edges, glabrous; style 0.1–0.7(–1.0) mm. Seeds uniseriate, 1.2–2.2 × 0.8–1.4 mm; wing continuous, 0.1–0.3 mm wide distally. $2n = 14$.

Flowering: Mar–May.

Habitat: rocky bluffs, cedar glades, wooded hillsides and floodplains.

Elevation: 100–500 m.

Distribution: Canada (Ontario, Quebec), United States (Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Ga., Illinois, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Michigan, Missouri, New Hampshire, N.J., New York, N.C., Ohio, Oklahoma, Pennsylvania, S.C., Tennessee, Vermont, Virginia, West Virginia, Wisconsin

Reproductive mode: sexual diploid.

52. *Boechera languida* (Rollins) Windham & Al-Shehbaz, *Harvard Pap. Bot.* 12: 244. 2007;

Arabis demissa Greene var. *languida* Rollins, *Rhodora* 43: 388. 1941; *Boechera demissa* (Greene) W. A. Weber var. *languida* (Rollins) Dorn, *Vasc. Pl. Wyoming*, ed. 3, 375. 2001.

TYPE: United States, Wyoming, Albany Co., limestone outcrop near the City Springs, 2 miles

E of Laramie, 7500 ft, 14 Jun 1936, *Reed C. Rollins 1178* (holotype, GH!; isotypes, CAS!, MO!, NY!, POM!, RM!, UC!, US!).

Plants short- to long-lived perennials, with non-woody (rarely woody) caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 2–5 per caudex branch, arising near ground surface from margin of basal rosettes or laterally below sterile shoot, 1–3 dm, lower parts with simple trichomes to 1 mm and short-stalked, 2-rayed trichomes 0.15–0.50 mm, upper parts glabrous or sparsely pubescent. Leaves at stem bases linear-oblongate to oblanceolate, 1–5(–9) mm wide, entire, ciliate with simple trichomes to 1 mm, blade surfaces densely pubescent with simple and 2–4-rayed trichomes 0.15–0.50 mm; cauline leaves 3–7, not concealing stem, the uppermost sparsely pubescent or glabrous, with auricles 0.5–1.5 mm. Inflorescences mostly unbranched, 10–20-flowered; fruiting pedicels 3–13 mm, horizontal, slightly to strongly recurved near apex, glabrous or with rare, simple trichomes. Flowers divaricate-ascending at anthesis; sepals pubescent; petals white to pale lavender, 4–6 × 1.5–2.0 mm, glabrous; ovules 42–70 per fruit. Fruits 3.0–4.5 cm × 1.8–2.0 mm, pendent, not appressed to rachises, not secund, straight to slightly curved, with parallel edges, glabrous; style 0.1–0.3 mm. Seeds subbiseriate, 1.2–1.5 × 0.8–1.0 mm; wing absent or distal, 0.05–0.12 mm wide.

Flowering: May–Jun.

Habitat: rocky slopes in sagebrush and pinyon-juniper communities.

Elevation: 1800–2300 m.

Distribution: United States (Wyoming).

Reproductive mode: apomictic triploid.

53. *Boechea lasiocarpa* (Rollins) Dorn, Brittonia 55: 3. 2003; *Arabis lasiocarpa* Rollins, Syst.

Bot. 6: 58. 1981. TYPE: United States, Utah, Rich Co., 6 mi. W of Garden City, off U.S.

Hwy. 89, Wasatch Range, high ridge, sedimentary rock, 22 Jun 1979, *R. C. & K. W. Rollins 79307* (holotype, GH!; isotypes, 2BRY!, 2MO!, 2NY!, RM!, UC!, US!).

Plants long-lived perennials, often with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems 1 or few per caudex branch, somewhat elevated on woody bases or arising near ground surface from center or margin of basal rosettes, (0.7–)2.0–3.5 dm, lower parts with abundant short-stalked, 4–8-rayed trichomes 0.05–0.15 mm, upper parts moderately to sparsely pubescent. Leaves at stem bases narrowly oblanceolate, 2–5 mm wide, entire, not ciliate, blade surfaces densely pubescent with short-stalked, 4–8-rayed trichomes 0.05–0.15 mm; cauline leaves 4–10, often concealing stem proximally, the uppermost sparsely to moderately pubescent, lacking auricles. Inflorescences mostly unbranched, 5–12-flowered; fruiting pedicels 4–14 mm, descending, recurved, with appressed, branched trichomes. Flowers divaricate at anthesis; sepals pubescent; petals purple to lavender, 6–10 × 1.5–2.5 mm, glabrous; ovules 26–36 per fruit. Fruits 2–5 cm × 1.7–2.2 mm, pendent, usually not appressed to rachises, rarely secund, straight or curved, glabrous or pubescent throughout; style 0.2–0.9 mm. Seeds uniseriate, 1.5–2.0 × 1.0–1.5 mm; wing distal or continuous, 0.1–0.2 mm wide.

Flowering: May–Jun.

Habitat: rocky ridges and slopes with dwarf sagebrush.

Elevation: 1850–2800 m.

Distribution: United States (Utah).

Reproductive mode: sexual diploid.

- 54. *Boecheera lemmonii*** (S. Watson) W. A. Weber, *Phytologia* 51: 370. 1982; *Arabis lemmonii* S. Watson, *Proc. Amer. Acad. Arts* 22: 467. 1887. TYPE: United States, California: Lassen Peak, Sep 1872, *J. G. Lemmon 23* (lectotype designated by Rollins (1941: 383), GH!).
- Arabis bracteolata* Greene, *Leafl. Bot. Observ. Crit.* 2: 73. 1910. TYPE: United States, Wyoming, 31 Aug 1893, *J. N. Rose 399a* (holotype, US!).
- Arabis canescens* Nuttall var. *latifolia* S. Watson, *Bot. U.S. Geol. Survey 40th Parallel* 5: 17. 1871; *Arabis latifolia* (S. Watson) Piper, *Contr. U.S. Natl. Herb.* 11: 295. 1906. TYPE: United States, Nevada, Clover Mt., Sep 1868, 1100 ft, *S. Watson 71* (lectotype designated by Rollins (1941: 383), GH!; isolectotype, NY!).
- Arabis codyi* G. A. Mulligan, *Rhodora* 97: 151. 1996. TYPE: Canada, Yukon, Kaskawulsh nunatak, jct. N and central arms Kaskawulsh Glaciere, W of Kluane Lake, 6000 ft., unstable slopes, 1 Jul–1 Aug 1965, *D. F. Murray and D. B. Murray 72* (holotype, DAO!).
- Arabis egglestonii* Rydberg, *Fl. Rocky Mts.* 361. 1918. TYPE: United States, Colorado, Clover Mt, above Garfield, 3940 m, 31 Jul 1910, *W. W. Eggleston 6013* (holotype, NY!; isotype, US!).
- Arabis kennedyi* Greene, *Leaf. Bot. Observ. Crit.* 2: 71. 1910. TYPE: United States, Nevada, Washoe Co., Galena Creek, Aug 1906, 8000 ft, *P. B. Kennedy 1248* (holotype, US!; isotype, NY!).
- Arabis oreocallis* Greene, *Leafl. Bot. Observ. Crit.* 2: 73. 1910. TYPE: Canada, British Columbia, Selkirk and Rocky Mountains, [near 51°30'N, Beaverfoot Mts], [14] Jul 1904, *C. H. Shaw s.n.* (holotype, US!; isotypes, E!, GH!, MO!, US!).
- Arabis polyclada* Greene, *Leafl. Bot. Observ. Crit.* 2: 75. 1910. TYPE: United States, California, Lassen Co., Farewell Gap, 10600 ft, Sep 1897, *C. A. Purpus 5229* (holotype, US!; isotypes, E!, GH!, MO!, UC!).
- Arabis semiseputa* Greene, *Leafl. Bot. Observ. Crit.* 2: 74. 1910. TYPE: United States, **Oregon**: Mt Thielson, Cascade Mts, near summit, in loose lava gravel, 6 Aug 1897, *F. V. Coville & E. I. Applegate 454* (holotype, US!; isotypes, DS!, RM!).
- Plants long-lived, somewhat caespitose perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual (with ellipsoid pollen) or apomictic (with spheroid pollen). Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes or laterally below sterile shoot, 0.5–2(–2.5) dm, lower parts glabrous or with scattered short-stalked, 2–6-rayed trichomes 0.1–0.2 mm, upper parts glabrous. Leaves at stem bases oblanceolate to obovate, 1.5–5.0 mm wide, entire or rarely slightly dentate, ciliate on petioles, blade surfaces densely to sparsely pubescent with short-stalked, 3–9-rayed trichomes 0.1–0.2 mm; cauline leaves 2–8(–12), not concealing stem, the uppermost glabrous or sparsely pubescent, with auricles 0.1–0.5 mm or lacking. Inflorescences mostly unbranched, 3–12(–17)-flowered; fruiting pedicels 2–6 mm, divaricate-ascending to slightly descending, slightly recurved or rarely straight, glabrous or with few appressed, branched trichomes. Flowers divaricate-ascending at anthesis; sepals glabrous or sparsely pubescent; petals purple to lavender, 3.5–6.0 × 1.0–1.5 mm; ovules and seeds 28–40(–44) per fruit. Fruits (1.6–)2.0–4.4 cm × 1.6–2.3 mm, divaricate-ascending to slightly descending, not appressed to rachises, secund, straight or curved, with parallel edges, glabrous; style 0.1–0.2 mm. Seeds uniseriate, 1.3–2.0 × 1.0–1.5 mm; wing continuous, 0.1–0.5 mm wide. $2n = 14$.
- Flowering: Jun–Aug.
- Habitat: cliffs, talus slopes, and gravelly soil in alpine and subalpine habitats.
- Elevation: 2150–4350 m.
- Distribution: Canada (Alberta, British Columbia, Yukon), United States (Alaska, California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming).
- Reproductive mode: sexual diploid, apomictic triploid.

55. *Boechea lignifera* (A. Nelson) W. A. Weber, *Phytologia* 51: 370. 1982; *Arabis lignifera* A. Nelson, *Bull. Torrey Bot. Club* 26: 123. 1899. TYPE: United States, Wyoming: Greene River, 14 Jun 1898, A. Nelson 4711 (Lectotype designated by Windham & Al-Shehbaz (2006: 7!), RM! 12591 [plant on right side of sheet]; isolectotypes, MO! [right-hand plant only], NY! [right-hand plant only], US!).

Plants short- to long-lived perennials, with mostly woody caudices, lacking crowded, persistent leaf bases; apomictic (with spheroid pollen) or sexual (with ellipsoid pollen). Stems usually 2–5 per caudex branch, often elevated on woody bases, arising laterally below sterile shoot, 1.2–4.0(–5.0) dm, lower parts with many short-stalked, 4–7-rayed trichomes 0.1–0.3 mm, upper parts sparsely pubescent to glabrous. Leaves at stem bases narrowly oblanceolate, 2–5(–8) mm wide, entire, rarely ciliate near petiole bases with simple or spurred trichomes to 1 mm, blade surfaces densely pubescent with short-stalked, 3–7-rayed trichomes 0.05–0.3 mm; cauline leaves 4–12(–17), rarely concealing stem proximally, uppermost leaves sparsely pubescent, with auricles 0.5–2 mm. Inflorescences mostly unbranched, 6–15(–25)-flowered; fruiting pedicels 5–16 mm, slightly descending, gently recurved, glabrous or with few appressed, branched trichomes. Flowers divaricate-ascending at anthesis; sepals pubescent; petals whitish but often aging pale lavender, 5–7 × 1.0–1.5 mm, glabrous; ovules 48–74 per fruit. Fruits 2.5–5.6 cm × 1.2–2.0 mm, widely pendent, not appressed to rachises, not secund, usually curved, with parallel edges, glabrous; style 0.1–0.2 mm. Seeds uniseriate, 1.0–1.3 × 0.8–1.0 mm; wing often continuous, 0.10–0.15 mm wide. $2n = 14$.

Flowering: Apr.–May.

Habitat: rocky slopes and sandy soil in sagebrush and pinyon-juniper woodland.

Elevations: 1700–2300 m.

Distribution: United States (Arizona, Colorado, Idaho, New Mexico, Utah, Wyoming).

Reproductive mode: sexual diploid.

56. *Boechea lincolnensis* Windham & Al-Shehbaz, *Harvard Pap. Bot.* 11: 71. 2006. TYPE: United States, Nevada, Lincoln County, WSW of Pony Springs on slopes below Kixmiller Summit ca. 1.56 km NW of South Mud Spring. T5N, R65E, sect. 9, 38°18'17" N, 114°41'56"W (WGS84 Datum), 6175 ft, in gravelly (limestone and volcanics) soil on gentle W-facing slope with *Artemisia*, *Pinus*, *Juniperus*, and *Purshia*, 2 May 2004, M. D. Windham 3016 (holotype, UT!; isotypes, BRY!, DUKE!, MO!, NMC!, NY!).

Arabis pulchra M. E. Jones ex S. Watson var. *munciensis* M. E. Jones, *Contr. W. Bot.* 14: 42. 1912; *Boechea pulchra* (M. E. Jones ex S. Wats.) W. A. Weber var. *munciensis* (M. E. Jones) Dorn, *Brittonia* 55: 3. 2003. TYPE: United States, Nevada, White Pine County, Muncy, 19 May 1906, 6500 ft, M. E. Jones s.n. (lectotype designated by Rollins (1941: 460), POM 94144!; isolectotype, POM!).

Plants long-lived perennial, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, elevated above ground surface on woody bases, arising from center of leaf tuft, 2–4.2 dm, lower parts with abundant short-stalked, 3–6-rayed trichomes 0.1–0.5 mm, upper parts similarly pubescent. Leaves at stem bases linear or linear-oblanceolate, 1–2 mm wide, entire, rarely ciliate near petiole bases with simple trichomes to 1 mm, blade surfaces densely pubescent with short-stalked, 3–8-rayed trichomes 0.1–0.4 mm; cauline leaves 10–25, concealing stem proximally, the uppermost densely pubescent, lacking auricles or (rarely) with auricles to 1 mm. Inflorescences mostly unbranched, 7–15-flowered; fruiting pedicels 10–20(–25) mm, divaricate-ascending, straight to slightly curved proximally, recurved distally, with appressed, branched trichomes. Flowers divaricate-

ascending at anthesis; sepals pubescent; petals lavender to purple, 10–12 × 2–3 mm, occasionally with few trichomes abaxially; ovules 86–120 per fruit. Fruits (3.2–)4.0–5.5 cm × 2.0–2.5 mm, widely pendent, not appressed to rachises, not secund, straight, with parallel edges, pubescent throughout; style 0.1–0.3 mm. Seeds biseriate, 1.0–1.5 × 0.7–0.9 mm; wing continuous, 0.07–0.12 mm wide. $2n = 14$.

Flowering: Apr–May.

Habitat: rocky slopes and gravelly soil with sagebrush and other shrubs.

Elevation: 1370–1900 m.

Distribution: United States (California, Nevada, Utah).

Reproductive mode: sexual diploid.

57. *Boechea lyallii* (S. Watson) Dorn, Vasc. Pl. Wyoming, ed. 3. 376. 2001; *Arabis lyallii* S. Watson, Proc. Amer. Acad. Arts 11: 122. 1876; *A. drummondii* A. Gray var. *alpina* S. Wats., Botany [Fortieth Parallel] 18. 1871; *A. drummondii* var. *lyallii* (S. Wats.) Jepson, Man. Fl. Pl. Calif. 429. 1925. TYPE: United States, Nevada, Elko County, Clover Mts. [East Humboldt Range], 10,000 ft, Sep 1868, *S. Watson 75* (lectotype designated by Hopkins (1937: 141), GH!).

Arabis armerifolia Greene, Leafl. Bot. Observ. Crit. 2: 75. 1910. TYPE: United States, Oregon, Klamath County, Crater Lake National Park, fine pumice slope, 14 Sep 1902, *F. V. Coville 1504* (holotype, US!).

Arabis densa Greene, Leafl. Bot. Observ. Crit. 2: 76. 1910. TYPE: United States, Oregon, Union County, Eagle Cap, Imnaha National Forest, 9500 feet (as 9000 feet in protologue), 14 Sep 1907, *A. W. Sampson & G. A. Pearson 206* (holotype, US!).

Arabis multiceps Greene, Leafl. Bot. Observ. Crit. 2: 76. 1910. TYPE: United States, Oregon, Douglas County, Mt. Thielson, Cascade Range, open rocky slopes, 6 Aug 1897, *F. V. Coville & E. I. Applegate 435* (holotype, US!; isotypes, DS!, NY!, RM!).

Arabis murrayi G. A. Mulligan, Rhodora 97: 151. 1996. TYPE: Canada, Yukon, Kaskawulsh nunatak, jct. north and central arms Kaskawulsh Glacier, W of Kluane Lake, 1 Jul–1 Aug 1965, 6000 ft, *D. F. & B. M. Murray 91b* (holotype, DAO!; isotype, ALA!).

Plants long-lived, caespitose perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual (with ellipsoid pollen) or apomictic (with spheroid pollen). Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.3–1.5(–2) dm, glabrous throughout. Leaves at stem bases linear-oblongate, 1–5(–8) mm wide, margin entire, usually ciliate at least proximally with simple and/or short-stalked, 2- or 3-rayed trichomes 0.1–0.3 mm, blade surfaces (occasionally the entire leaf) glabrous or rarely the youngest leaves of sterile shoots pubescent with 4–6-rayed trichomes 0.05–0.10 mm; cauline leaves 1–5, mostly not concealing stem, glabrous, with auricles 0.5–1.5 mm or rarely lacking. Inflorescences unbranched, 2–10(–15)-flowered; fruiting pedicels 3–8(–15) mm, erect, straight, glabrous.

Flowers erect at anthesis; sepals glabrous; petals lavender to purplish, 6.0–8.5 × 1.5–3.0 mm, glabrous; ovules 34–64 per fruit. Fruits 3.0–5.6 cm × 1.5–2.5 mm, erect, appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.1–0.7 mm. Seeds biseriate or subbiseriate, 1.5–2.0 × 1.0–1.5 mm; wing continuous, 0.3–0.5 mm wide.

Flowering: Jun–Aug.

Habitat: cliffs, talus slopes, and gravelly soil in alpine and subalpine habitats.

Elevation: 1450–3700 m.

Distribution: Canada (British Columbia, Yukon), United States (California, Idaho, Montana, Nevada, Oregon, Utah, Washington).

Reproductive mode: sexual diploid.

58. *Boechea macounii* (S. Watson) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 267. 2007; *Arabis macounii* S. Watson, Proc. Amer. Acad. Arts 26: 124. 1891; *A. microphylla* Nuttall var. *macounii* (S. Watson) Rollins, Rhodra 43: 428. 1941; *Boechea microphylla* (Nutt.) Dorn var. *macounii* (S. Watson) Dorn, Vasc. Pl. Wyoming, ed. 3, 376. 2001. TYPE: Canada, British Columbia: Revelstoke, 13 May 1890, *John Macoun s.n.* (holotype, GH!; isotypes, CAN!, CAS!, K!, MO!, NY!, US!).

Arabis densicaulis A. Nelson, Bot. Gaz. 30: 190. 1900. TYPE: United States, Wyoming, Park Co., Yellowstone National Park, Undine Falls, 6 Jul 1899, *Aven Nelson & Elias Nelson 5680* (holotype, RM!; isotypes, E!, K!, MO!, NDG!, NMC!, NY!, RM!, US!).

Plants mostly long-lived perennials, often with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems 1 or several per caudex branch, arising near ground surface from margin or center of basal rosettes, 2.0–3.6 dm, lower parts with abundant simple and short-stalked, 2-rayed trichomes 0.1–0.8 mm, upper parts glabrous. Leaves at stem bases oblanceolate to linear-oblanceolate, 1–3(–5) mm wide, entire or minutely toothed, ciliate proximally with simple trichomes to 0.7 mm, blade surfaces densely pubescent with short-stalked, 3–6-rayed trichomes 0.07–0.30 mm; cauline leaves (5–)9–16, often concealing stem proximally, the uppermost glabrous, with auricles 0.5–1.5 mm. Inflorescences mostly unbranched, 10–33-flowered; fruiting pedicels 5–13(–17) mm, divaricate-ascending to horizontal, straight, with few appressed, branched trichomes or rarely glabrous. Flowers divaricate-ascending at anthesis; sepals pubescent; petals lavender to purple, 4–5 × 0.5–0.8 mm, glabrous; ovules 56–78 per fruit. Fruits 3.5–6.5 cm × 0.8–1.2 mm, divaricate-ascending to descending, not appressed to rachises, not secund, usually curved, with parallel edges, glabrous; style 0.1–0.4 mm. Seeds uniseriate, 1.0–1.2 × 0.7–1.0 mm; wing often continuous, 0.05–0.15 mm wide.

Flowering: May–Jul.

Habitat: rocky hillsides in open pinewoods.

Elevation: 2200–2900 m.

Distribution: Canada (British Columbia), United States (Idaho, Montana, Wyoming).

59. *Boechea microphylla* (Nuttall) Dorn, Vasc. Pl. Wyoming, ed. 3, 376. 2001; *Arabis microphylla* Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 82. 1838. TYPE: United States, “Rocky Mountains”, *T. Nuttall s.n.* (holotype, RM!; isotype, PH!).

Arabis tenuicula Greene, Leaf. Bot. Observ. Crit. 2: 82. 1910. TYPE: United States, Oregon, Union County, in clefts of rocks, 3000 ft, May 1883, *W. C. Cusick 1124* (holotype, US!; isotypes, GH!, NY!, OSC!, US!).

Plants long-lived, caespitose perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual (with ellipsoid pollen) or apomictic (with spheroid pollen). Stems 1 or several per caudex branch, arising near ground surface from center or margin of basal rosettes, 0.8–2.8(–3.5) dm, lower parts with few simple and sessile, 2-rayed trichomes 0.3–0.6 mm, upper parts glabrous. Leaves at stem bases oblanceolate to linear-oblanceolate, 1–4(–6) mm wide, entire or subapically few toothed, ciliate proximally with simple trichomes to 0.6 mm, blade surfaces densely pubescent with short-stalked, 4–8-rayed trichomes 0.05–0.1 mm; cauline leaves 2–6, not concealing stem, the uppermost glabrous, with auricles 0.5–1.5 mm. Inflorescences mostly unbranched, 5–17-flowered; fruiting pedicels 4–14 mm, ascending to divaricate-ascending, straight, glabrous. Flowers ascending at anthesis; sepals glabrous or pubescent; petals lavender to purple, 3.5–5.5 × 1.0–1.8 mm, glabrous; ovules 52–72 per fruit. Fruits 3–7 cm × 1.0–1.5 mm,

ascending to divaricate-ascending, not appressed to rachises, not secund, straight to slightly curved, with parallel edges, glabrous; style 0.05–0.3 mm. Seeds uniseriate, 1.0–1.5 × 0.7–1.0 mm; wing often distal, ca. 0.1 mm wide. $2n = 14$.

Flowering: Apr–Jun.

Habitat: cliffs and rocky slopes in sagebrush, mountain shrub, and open conifer forest.

Elevation: 430–2400 m.

Distribution: Canada (British Columbia), United States (Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming).

Reproductive mode: sexual diploid.

60. *Boecheira missouriensis* (Greene) Al-Shehbaz, Novon 13: 387. 2003; *Arabis missouriensis* Greene, Repert. Sp. Nov. Regni Veg. 5: 244. 1908; *A. laevigata* var. *missouriensis* (Greene) Ahles, J. Elisha Mitchell Sci. Soc. 80: 172. 1964. TYPE: United States, Missouri, Montier, 15 May 1894, B. F. Bush 31 (holotype, NDG!; isotype, GH!).

Arabis viridis var. *deamii* M. Hopkins, Rhodora 39: 157. 1937; *A. missouriensis* var. *deamii* (M. Hopkins) M. Hopkins, Rhodora 45: 269. 1943. TYPE: United States, Indiana, Lagrange Co., 5 miles E of Lagrange, on cleared gravelly slope on E side of old tamarack bog, 4 Jun 1922, D. C. Deam 36370 (holotype, GH!).

A. viridis Harger Rhodora 13: 38. 1911. TYPE: United States, Connecticut, Southbury, dry crevices of trap cliff, 25 Jul 1908, E. B. Harger 5322 (lectotype designated by Hopkins (1937: 157), GH!).

Plants biennials, without evident caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per plant, arising near ground level from center of basal rosettes, 2.0–7.5 dm, lower parts with few simple trichomes to 0.5 mm, or glabrous throughout. Leaves at stem bases oblanceolate, 5–18 mm wide, lyrate-pinnatifid, often minutely ciliate-mucronate on lobes, blade surfaces glabrous or sparsely pubescent with simple trichomes 0.1–0.5 mm; cauline leaves 10–45, often concealing stem proximally, glabrous with auricles 1–5 mm. Inflorescences occasionally branched, 18–47-flowered; fruiting pedicels 5–13 mm, suberect to divaricate-ascending, straight or slightly curved, glabrous. Flowers ascending at anthesis; sepals glabrous; petals white, 5–10 × 1.0–1.5 mm, glabrous; ovules 60–86 per fruit. Fruits 6–11 cm × 1.5–2.0 mm, ascending to divaricate-ascending, not appressed to rachises, not secund, curved, with parallel edges, glabrous; style 0.1–1.0 mm. Seeds uniseriate, 1.2–2.0 × 1.0–1.2 mm; wing continuous, 0.1–0.4 mm wide.

Flowering: Mar–Jun.

Habitat: rocky bluffs, wooded slopes, and valley bottoms.

Elevation: 50–300 m.

Distribution: United States (Arkansas, Connecticut, Georgia, Illinois, Kentucky, Massachusetts, Missouri, New York, North Carolina, Oklahoma, South Carolina, Wisconsin).

Reproductive mode: sexual diploid.

61. *Boecheira nevadensis* (Tidestrom) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 73. 2006; *Arabis nevadensis* Tidestrom, Proc. Biol. Soc. Wash. 36: 182. 1923. TYPE: United States, Nevada: Clark County, head of Lee Canyon, Charleston Mts., 10,000 ft, 5 Aug 1913, A. A. Heller 11077 (holotype, US!; isotypes, DS!, E!, GH!, MO!, NY!).

Plants short- to long-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–4 per caudex branch, arising near ground surface from margin of basal rosettes or laterally below sterile shoots, 0.6–2.0 dm, glabrous throughout. Leaves at stem bases oblanceolate, 2–6 mm wide, entire, rarely ciliate on

petioles with simple trichomes 0.5–0.7 mm, blade surfaces glabrous; cauline leaves 5–9, rarely concealing stem proximally, the uppermost glabrous, with auricles 0.7–2.5 mm. Inflorescences mostly unbranched, 4–12-flowered; fruiting pedicels 2.5–8.0 mm, divaricate-ascending to horizontal, straight, glabrous. Flowers ascending at anthesis; sepals glabrous; petals lavender, 4.0–5.5 × 1.5–2.0 mm, glabrous; ovules 52–72 per fruit. Fruits 1.9–4.0 cm × 2–3 mm, divaricate-ascending or rarely slightly descending, usually secund, straight to slightly curved, glabrous; style 0.05–0.20 mm. Seeds biseriate, 1.1–1.4 × 0.8–1.0 mm; wing continuous, 0.07–0.15 mm wide. Flowering: Jun.

Habitat: ledges and talus of limestone cliffs.

Elevation: 3050–3350 m.

Distribution: United States (Nevada/Clark and Nye counties)

Reproductive mode: sexual diploid.

62. *Boechera ophira* (Rollins) Al-Shehbaz, *Novon* 13: 387. 2003; *Arabis ophira* Rollins, *Syst. Bot.* 6: 56. 1981. TYPE: United States, Nevada, Nye Co., Toiyabe Range, near Ophir Pass, T13N, R41E, open rocky area, 13 Jun 1979, R. C. & K. W. Rollins 79231 (holotype, GH!; isotype, GH!).

Plants long-lived, caespitose perennials, often with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.4–1.4 dm, lower parts with abundant short-stalked, 2–3-rayed trichomes 0.2–0.3 mm, upper parts sparsely to moderately pubescent. Leaves at stem bases narrowly oblanceolate to linear, 0.8–1.8 mm wide, entire, ciliate on petiole with simple trichomes to 0.8 mm, blade surfaces densely pubescent with short-stalked, 2–3-rayed trichomes 0.2–0.3 mm; cauline leaves 6–10, somewhat concealing stem proximally, the uppermost pubescent, with auricles to 0.5 mm. Inflorescences mostly unbranched, 6–15-flowered; fruiting pedicels 3–8 mm, ascending, straight, with appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals purplish, 4–5 × 1.0–1.8 mm, glabrous; ovules 50–60 per fruit. Fruits 2.5–4.0 cm × 1.2–1.8 mm, suberect or ascending, occasionally appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.05–0.10 mm. Seeds uniseriate, 1.2–1.8 × 1.0–1.5 mm; wing continuous, 0.1–0.2 mm wide.

Flowering: May–Jun.

Habitat: rocky slopes or gravelly soil in subalpine meadows.

Elevation: 3000–3200 m.

Distribution: United States (Nevada/Toiyabe Range).

Reproductive mode: sexual diploid.

63. *Boechera oxylobula* (Greene) W. A. Weber, *Phytologia* 51: 370. 1982; *Arabis oxylobula* Greene, *Pittonia* 4: 195. 1900. TYPE: United States, Colorado, Garfield County, Glenwood Springs, 18 Jun 1899, G. E. Osterhout s.n. (holotype, NDG!; isotype, RM!).

Arabis aprica Osterhout ex A. Nelson in J. M. Coulter & A. Nelson, *New Man. Bot. Centr.*

Rocky Mts. 228. 1909. TYPE: United States, Colorado, Grand County, Sulphur Springs, on naked limestone slopes, 26 Jun 1907, G. E. Osterhout 3540 (lectotype designated by Rollins (1941: 387), RM!; isolectotypes, BRY!, NY!, RM!).

Arabis demissa Greene, *Pl. Baker.* 3: 8. 1901; *Boechera demissa* (Greene) W. A. Weber, *Phytologia* 51: 370. 1982. TYPE: United States, Colorado, Montrose County, Cimarron, 4 Jun 1901, C. F. Baker 16 (holotype, NDG!).

Arabis rugocarpa Osterhout, Bull. Torrey Bot. Club 31: 357. 1904. TYPE: United States, Colorado, Lake County, at Malta, a station on the Denver and Rio Grande Railway near Leadville, 20 Jun 1903, *G. E. Osterhout 2800* (holotype, RM!; isotype, NY!, 2RM!).

Plants short- to long-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 3–7 per caudex branch, arising near ground surface from margin of basal rosettes or laterally below sterile shoot, 0.4–2.5 dm, lower parts glabrous or with simple and short-stalked, 2-rayed trichomes 0.1–0.4 mm, upper parts glabrous. Leaves at stem bases linear to linear-oblongate, 1.0–2.5 mm wide, entire or rarely denticulate, often ciliate with simple trichomes 0.3–0.7 mm, blade surfaces glabrous or sparsely pubescent with short-stalked, 2–3-rayed trichomes 0.1–0.4 mm; cauline leaves 3–12, not concealing stem, the uppermost glabrous or rarely sparsely pubescent, without auricles. Inflorescences unbranched, 2–12-flowered; fruiting pedicels 3–8 mm, divaricate-ascending to horizontal, slightly to strongly recurved, glabrous or with isolated simple trichomes. Flowers ascending-divaricate at anthesis; sepals glabrous or pubescent; petals white to pale lavender, 4–5 × 1.5–2.0 mm, glabrous; ovules 28–44 per fruit. Fruits 1.5–3.5 cm × 1.2–2.0 mm, pendent, not appressed to rachises, rarely weakly secund, straight, with parallel edges, glabrous; style 0.1–0.4 mm. Seeds uniseriate, 0.9–1.2 × 0.6–1.0 mm; wing often continuous, 0.07–0.10 mm wide.

Flowering: May–Jul.

Habitat: cliffs, rocky slopes, and gravelly soil in sagebrush and open conifer forest.

Elevation: 2100–3600 m.

Distribution: United States (Colorado).

Reproductive mode: sexual diploid.

64. *Boechea paddoensis* (Rollins) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 268. 2007; *Arabis lemmonii* S. Watson var. *paddoensis* Rollins, Rhodora 43: 384. 1941. TYPE: United States, Washington, Yakima Co., Mt. Paddo (Mt. Adams), rocks, 6000 or 7000 ft [1818 or 2121 m], 8 Aug 1885, *W. N. Suksdorf 509* (holotype, GH!).

Plants long-lived, caespitose perennials with mostly woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems 1–3 per caudex branch, arising near ground surface from center of basal rosettes or laterally below sterile shoot, 1.0–2.5 dm, glabrous throughout. Leaves at stem bases narrowly oblanceolate, 1–3(–6) mm wide, entire or rarely few toothed near apices, not ciliate, blade surfaces sparsely pubescent with short-stalked, 4–8-rayed trichomes 0.08–0.20 mm; cauline leaves 4–8, not concealing stem, the uppermost glabrous, with auricles 1–2 mm. Inflorescences mostly unbranched, 5–12(–18)-flowered; fruiting pedicels 2–5(–10) mm, divaricate-ascending or rarely horizontal, straight, glabrous. Flowers ascending at anthesis; sepals glabrous; petals lavender to purple, 4.0–5.5 × 1.0–1.5 mm, glabrous; ovules 42–54 per fruit. Fruits 3.0–5.5 cm × 1.5–2.0 mm, divaricate-ascending or rarely horizontal, not appressed to rachises, secund (often weakly so), straight, with parallel edges, glabrous; style 0.05–0.1 mm. Seeds uniseriate, 1.1–1.5 × 0.9–1.3 mm; wing continuous, 0.1–0.3 mm wide.

Flowering: Jul–Aug.

Habitat: rocky ridges.

Elevation: 1500–2100 m.

Distribution: United States (Oregon, Washington).

Reproductive mode: apomictic triploid.

65. *Boechea pallidifolia* (Rollins) W. A. Weber, Phytologia 79: 65. 1996; *Arabis pallidifolia* Rollins, Cruciferae of Continental North America 181. 1993. TYPE: United States, Colorado,

Gunnison County, high hill above Sapinero, steep hillside among rocks and low sagebrush, 18 Jun 1980, *R. C. Rollins, K. W. Rollins & A. G. Roads 8376* (holotype, GH!; isotypes, BRY!, E!, NY!, UC!).

Arabis thompsonii S. L. Welsh, *Utah Fl.*, ed. 3. 260. 2003; *Boechera thompsonii* (S. L. Welsh) N. H. Holmgren, *Intermountain Fl.* 2B: 374. 2005. TYPE: United States, Utah, San Juan County, sandy soil in alcove, head of South Canyon below Wild Cow Point, S of Beef Basin, T33S, R18E, S9, 2250 m, 5 Jun 1985, *N. D. Atwood & B. Thompson 11154* (holotype, BRY!).

Plants short-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–5 per caudex branch, arising near ground surface from margin of basal rosettes or laterally below sterile shoots, (0.5–)1.5–4.0 dm, lower parts many short-stalked, 2–6-rayed trichomes 0.1–0.3 mm, upper parts glabrous to sparsely pubescent. Leaves at stem bases oblanceolate to obovate, 5–11(–13) mm wide, shallowly dentate or occasionally entire, often ciliate on petioles with simple and 2-rayed trichomes, blade surfaces moderately pubescent with short-stalked, 4–8-rayed trichomes 0.1–0.3 mm; cauline leaves 3–8(–11), not concealing stem, the uppermost sparsely pubescent, with auricles (0.5–)1–2 mm. Inflorescences mostly unbranched, 4–15(–20)-flowered; fruiting pedicels 7–15 mm, ascending to divaricate-ascending, straight or occasionally recurved, glabrous or sparsely pubescent. Flowers ascending at anthesis; sepals pubescent; petals lavender to rarely whitish, 5–9 × 1.2–2.5 mm, glabrous; ovules 44–62 per fruit. Fruits 2.5–5(–6.5) cm × 1–2 mm, ascending to rarely horizontal, not appressed to rachises, not secund, straight to curved, with parallel edges, glabrous; style 0.05–0.40 mm. Seeds uniseriate, 1.1–1.3 × 1.0–1.1 mm; wing nearly continuous, 0.07–0.15 mm wide.

Flowering: Apr–Jun.

Habitat: rocky slopes and sandy soil in pinyon-juniper and sagebrush communities.

Elevation: 1650–2450 m.

Distribution: United States (Arizona, Colorado, New Mexico, Utah, Wyoming).

Reproductive mode: sexual diploid.

66. *Boechera parishii* (S. Watson) Al-Shehbaz, *Novon* 13: 388. 2003; *Arabis parishii* S.

Watson, *Proc. Amer. Acad. Arts* 22: 468. 1887. TYPE: United States, California, San Bernardino Co., Bear Valley, San Bernardino Mts., 6500 ft., Jun 1886, *S. B. Parish 1793* (holotype, GH!; isotypes, DS!, NDG!, NY!, UC!).

Plants short- to long-lived perennials, often with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.3–1.4 dm, lower sith abundant short-stalked, 2–8-rayed trichomes 0.2–0.4 mm, upper parts sparsely pubescent. Leaves at stem bases linear to linear-ob lanceolate, 0.5–2 mm wide, entire, often ciliate on petioles with branched trichomes to 0.6 mm, blade surfaces densely pubescent with short-stalked, 6–12-rayed trichomes 0.07–0.15 mm; cauline leaves 2–8, rarely concealing stem proximally, the uppermost densely pubescent, without auricles. Inflorescences unbranched, 5–20-flowered; fruiting pedicels 3–7 mm, ascending, straight, with appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals lavender to purple, 8–13 × 2.5–4.0 mm, glabrous; ovules 12–20 per fruit. Fruits 1.5–2.5 cm × 1.8–2.5 mm, ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 3–8 mm. Seeds uniseriate, 1.5–2.0 × 1.0–1.5 mm; wing distal or continuous, 0.05–0.20 mm wide. $2n = 14$.

Flowering: Mar–May.

Habitat: gravelly hillsides in sagebrush-juniper-pine areas.

Elevation: 1900–2300 m.

Distribution: United States (California/ San Bernardino Co).

Reproductive mode: sexual diploid.

67. *Boechera pauciflora* (Nuttall) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 268. 2007;

Sisymbrium pauciflorum Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 93. 1838. TYPE:

United States, Rocky Mts., *T. Nuttall s.n.* (holotype, BM!; isotype, PH!).

Arabis arcuata (Nuttall) A. Gray var. *subvillosa* S. Watson in A. Gray & S. Watson, Syn. Fl. N.

Amer. 1(1): 164. 1895; *A. sparsiflora* Nuttall var. *subvillosa* (S. Watson) Rollins, Rhodora 43:

403. 1941; *Boechera sparsiflora* (Nuttall) Dorn var. *subvillosa* (S. Watson) Dorn, Vasc. Pl.

Wyoming, ed. 3. 376. 2001. TYPE: United States, Washington, Whitman Co., Pullman, 20

May 1894, *C. V. Piper 1812* (lectotype designated by Rollins (1941: 404), GH!; isotype, US!).

Arabis elegans A. Nelson, Bot. Gaz. 30: 192. 1900, not *A. elegans* Tineo ex Lojacono, Fl. Sicula

1: 106. 1886; *A. perelegans* A. Nelson in J. M. Coulter & A. Nelson, New Man. Bot. Centr.

Rocky Mts. 228. 1909. TYPE: United States, Wyoming. [Park Co.:] Yellowstone National

Park, Undine Falls, partly shaded slopes, 6 Jul 1897, *Aven Nelson & Elias Nelson 5676*

(lectotype designated by Windham & Al-Shehbaz (2007: 268), RM!; isolectotypes, E!, MO!).

Plants short- to long-lived perennials, occasionally with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, (1.4–)3.0–11.2 dm, lower parts with abundant simple trichomes 0.6–1.5 mm mixed with stalked, 2(or 3)-rayed trichomes 0.2–0.4 mm, upper parts sparsely pubescent. Leaves at stem bases oblanceolate, 3–10 mm wide, dentate or rarely entire, occasionally ciliate with simple or branched trichomes to 1 mm, blade surfaces densely pubescent with stalked, 2–5-rayed trichomes 0.3–0.6 mm; cauline leaves (8–)14–60, often concealing stem proximally, the uppermost glabrous or sparsely pubescent, with auricles (1–)3–10 mm. Inflorescences mostly unbranched, 17–60-flowered; fruiting pedicels 4–13 mm, horizontal to divaricate-descending, straight or rarely slightly recurved, with spreading 2–3-rayed trichomes. Flowers divaricate at anthesis; sepals pubescent; petals lavender to whitish, 5–8 × 1–2 mm, glabrous; ovules 80–162 per fruit. Fruits 5.5–10.5 cm × 1.5–2.2 mm, horizontal, divaricate-descending or widely pendent, not appressed to rachises, not secund, curved, with parallel edges, glabrous; style 0.05–0.50 mm. Seeds uniseriate, 1.4–1.8 × 1.0–1.4 mm; wing continuous, 0.10–0.25 mm wide. $2n = 21$.

Flowering: May–Jun.

Habitat: rocky soil in sagebrush areas, mountain shrub communities, and edges of conifer forests.

Elevation: 600–2500 m.

Distribution: Canada (British Columbia), United States (California, Idaho, Montana, Nevada,

Oregon, Utah, Washington, Wyoming).

Reproductive mode: apomictic triploid.

68. *Boechera paupercula* (Greene) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 75. 2006;

Arabis paupercula Greene, Leafl. Bot. Observ. Crit. 2: 77. 1910. TYPE: United States,

California, Tulare County, Farewell Gap, 10,600 ft, Sep 1897, *C. A. Purpus 5229½* (holotype,

US!; isotypes, E!, GH!, MO!, UC!).

Arabis nubigena J. F. Macbr. & Payson, Contr. Gray Herb. 49: 62. 1917; *A. lyallii* S. Wats. var.

nubigena (J. F. Macbr. & Payson) Rollins, Rhodora 43: 367. 1941; *A. microphylla* Nuttall var.

nubigena (J. F. Macbr. & Payson) Rollins, Res. Stud. State Coll. Wash. 4: 40. 1936. TYPE:

United States, Idaho, Blaine County, gravelly flat, exposed alpine summit, Smoky Mts., 9000

ft, 13 Aug 1916, *J. F. Macbride & E. B. Payson* 3772 (holotype, GH!; isotypes, CAS!, E!, K!, MO!, NY!, POM!, RM!, US!).

Plants long-lived, caespitose perennials, often with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.3–1.5 dm, lower parts with abundant simple and short-stalked, 2–4-rayed trichomes (0.07)0.10–0.20 mm, upper parts glabrous or sparsely pubescent. Leaves at stem bases linear-oblongate, 1–3(–5) mm wide, entire, ciliate proximally with trichomes to 0.4 mm, blade surfaces densely pubescent with short-stalked, 2–6-rayed trichomes (0.07)0.10–0.20 mm; cauline leaves 2–6, rarely concealing stem, the uppermost glabrous, without auricles or (rarely) 0.2–1.5 mm. Inflorescences unbranched, 3–8-flowered; fruiting pedicels 3–9 mm, erect, straight, glabrous or sparsely pubescent. Flowers erect at anthesis; sepals glabrous or sparsely pubescent; petals lavender to purplish, 4–6(–7) × 1–2 mm, glabrous; ovules 24–40 per fruit. Fruits 2.5–5.5 cm × 1.3–1.7(–2.0) mm, erect, appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.2–1.0 mm. Seeds uniseriate or rarely subseriate, 1.5–2(–2.5) × 1.0–1.4 mm; wing continuous, 0.3–1.0 mm wide.

Flowering: Jun–Aug.

Habitat: rock outcrops, talus slopes, and gravelly soil in alpine and subalpine habitats.

Elevation: 2400–3350 m.

Distribution: United States (California, Idaho, Oregon, Washington, Wyoming).

Reproductive mode: sexual diploid.

69. *Boechera peirsonii* Windham & Al-Shehbaz, *Harvard Pap. Bot.* 11: 270. 2007. TYPE:

United States, California, San Bernardino Co., San Bernardino Mts., rocky ledge above Dollar Lake, 9100 ft [2758 m], 24 Aug 1922, *F. W. Peirson* 3269 (holotype, RSA!; isotype, CAS!).

Arabis breweri S. Watson var. *pecuniaria* Rollins, *Rhodora* 43: 409. 1941. TYPE: United States, California, San Bernardino Co., San Bernardino Mts., Dollar Lake, rocky ledges, 9250 ft [2803 m], 24 Aug 1922, *P. A. Munz* 6238 (holotype, GH!).

Plants long-lived, caespitose perennials, with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1.0–2.5 dm, lower parts glabrous or with few short-stalked, 2–5-rayed (rarely a few simple) trichomes 0.4–0.6 mm, upper parts glabrous. Leaves at stem bases oblongate, 2.5–6.0 mm wide, entire, ciliate proximally with simple trichomes, blade surfaces densely pubescent with short-stalked, 4–7-rayed trichomes 0.3–0.5 mm; cauline leaves 3–12, often concealing stem proximally, the uppermost glabrous or ciliate, with auricles 0.5–2 mm. Inflorescences mostly unbranched, 12–25-flowered; fruiting pedicels 2–6 mm, ascending to divaricate-descending, straight, glabrous. Flowers ascending at anthesis; sepals pubescent; petals purple, 5–6 × 1.5–2.0 mm, glabrous; ovules 56–80 per fruit. Fruits 2.0–3.7 cm × 2.0–2.8 mm, ascending to divaricate-ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.1–0.3 mm. Seeds uniseriate, 1.0–1.5 × 0.8–1.0 mm; wing distal or continuous, 0.05–0.10 mm wide.

Flowering: Jun–Sep.

Habitat: granitic ledges and talus slopes.

Elevation: 2700–3350 m.

Distribution: United States (California/San Bernardino County).

Reproductive mode: apomictic triploid.

- 70. *Boechea pendulina*** (Greene) W. A. Weber, *Phytologia* 51: 370. 1982; *Arabis pendulina* Greene, *Leafl. Bot. Observ. Crit.* 2: 81. 1910; *B. demissa* (Greene) W. A. Weber var. *pendulina* (Greene) N. H. Holmgren, *Brittonia* 56: 246. 2004. TYPE: United States, Nevada: Clark County, Charleston Mts., Jun 1898, 7000–8000 ft, *C. A. Purpus 6104* (holotype, US!; isotypes, E!, RM!, 2UC!).
- Arabis setulosa* Greene, *Leafl. Bot. Observ. Crit.* 2: 81. 1910. TYPE: United States, Utah, Piute/County, near Marysville, 6000 ft, 31 May 1894, *M. E. Jones 5330* (holotype, US!; isotypes, CAS!, 2MO!, NY!, POM!, UC!).
- Arabis diehlii* M. E. Jones, *Contr. W. Bot.* 14: 38. 1912. TYPE: United States, Utah, Beaver/Piute Co., Belknap Mt., Jun 1899, *M. E. Jones s.n.* (lectotype, POM!).
- Arabis demissa* Greene var. *russeola* Rollins, *Rhodora* 43: 387. 1941; *A. pendulina* Greene var. *russeola* (Rollins) Rollins, *Contr. Gray Herb.* 212: 105. 1982; *Boechea demissa* (Greene) W. A. Weber var. *russeola* (Rollins) N. H. Holmgren, *Intermountain Fl.* 2B: 376. 2005; *B. pendulina* (Greene) W. A. Weber var. *russeola* (Rollins) Dorn, *Vasc. Pl. Wyoming*, ed. 3. 376. 2001. TYPE: United States, Utah, Uintah County, among sagebrush and under the junipers on a high limy knoll, foothills of the Uinta Mts., 18 miles N of Vernal, 6500 ft, 17 Jun 1937, *R. C. Rollins 1757* (holotype, GH!; isotypes, DS!, 2MO!, NY!, PH!, POM!, RM!, UC!, US!, UTC).

Plants short- to long-lived perennials, occasionally with woody caudices, lacking crowded, persistent leaf bases; sexual (with ellipsoid pollen) or apomictic (with spheroid pollen). Stems usually 2–6 per caudex branch, arising near ground surface from margin of basal rosettes or laterally below sterile shoots, 0.6–3.0(–3.7) dm, lower parts with few to many simple trichomes 0.3–0.8 mm, upper parts glabrous. Leaves at stem bases oblanceolate to obovate, 1.5–6 mm wide, entire or rarely dentate, ciliate throughout with mostly simple trichomes 0.4–1 mm, blade surfaces pubescent with simple and short- and long-stalked, 2-rayed trichomes 0.3–0.8 mm; cauline leaves 2–10(–13), not concealing stem, the uppermost sparsely ciliate to glabrous, without auricles or (rarely) to 0.7 mm. Inflorescences mostly unbranched, 4–14-flowered; fruiting pedicels 3–7(–10) mm, divaricate-ascending to horizontal, curved or angled downward, glabrous or very rarely with isolated simple trichomes. Flowers divaricate-ascending at anthesis; sepals sparsely pubescent or rarely glabrous; petals whitish to pale lavender, 4–6 × 1.0–1.5 mm, glabrous; ovules 40–70(–90) per fruit. Fruits 2.2–4.0 cm × 1.2–2.1 mm, widely pendent, not appressed to rachises, not secund, curved to nearly straight, with parallel edges, glabrous; style 0.1–0.3(–0.5) mm. Seeds biseriate, 0.9–1.2 × 0.6–0.9 mm, wingless. $2n = 14, 21$.

Flowering: Apr–Jun.

Habitat: rock outcrops, open gravelly flats and hillsides in sagebrush, pinyon-juniper, mountain mahogany, and open conifer forest.

Elevation: 1650–3050 m.

Distribution: United States (Arizona, California, Colorado, Nevada, Utah, Wyoming).

Reproductive mode: sexual diploid, apomictic triploid.

- 71. *Boechea pendulocarpa*** (A. Nelson) Windham & Al-Shehbaz, *Harvard Pap. Bot.* 11: 77. 2006; *Arabis pendulocarpa* A. Nelson, *Bot. Gaz.* 30: 192. 1900; *A. holboellii* Hornemann var. *pendulocarpa* (A. Nelson) Rollins, *Rhodora* 43: 446. 1941; *Boechea holboellii* (Hornemann) Á. Löve & D. Löve var. *pendulocarpa* (A. Nelson) N. Snow, *Madroño* 52: 62. 2005. TYPE: United States, Wyoming: Yellowstone National Park, Madison River, on cliffs and rocky ridges, 23 Jun 1899, *A. Nelson & E. Nelson 5504* (lectotype, designated by Rollins (1941: 446), RM!; isolectotypes, E!, GH!, K!, MO!, NY!, RM!, US!).

Plants short- to long-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.6–3 dm, lower parts densely with abundant simple and stalked, 2–4-rayed trichomes 0.1–0.4 mm, upper parts glabrous or sparsely pubescent. Leaves at stem bases narrowly oblanceolate, 1.5–4.0(–5.0) mm wide, entire, often ciliate on petiole with simple trichomes to 0.6 mm, blade surfaces densely pubescent with short-stalked, 4–8-rayed trichomes 0.08–0.20 mm; cauline leaves 6–17, occasionally concealing stem proximally, the uppermost glabrous or sparsely pubescent, without auricles. Inflorescences unbranched, 4–11-flowered; fruiting pedicels 3–8(–12) mm, arched, gently recurved, glabrous or with few appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals white or lavender, 4–6 × 1.0–1.5 mm, glabrous; ovules 66–92 per fruit. Fruits (2.0–)2.5–3.8 cm × 1.5–2.2 mm, pendent, not appressed to rachises, not secund, usually straight, with parallel edges, glabrous; style 0.3–0.5 mm. Seeds subbiseriate, 1.0–1.2 × 0.7–0.9 mm; wing distal, 0.05–0.10 mm wide. $2n = 14$.

Flowering Apr–Jul.

Habitat: rock outcrops and gravelly slopes in sagebrush, open conifer forest, and subalpine meadows.

Elevation: 1000–3300 m.

Distribution: Canada (British Columbia, Yukon), United States (California, Idaho, Montana, Nevada, Oregon, Utah, Wyoming).

Reproductive mode: sexual diploid.

72. *Boechera perennans* (S. Watson) W. A. Weber, *Phytologia* 51: 370. 1982; *Arabis perennans* S. Watson, *Proc. Amer. Acad. Arts* 22: 467. 1887; *A. arcuata* (Nuttall) A. Gray var. *perennans* (S. Watson) M. E. Jones, *Proc. Calif. Acad. Sci.* 5: 621. 1895. TYPE: United States, Arizona: Pima Co., Santa Catalina Mts., rocky canyon, 15 Apr 1881, *C. G. Pringle s.n.* (holotype, GH!; isotypes, MO!, NY!).

Arabis angulata Greene ex Wootton & Standley, *Contr. U.S. Natl. Herb.* 16: 123. 1913. TYPE: United States, Grant: Mangas Springs, 18 miles NW of silver City, 4770 ft, 9 Apr 1903, *O. B. Metcalfe 12* (holotype, US!; isotypes, DS!, E!, GH!, K!, MO!, NDG!, NY!, POM!, RM!, 2US!).

Arabis eremophila Greene, *Pittonia* 4: 194. 1900. TYPE: United States, Arizona, Peach Springs, 30 Apr 1893, *N. C. Wilson s.n.* (lectotype designated by Rollins (1941: 397), NDG!; isotypes, NDG!, NY!).

Arabis recondita Greene, *Pittonia* 4: 194. 1900. TYPE: United States, Arizona, Diamond Creek, 1893, *N. C. Wilson s.n.* (lectyotype designated by Rollins (1941: 397), NDG!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–5 per caudex branch, often elevated above ground surface on woody bases, arising laterally below sterile shoots or leaf rosettes, (1.5–)2.0–7.0 dm, lower parts with many short-stalked, Y-shaped trichomes 0.2–0.4 mm, these often mixed 3–5-rayed or (rarely) simple trichomes, upper parts usually glabrous. Leaves at stem bases oblanceolate to obovate, 3–15(–20) mm wide, dentate, ciliate proximally with trichomes to 1.2 mm, blade surfaces moderately to densely pubescent with short-stalked, 3–6-rayed trichomes 0.2–0.4 mm; cauline leaves 4–12(–17), not concealing stem, the uppermost glabrous, with auricles 0.5–3.5 mm. Inflorescences mostly unbranched, 16–35-flowered; fruiting pedicels (6–)10–25 mm, mostly horizontal, straight or slightly recurved, usually glabrous. Flowers ascending at anthesis; sepals pubescent; petals white to purplish, 5–9 × 1.0–1.5 mm, occasionally with a few trichomes abaxially; ovules 60–96 per fruit. Fruits (3–)4–7 cm × 1.7–2.1 mm, widely

pendent, not appressed to rachises, not secund, usually curved, with parallel edges, glabrous; style 0.05–0.40 mm. Seeds uniseriate, 1.1–1.5 × 0.9–1.2 mm; wing continuous, 0.1–0.2 mm wide. $2n = 14$.

Flowering: Feb–May.

Habitat: rocky slopes and gravelly soil in warm desert, chaparral, and low montane habitats.

Elevation: 250–1700 m.

Distribution: Mexico (Baja California, Chihuahua, Sonora), United States (Arizona, California, Nevada, New Mexico, Texas, Utah).

Reproductive mode: sexual diploid.

73. *Boechera perstellata* (E. Braun) Al-Shehbaz, Novon 13: 388. 2003; *Arabis perstellata* E.

Braun, Rhodora 42: 47. 1940. TYPE: United States, Kentucky: Franklin Co., Elkhorn Creek, wooded hillsides, 6 May 1936, E. L. Braun 1226 (holotype, GH!).

Arabis perstellata var. *ampla* Rollins, Rhodora 62: 243. 1960. TYPE: United States, Tennessee, Davidson Co., ca. 1 mile NW of junction of Couchville Pike and Fuqua Road, off Fuqua Road and about 3 miles NE of Una, 28 May 1960, R. B. Chanell 7998 (holotype, GH!; isotype, VDB).

Plants mostly short-lived perennials, with non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–5 per plant, arising near ground surface from margin of basal rosettes, (1–)2–8 dm, lower parts with many short-stalked, 3–4-rayed trichomes 0.1–0.5 mm, upper parts similarly pubescent. Leaves at stem bases obovate to oblanceolate, (5–)10–45 cm wide, coarsely dentate or rarely sinuate, ciliate on petiole base, blade surfaces moderately pubescent with short-stalked, 3–4(–6)-rayed trichomes 0.1–0.5 mm; cauline leaves 6–25, concealing stem proximally, the uppermost pubescent, with auricles 1–6 mm. Inflorescences mostly unbranched, 10–40-flowered; fruiting pedicels 5–15 mm, mostly horizontal, straight or rarely slightly curved, with spreading, simple trichomes. Flowers ascending at anthesis; sepals pubescent; petals purplish, 3–4 × 0.7–1.0 mm, glabrous; ovules 12–20 per fruit. Fruits (1.5–)2–3.3 cm × 0.8–1.0 mm, mostly horizontal, not appressed to rachises, not secund, straight, with parallel edges, sparsely pubescent throughout; style 0.4–0.8 mm. Seeds uniseriate, 0.8–1.1 × 0.6–0.8 mm, wingless. $2n = 14$.

Flowering Apr–May.

Habitat: calcareous bluffs and wooded hillsides.

Distribution: United States (Kentucky, Tennessee).

74. *Boechera pinetorum* (Tidestrom) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 271.

2007; *Arabis pinetorum* Tidestrom, Proc. Biol. Soc. Wash. 36: 182. 1923; *A. divaricarpa* A.

Nelson var. *pinetorum* (Tidestrom) B. Boivin, Canad. Field-Naturalist 65: 16. 1951; *A.*

holboellii Hornemann var. *pinetorum* (Tidestrom) Rollins, Rhodora 43: 447. 1941; *Boechera*

holboellii (Hornemann) Á. Löve & D. Löve var. *pinetorum* (Tidestrom) Dorn, Vasc. Pl.

Wyoming, ed. 3. 375. 2001. TYPE: United States, Nevada. Douglas Co., coniferous forests N of Glenbrook, along Lake Tahoe, 1890 m, 7 Jul 1919, Ivar Tidestrom 10387 (holotype, US!).

Plants short-lived perennials, with non-woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 2.0–8.0(–9.6) dm, lower parts with many simple and short-stalked, 2–4-rayed trichomes to 1 mm, upper parts sparsely pubescent or glabrous. Leaves at stem bases oblanceolate, 2–8(–11) mm wide, entire or denticulate, ciliate proximally with simple trichomes 0.5–1 mm, blade surfaces sparsely to densely pubescent with short-stalked, 2–5-rayed trichomes 0.2–0.5 mm, these mixed with fewer simple trichomes; cauline leaves 7–33, often

concealing stem proximally, the uppermost sparsely pubescent or glabrous, with auricles 1–3 mm. Inflorescences mostly unbranched, 15–63-flowered; fruiting pedicels 4–12 mm, reflexed, abruptly recurved near base but otherwise straight, with few spreading, simple and 2-rayed trichomes or glabrous. Flowers divaricate to pendent at anthesis; sepals pubescent; petals white to lavender, 5–6 × 1.0–1.5 mm, glabrous; ovules 70–110 per fruit. Fruits (4.5–)5.5–8.5 cm × 1.5–2.0 mm, reflexed to closely pendent, not appressed to rachises, not secund, straight or curved, with parallel edges, glabrous; style 0.05–0.40 mm. Seeds uniseriate, 1.5–1.8 × 1.2–1.5 mm; wing continuous, 0.15–0.30 mm wide.

Flowering: May–Jul.

Habitat: rock outcrops and gravelly soil in meadows and open conifer forests.

Elevation: 1100–3200 m.

Distribution: United States (California; Nevada, Oregon).

Reproductive mode: apomictic triploid.

75. *Boechera pinzliae* (Rollins) Al-Shehbaz, Novon 13: 388. 2003; *Arabis pinzliae* Rollins, Contr. Gray Herb. 212: 110. 1982. TYPE: United States, Nevada, Esmeralda Co., White Mts, bowl on NE side of Boundary Peak, near center of bowl, 11,200 ft, A. Pinzl 4442 (holotype, GH!; isotypes, GH!, NY!).

Plants long-lived perennial, with mostly woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems 1–3 per caudex branch, arising near ground surface from margin of basal rosettes, 0.4–1.6 dm, lower parts with abundant short-stalked, 2–5-rayed trichomes 0.05–0.2 mm, upper parts glabrous or sparsely pubescent. Leaves at stem bases linear-oblongate, 1–3 mm wide, entire, rarely ciliate proximally with trichomes to 0.5 mm, blade surfaces densely pubescent with short-stalked, 2–5-rayed trichomes 0.05–0.2 mm; cauline leaves 3–6, not concealing stem, the uppermost sparsely to moderately pubescent, without auricles or (rarely) to 0.3 mm. Inflorescences unbranched, 5–8-flowered; fruiting pedicels 2–6 mm, ascending to divaricate-ascending, straight, glabrous or with few appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals purple, 4–5 × 1.0–1.5 mm, glabrous; ovules 26–34 per fruit. Fruits 2.5–4.8 cm × 2.5–3.2 mm, ascending to divaricate-ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.1–0.3 mm. Seeds uniseriate, 2.5–3.5 × 1.5–2.5 mm; wing continuous, 0.2–0.9 mm wide.

Flowering Jul.

Habitat: gravelly granitic soils in alpine and subalpine areas.

Elevation: 3000–3400 m.

Distribution: United States (California/Mono County, Nevada/Esmeralda County).

Reproductive mode: apomictic triploid.

76. *Boechera platysperma* (A. Gray) Al-Shehbaz, Novon 13: 388. 2003; *Arabis platysperma* A. Gray, Proc. Amer. Acad. Arts 6: 519. 1865. TYPE: United States, California, Alpine Co., Ebbetts Pass, 1863, W. H. Brewer 1989 (lectotype designated by Rollins (1941: 473), GH!; isotypes, MO!, UC!, US!).

Arabis inamoena Greene, Repert. Sp. Nov. Regni Veg. 5: 243. 1908, not Greene, Leaf. Bot. Observ. Crit. 2: 158. 1911. TYPE: United States, California, Tulare Co., Long Meadow, 8000–9000 ft, 7–14 July 1888, D. Palmer 192 (holotype, US!; isotype, K!).

A. oligantha Greene, Repert. Sp. Nov. Regni Veg. 5: 243. 1908. TYPE: United States, California, Fresno Co., Dinkey Creek, 25 June–15 July 1900, 5300 ft, H. M. Hall & H. P. Chandler 354 (holotype, US!; isotypes, DS!, E!, K!, MO!, NY!, UC!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, elevated above ground surface on woody bases or produced near ground surface, arising from center of basal rosettes, 0.6–2.8(–3.5) dm, lower parts with abundant short-stalked, 2–5-rayed trichomes 0.1–0.3 mm, upper parts glabrous or sparsely pubescent. Leaves at stem bases narrowly oblanceolate, 3–7(–10) mm wide, entire, ciliate near petiole bases with simple or spurred trichomes to 1 mm, blade surfaces densely pubescent with short-stalked, 2–5-rayed trichomes 0.1–0.3 mm; cauline leaves 3–7(–12), not concealing stem, the uppermost glabrous to sparsely pubescent, without auricles. Inflorescences unbranched, 2–7-flowered; fruiting pedicels 3–13 mm, ascending, straight, glabrous or with few appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals creamy white to purplish, 4–6 × 1–2 mm, often with a few trichomes abaxially; ovules 16–44 per fruit. Fruits (2.5–)4.0–8.5 cm × 3.0–5.5 mm, ascending, not appressed to rachises, not secund, straight to slightly curved, with undulate (non-parallel) edges, glabrous; style 0.05–1.0 mm. Seeds uniseriate, 3–6(–8) × 2.0–3.5 mm; wing continuous, 0.8–2.5 mm wide. $2n = 14$.

Flowering Jun–Aug.

Habitat: rock outcrops and gravelly soil in dry pine forests and lodgepole-chaparral woodlands.

Elevation: 1600–3000 m.

Distribution: United States (California, Oregon).

Reproductive mode: sexual diploid.

77. *Boechera polyantha* (Greene) Al-Shehbaz, Harvard Pap. Bot. 11: 78. 2006; *Arabis polyantha* Greene, Leaf. Bot. Observ. Crit. 2: 80. 1910. TYPE: United States, Washington, Douglas County, along R.R. track at Rock Island, 23 Apr 1899, K. *Whited 1043* (holotype, US!; isotype, WS!).

Arabis macdougalii Rydb., Bull. Torrey Bot. Club 39: 326. 1912. TYPE: United States, Montana, Missoula County, Old Sentinel, mountain near Missoula, 12 Jun 1901, 1500 m, D. T. *MacDougal 191* (holotype, NY!; isotypes, CAN!, K!, NY!, US!).

Plants mostly short-lived perennials, with non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosette, 2.5–9.0 dm, lower parts with many short-stalked, 2–6-rayed trichomes 0.1–0.7 mm, upper parts similarly pubescent. Leaves at stem bases oblanceolate, 1.5–7.0 mm wide, entire or shallowly dentate, ciliate at base of petiole with trichomes to 0.9 mm, blade surfaces densely pubescent with short-stalked, 5–10-rayed trichomes 0.10–0.25 mm; cauline leaves 16–42, concealing stem proximally, the uppermost pubescent, with auricles 0.5–1.5 mm. Inflorescences mostly unbranched, 17–96-flowered; fruiting pedicels 7–13 mm, reflexed, abruptly recurved at base but otherwise straight, with appressed, branched trichomes. Flowers descending at anthesis; sepals pubescent; petals white, 6–9 × 1.0–2.5 mm, sparsely pubescent abaxially; ovules 74–110 per fruit. Fruits 3.5–7.2 cm × 1.2–1.5 mm, strongly reflexed, usually appressed to rachises, occasionally somewhat secund, straight, with parallel edges, densely pubescent; styles 0.05–0.20 mm. Seeds uniseriate, 0.9–1.2 × 0.7–1.0 mm; wing continuous, 0.05–0.10 mm wide.

Flowering: Apr–Jun.

Habitat: rocky, gravelly, and sandy slopes in open areas.

Elevation: 900–2450 m.

Distribution: United States (Idaho, Montana, Oregon, Washington).

Reproductive mode: sexual diploid.

78. *Boechea porphyrea* (Wooton & Standley) Windham, Al-Shehbaz & P. Alexander, Harvard Pap. Bot. 11: 272. 2007; *Arabis porphyrea* Wooton & Standley, Contr. U.S. Natl. Herb. 16: 123. 1913. TYPE: United States, New Mexico, Dona Ana Co., Organ Mts, the Cueva, 25/4/1907, E. O. Wooton & P. Standley s.n. (holotype, US!).

Plants mostly long-lived perennials, often with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems 1 to several per caudex branch, somewhat elevated on woody bases or produced at ground surface, arising from center of basal rosettes or laterally below sterile shoots, 2–5(–9) dm, lower parts glabrous or rarely with few simple and short-stalked, 2–3-rayed trichomes 0.1–0.5 mm, upper parts glabrous. Leaves at stem bases oblanceolate, (3–)5–15 mm wide, dentate, ciliate at least on petioles with trichomes to 1 mm, blade surfaces with short-stalked, 2–6-rayed trichomes 0.1–0.5 mm; cauline leaves 5–17(–21), occasionally concealing stem proximally, the uppermost glabrous, with auricles 0.5–3.5(–5.5) mm. Inflorescences mostly unbranched, 10–30(–70)-flowered; fruiting pedicels 10–27 mm, horizontal, gently curved downward, glabrous. Flowers ascending at anthesis; sepals glabrous; petals lavender, 6.5–8.5 × 1–2.5 mm, glabrous; ovules 100–160 per fruit. Fruits 3–7 cm × 1.8–2.5 mm, widely pendent, not appressed to rachises, not secund, usually curved, with parallel edges, glabrous; style 0.2–0.5 mm. Seeds subbiseriate, 1.1–1.6 × 0.9–1.1 mm; wing continuous, 0.1–0.2 mm wide.

Flowering: Mar–May.

Habitat: rocky slopes in evergreen woodland or desert scrub.

Elevation: 1250–2100 m.

Distribution: United States (New Mexico, Texas).

Reproductive mode: apomictic triploid.

79. *Boechea pratincola* (Greene) Windham & Al-Shehbaz, Harvard Pap. Bot. 12: 245. 2007; *Arabis pratincola* Greene, Repert. Sp. Nov. Regni Veg. 5: 244. 1908; *A. drummondii* A. Gray var. *pratincola* (Greene) M. Hopkins, Rhodora 39: 142. 1937. TYPE: United States, Nevada, Douglas Co., Spooner, common in wet meadows, 2155 m, 23 Jun 1902, C. F. Baker 1149 (holotype, US!; isotypes, GH!, MO!, NDG!, NY!, ORE!, POM!, UC!).

Arabis nemophila Greene, Leaflet Bot. Observ. Crit. 2: 78. 1910. TYPE: United States, California, Sequoia National Forest, Jul 1908, A. Davidson 1847 (holotype, US!).

Plants mostly short-lived perennials, with non-woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 2–6 dm, lower parts with sessile, 2–3-rayed trichomes 0.15–0.60 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 1.5–5(–7) mm wide, entire or rarely denticulate, ciliate at petiole base with trichomes to 0.4 mm, blade surfaces with sessile, 2–4(–6)-rayed trichomes 0.10–0.45 mm; cauline leaves (7–)13–42, concealing stem proximally, the uppermost sparsely pubescent apically, with auricles 1–4 mm. Inflorescences mostly unbranched, (7–)14–45-flowered; fruiting pedicels 5–12 mm, erect, straight, glabrous. Flowers ascending at anthesis; sepals glabrous; petals lavender, 6–10 × 1.5–2 mm, glabrous; ovules 60–140 per fruit. Fruits 4–6.5 cm × 1.5–2 mm, erect, appressed to rachis, not secund, straight, with parallel edges, glabrous; style 0.1–0.3 mm. Seeds subbiseriate, 1.4–2.0 × 1.0–1.4 mm; wing continuous, 0.10–0.35 mm wide.

Flowering: Jun–Aug.

Habitat: rocky slopes and soil patches in open areas and along forest edges.

Elevation: 1900–3200 m.

Distribution: United States (California, Idaho, Nevada, Oregon).
Reproductive mode: apomictic triploid.

80. *Boechea puberula* (Nuttall) Dorn, *Brittonia*, 55: 3. 2003; *Arabis puberula* Nuttall in Torrey & A. Gray, *Fl. N. Amer.* 1: 82. 1838; *Erysimum puberulum* (Nuttall) Kuntze, *Revis. Gen. Pl.* 2: 933. 1891. TYPE: United States, Oregon, Blue Mountains, *T. Nuttall s.n.* (holotype, BM!; isotype, PH!).

Arabis arida Greene, *Pittonia* 4: 190. 1900. TYPE: United States, Nevada, Nye Co., Moor's Station, 16 July 1896, *E. L. Greene s.n.* (holotype, NDG!).

Arabis beckwithii S. Watson, *Proc. Amer. Acad. Arts* 22: 467. 1887; *A. subpinnatifida* S. Watson var. *beckwithii* (S. Watson) Jepson, *Man. Fl. Pl. Calif.* 431. 1925; *Boechea beckwithii* (S. Watson) Dorn, *Brittonia* 55: 3. 2003. TYPE: United States, Nevada, Nye County, summit of [Quartz Mt.] W of Great Salt Lake, 1 Jun 1854, *Lieut. E. G. Beckwith 22* (Lectotype, designated by Rollins (1941: 452), GH!; isolectotype, NY!).

Arabis lignipes A. Nelson var. *impar* A. Nelson, *Bot. Gaz.* 54: 139. 1912; *A. subpinnatifida* var. *impar* (A. Nelson) Rollins, *Res. Stud. State Coll. Wash.* 4: 32. 1936. TYPE: United States, Idaho, Boise Co., Squaw Creek, 8 May 1911, 3500 ft, *J. F. Macbride 828* (holotype, RM!; isotypes, CAN!, E!, MO!, RM!, POM!, US!).

Arabis sabulosa M. E. Jones, *Contr. W. Bot.* 14: 40. 1912. TYPE: United States, Nevada, Nye Co., Palisade, 14 Jun 1882, *M. E. Jones 3761* (lectotype designated by Rollins (1941: 451), POM!; isolectotypes, CAS!, 2NY!, UC!, US!).

Arabis sabulosa var. *colorata* M. E. Jones, *Contr. W. Bot.* 14: 41. 1912. TYPE: United States, California, Summit, Owen's Valley, 19 or 20 May 1897, *M. E. Jones s.n.* (lectotype designated by Rollins (1941: 452), POM!).

Arabis sabulosa var. *frigida* M. E. Jones, *Contr. W. Bot.* 14: 41. 1912. TYPE: United States, California, Lassen Co., Perkin's Ranch, top of Diamond Peak, near Susanville, 28 June 1897, *M. E. Jones s.n.* (holotype, POM!).

Plants short-lived perennials, with non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, (1–)2–6.3 dm, lower parts with many, short-stalked, 3–8-rayed trichomes 0.1–0.3(–0.5) mm, upper parts similarly pubescent. Leaves at stem bases oblanceolate to linear-ob lanceolate, 1.5–5 mm wide, usually dentate, not ciliate, blade surfaces densely pubescent with short-stalked, 5–12-rayed trichomes 0.05–0.2 mm; cauline leaves 7–45(–65), concealing stem proximally, the uppermost pubescent, with auricles 0.7–3 mm or occasionally lacking. Inflorescences mostly unbranched, 10–40(–64)-flowered; fruiting pedicels 4–10 mm, arched, recurved above horizontal to ascending base, with appressed, branched trichomes. Flowers ascending to descending at anthesis; sepals pubescent; petals white to lavender, 5–9 × 0.8–1.8 mm, glabrous; ovules 38–64 per fruit. Fruits 3–6.5 cm × 1.9–2.2 mm, closely pendent, rarely appressed to rachises, occasionally somewhat secund, mostly straight, with parallel edges, pubescent throughout; style 0.01–0.10 mm. Seeds uniseriate, 1.4–1.8 × 1–1.4 mm; wing continuous, 0.1–0.3 mm wide. $2n = 14$.

Flowering Apr–Jul.

Habitat: ledges, rocky slopes, and gravelly hillsides in sagebrush, pinyon-juniper, and mountain shrub communities.

Elevation: 1350–2900 m.

Distribution: United States (California, Nevada, Oregon, Utah).

Reproductive mode: sexual diploid.

81. *Boecheera pulchra* (M. E. Jones ex S. Watson) W. A. Weber, *Phytologia* 51: 370. 1982; *Arabis pulchra* M. E. Jones ex S. Watson, *Proc. Amer. Acad. Arts* 22: 468. 1887. TYPE: United States, Nevada, Empire City, 19 Jun 1882, *M. E. Jones 3765* (holotype, GH!; isotypes, BRY!, DS!, !MO, 2NY!, POM!, UC!, 2US!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, elevated above ground surface on woody bases, arising from center of leaf tufts, (1.5–)3.0–7.5 dm, lower parts with abundant, short-stalked, mostly 4–7-rayed trichomes 0.1–0.3 mm, upper parts similarly pubescent. Leaves at stem bases linear to linear-oblongate, 1–3 mm wide, entire, not ciliate, blade surfaces densely pubescent with short-stalked, 4–9-rayed trichomes 0.1–0.3 mm; cauline leaves 10–30, often concealing stem proximally, the uppermost pubescent, lacking auricles or (rarely) with auricles to 0.5 mm. Inflorescences mostly unbranched, 8–25-flowered; fruiting pedicels 8–16 mm, reflexed, abruptly recurved at base but otherwise straight, with appressed, branched trichomes. Flowers descending at anthesis; sepals pubescent; petals purple (very rarely white), 9–16 × 2–4(–5) mm, with scattered trichomes abaxially or glabrous; ovules 68–106 per fruit. Fruits 3.3–8.0 cm × 2.5–4.0 mm, strongly reflexed, often appressed to rachises, occasionally somewhat secund, straight, with parallel edges, pubescent throughout; style 0.1–0.3 mm. Seeds biseriate, 1.7–2.8 × 1.5–2.2 mm; wing continuous, 0.25–0.65 mm wide.

Flowering: Mar–Jun.

Habitat: rocky, gravelly or sandy slopes in chaparral, sagebrush and desert scrub communities.

Elevation: 850–2750 m.

Distribution: Mexico (Baja California), United States (California, Nevada).

Reproductive mode: sexual diploid.

82. *Boecheera pusilla* (Rollins) Dorn, *Vasc. Pl. Wyom. Ed. 3*, 376. 2001; *Arabis pusilla* Rollins, *Contr. Gray Herb.* 212: 107. 1982. TYPE: United States, Wyoming, Fremont Co., off Wyoming State Hwy. 28, 39 mi. SW of Lander, cracks & crevices of huge metamorphosed rocks, 20 Jun 1981, *R. C. & K. W. Rollins 81366* (holotype, GH!; isotypes, BRY!, E!, GH!, MO!, RM!, UC!).

Plants long-lived, caespitose perennials, often with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 2–6 per caudex branch, arising near ground surface from margin of basal rosettes, 0.5–2.0 dm, lower parts glabrous or with few simple and short-stalked, 2-rayed trichomes to 0.2 mm, upper parts glabrous. Leaves at stem bases linear-oblongate, 1–2.5 mm wide, entire, ciliate on petiole with simple trichomes 0.4–0.7 mm, blade surfaces sparsely pubescent with short-stalked, 2–3-rayed trichomes 0.1–0.4 mm or rarely glabrous; cauline leaves 3–5, not concealing stem, the uppermost glabrous or rarely sparsely ciliate, with auricles to 0.2 mm or lacking. Inflorescences unbranched, 6–13-flowered; fruiting pedicels 2–5 mm, horizontal to divaricate-descending, straight or slightly curved downward, glabrous. Flowers divaricate-ascending at anthesis; sepals glabrous or with few spreading, 2-rayed trichomes; petals white to lavender, 4–5 × 1.5–1.8 mm, glabrous; ovules 20–32 per fruit. Fruits 1.6–3.2 cm × 1.5–2.0 mm, horizontal or divaricate-descending, not appressed to rachises, secund, straight, with parallel edges, glabrous; style 0.1–0.4 mm. Seeds uniseriate, 1.2–1.5 × 0.8–0.9 mm; wingless or with distal wing 0.05–0.1 mm wide.

Flowering: May–Jun.

Habitat: cracks and crevices of granitic rock outcrops.

Elevation: 2400–2450 m.

Distribution: United States (Wyoming).

Reproductive mode: apomictic triploid.
Notes: known only from the type collection.

83. *Boechea pygmaea* (Rollins) Al-Shehbaz, *Novon* 13: 388. 2003; *Arabis pygmaea* Rollins, *Rhodora* 43: 476. 1941. TYPE: United States, California, Tulare Co., Basin of the Upper Kern River at Volcano Meadows (originally known as Whitney Meadows, 8500 ft, 21 Jul 1904, H. M. Hall & H. D. Babcock 5465 (holotype, GH!; isotypes, E!, MO!, NY!, OSC!, US!)).

Plants mostly long-lived perennials, with woody caudices, often with crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–5 per caudex branch, arising near ground surface from margin of basal rosettes or laterally below sterile shoots, 2–8 cm, lower parts with simple and short-stalked, 2–3-rayed trichomes to 0.4 mm, upper parts glabrescent. Leaves at stem bases linear, 0.8–1.5 mm wide, entire, ciliate with simple and spurred trichomes to 0.8 mm, blade surfaces moderately pubescent with short-stalked, 2–4-rayed trichomes 0.05–0.40 mm; cauline leaves 2–4, not concealing stem, the uppermost pubescent, lacking auricles. Inflorescences unbranched, 2–5-flowered; fruiting pedicels 2–7 mm, erect to ascending, straight, with subappressed, branched trichomes or rarely glabrous. Flowers erect at anthesis; sepals pubescent; petals white, 3.5–5.0 × 0.7–1.0 mm, glabrous; ovules 8–12 per fruit. Fruits 1.3–3.3 cm × 4–5 mm, erect to ascending, often appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.05–0.40 mm. Seeds uniseriate, 3–5 × 2.5–4.5 mm; wing continuous, 0.8–2.0 mm wide distally.

Flowering: May–Jul.

Habitat: barren flats of arkosic gravel.

Elevation: 2400–3200 m.

Distribution: United States (California/Inyo and Tulare counties).

Reproductive mode: sexual diploid.

84. *Boechea quebecensis* Windham & Al-Shehbaz, *Harvard Pap. Bot.* 12: 246. 2007. TYPE: Canada, Quebec, Rimouski Co.: cold and shaded limestone and limestone-conglomerate ridges from Pinte aux Corbeaux to Cape Caribou, Bic, 8 Jul 1907, M. L. Fernald & J. F. Collins 1061 (holotype, GH!; isotypes, 3GH!, CAN!).

Arabis divaricarpa A. Nelson var. *dechamplainii* B. Boivin, *Naturaliste Can.* 94: 645. 1967.

TYPE: Canada, Quebec, Comte de Rimouski, rochers maritimes calcaires, Cap au Corbeau, Bic, 17 Jul 1947, A. A. De Champlain 1577 (holotype, DAO!; isotype, MT).

Plants short-lived perennials or biennials, with or without caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1.0–4.5 dm, lower parts with many sessile, 2–4-rayed trichomes 0.15–0.5 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 5–15 mm wide, denticulate, ciliate proximally with simple trichomes to 1 mm, blade surfaces moderately pubescent with subsessile, (2–)3–7-rayed trichomes 0.1–0.3 mm; cauline leaves 4–15, not concealing stem, the uppermost glabrous, with auricles 1.0–3.5 mm. Inflorescences mostly unbranched, 11–41-flowered; fruiting pedicels 3–8(–14) mm, horizontal to slightly descending, curved to straight, glabrous or with few subappressed, branched trichomes. Flowers divaricate at anthesis; sepals pubescent; petals white, 6–7 × 1–2 mm, glabrous; ovules 56–94 per fruit. Fruits 3–6 cm × 1.5–2.0 mm, horizontal to slightly descending, not appressed to rachises, secund, straight, with parallel edges, glabrous. Seeds uniseriate, 1.2–1.5 × 1.0–1.3 mm; wing continuous, 0.10–0.15 mm wide.

Flowering: Jun–Jul.

Habitat: calcareous rock outcrops and talus slopes.

Elevation: 0–300 m.

Distribution: Canada (Quebec).

Reproductive mode: apomictic triploid.

85. *Boechea rectissima* (Greene) Al-Shehbaz, Novon 13: 388. 2003; *Arabis rectissima* Greene, Pittonia 4: 191. 1900. TYPE: United States, California, Fresno Co., 1890, *Peckinpah* (holotype, NDG!; isotype, NY!).

Arabis setigera Greene, Leaf. Bot. Observ. Crit. 2: 80. 1910. TYPE: United States, Oregon, Klamath Co., Corral Springs, 2 Aug 1894, *J. B. Leiberg 610* (holotype, US!; isotype, UC!).

Arabis wyndii Henderson, Rhodora 32: 25. 1930. TYPE: United States, Oregon, Klamath Co., Crater Lake Park, dry woods about Crater Lake, 5500 ft, 25 Jul 1928, *L. Wynd 2322* (holotype, OSC!).

Plants biennials or short-lived perennials, with or without caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 2–8(–10) dm, lower parts glabrous or rarely with few simple trichomes to 0.7 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 3–8(–13) mm wide, entire or denticulate, ciliate with simple trichomes 0.5–1.2 mm, blade surfaces sparsely to densely pubescent with simple trichomes to 0.8 mm, these often mixed with short-stalked, 2–3-rayed trichomes 0.15–0.5 mm; cauline leaves 6–30(–45), often concealing stem proximally, the uppermost ciliate or sparsely pubescent, with auricles 1–1.5 mm. Inflorescences mostly unbranched, 10–30(–50)-flowered; fruiting pedicels 4–10 mm, reflexed, abruptly recurved at base but otherwise straight, glabrous. Flowers pendent at anthesis; sepals pubescent; petals white, 3–4 × 0.7–1.2 mm, glabrous; ovules 46–80 per fruit. Fruits 5–9 cm × 1.8–2.5 mm, strongly reflexed, usually appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.2–0.8 mm. Seeds uniseriate, 1.8–2.1 × 1.0–1.5 mm; wing continuous, 0.15–0.25 mm wide.

Flowering: May–Jul.

Habitat: rocky slopes in open conifer forests.

Elevation: 1500–2500 m.

Distribution: United States (California, Oregon).

Reproductive mode: sexual diploid.

86. *Boechea repanda* (S. Watson) Al-Shehbaz, Novon 13: 388. 2003; *Arabis repanda* S.

Watson, Proc. Amer. Acad. Arts 11: 122. 1875. TYPE: United States, California, Mariposa Co., Yosemite Valley, 1866, *H. N. Bolander 4881* (holotype, GH!; isotype, UC!).

Arabis inamoena Greene, Leaf. Bot. Observ. Crit. 2: 158. 1911, not Greene, Repert. Sp. Nov. Regni Veg. 5: 243. 1908. TYPE: United States, California, Inyo Co., Lake Sabrina, Bishop Creek, *A. Davidson 2729* (holotype, NDG!; isotypes, JEPS!, RSA!).

Arabis repanda var. *greenei* Jepson. TYPE: United States, California, Inyo Co., Lake Sabrina, Bishop Creek, *A. Davidson 2729* (holotype, JEPS!; isotypes, NDG!, RSA!).

Plants short- to long-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, (1–)2–9 dm, lower parts with abundant, short- to long-stalked, 2–6-rayed trichomes 0.2–0.5 mm, rarely few simple trichomes to 1.5 mm long, upper parts glabrous or sparsely pubescent. Leaves at stem bases broadly oblanceolate to obovate, 10–25(–50) mm wide, repand to coarsely dentate or rarely entire, not ciliate, blade surfaces moderately to densely pubescent with short- to long-stalked, 3–6-rayed trichomes 0.2–

0.5 mm; cauline leaves (3–)8–30, not concealing stem, the uppermost sparsely pubescent, without auricles. Inflorescences occasionally branched, 7–25-flowered; fruiting pedicels 3–10 mm, erect to divaricate-ascending, straight, glabrous or with spreading 2–5-rayed (rarely simple) trichomes. Flowers erect to ascending at anthesis; sepals glabrous or sparsely pubescent; petals white, 3.5–6.0 × 0.8–1.0 mm, glabrous; ovules 34–50 per fruit. Fruits (3.5–)5.0–13.5 cm × 2.5–4.0 mm, divaricate-ascending, not appressed to rachises, not secund, curved or rarely straight, with parallel edges, glabrous or pubescent throughout; style 0.5–1.5 mm. Seeds uniseriate, 2.5–5.0(–6.0) × 2.0–3.0(–3.5) mm; wing continuous, 0.7–1.8 mm wide. $2n = 14$.

Flowering: Jun–Jul.

Habitat: rock outcrops, talus, and gravelly soil in meadows and open pine forests.

Elevation: 1570–3540 m.

Distribution: United States (California, Nevada)

Reproductive mode: sexual diploid.

87. *Boechea retrofracta* (Graham) A. Löve & D. Löve, *Taxon* 31: 125. 1982; *Arabis retrofracta* Graham, *Edinburgh New Philos. J.* 1829: 344. 1829; *Turritis retrofracta* (Graham) W. J. Hooker, *Fl. Bor. Amer.* 1: 41. 1829; *A. holboellii* Hornem. var. *retrofracta* (Graham) Rydberg, *Contr. U.S. Natl. Herb.* 3: 484. 1896. TYPE: U.S.A. “Raised at the Botanic Garden from seeds collected [by *J. Richardson*] in Captain Franklin’s last [1819–1822] expedition from Hudson’s Bay to the Rocky Mountains and from Canada to Lat. 68° at Mackenzie’s River” (lectotype designated by Windham & Al-Shehbaz (2006: 79) as the second plant from the right of sheet, K!).

Arabis secunda Howell, *Erythea* 3: 33. 1895; *A. arcuata* (Nuttall) var. *secunda* (Howell) B. L. Robinson in A. Gray & S. Watson, *Syn. Fl. N. Amer.* 1(1): 164. 1895; *A. holboellii* var. *secunda* (Howell) Jepson, *Man. Fl. Pl. Calif.* 430. 1925; *Boechea holboellii* (Graham) Á. Löve & D. Löve var. *secunda* (Howell) Dorn, *Vasc. Pl. Wyoming*, ed. 3. 376. 2001. TYPE: United States, Washington, Yakima County, Mt. Adams, Aug 1882, *T. Howell 1487* (holotype, ORE!; isotypes, JEPS!, MO!, NY!, PH!, UC!, US!, WS!).

Arabis exilis A. Nelson, *Bull. Torrey Bot. Club* 26: 123. 1899; *Boechea exilis* (A. Nelson) Dorn, *Vasc. Pl. Wyoming*, ed. 3. 375. 2001. TYPE: United States, Wyoming, Uinta County, Evanston, 4 Jun 1898, *A. Nelson 4523* (holotype, RM!; isotypes, GH!, MO!, NY!; US!).

Arabis lignipes A. Nelson, *Bot. Gaz.* 30: 191. 1900. TYPE: United States, Wyoming, Yellowstone National Park, stony flats near Madison River, 23 Jun 1899, *A. Nelson & E. Nelson 5505* (Lectotype, designated by Rollins (1941: 443), RM!; isolectotypes, DS!, E!, GH!, K!, MO!, NDG!, NMC!, NY!, POM!, 2RM!, US!).

Arabis tenuis Greene, *Pittonia* 4: 189. 1900. TYPE: United States, Washington, Klickitat County, on mountains, 2000 ft, May 1884, *W. N. Suksdorf 15* (lectotype, designated by Jepson (1936: 67), NDG!; isolectotypes, GH!, NY!).

Arabis kochii Blankinship, *Montana Coll. Agr. Sci. Stud. Biol.* 1: 57. 1904. TYPE: United States, Montana, five syntypes not seen.

Arabis retrofracta var. *multicaulis* B. Boivin, *Canad. Filed-Naturlist* 63: 17. 1951. TYPE: Canada, Alberta, Jasper National Park, left bank of Malique River at Fish Hatchery, 14 Aug 1946, *G. H. Turner 5086* (holotype, DAO!).

Plants short-lived perennials or biennials, with or without caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1.5–7.0(–10.5) dm, lower parts with abundant short-stalked, 2–8-rayed trichomes 0.1–0.2 mm, upper parts sparsely pubescent. Leaves at stem bases oblanceolate, 2–7 mm wide, entire or shallowly dentate, occasionally ciliate at petiole

bases, blade surfaces densely pubescent with short-stalked, 5–10-rayed trichomes 0.05–0.2 mm; cauline leaves 15–40, concealing stem proximally, the uppermost pubescent, with auricles 0.5–2.5 mm or (very rarely) lacking. Inflorescences mostly unbranched, 15–80(–140)-flowered; fruiting pedicels 7–12(–18) mm, reflexed, abruptly recurved at base but otherwise usually straight, with appressed, branched trichomes. Flowers pendent at anthesis; sepals pubescent; petals white to lavender, 4–8 × 0.8–2.2 mm, glabrous; ovules 60–116 per fruit. Fruits 3.5–9.0 × 0.9–1.8 mm, strongly reflexed, usually appressed to rachises, occasionally somewhat secund, straight, with parallel edges, glabrous or sparsely pubescent throughout. Seeds uniseriate, 1.0–1.4 × 0.9–1.2 mm; wing continuous, to 0.1 mm. $2n = 14$.

Flowering: Apr–Aug.

Habitat: rock outcrops, open hillsides, gravel bars and sandy banks in grassland, sagebrush, oak woodlands, and open conifer forests.

Elevation: 300–3250 m.

Distribution: Canada (Alberta, British Columbia, Manitoba, Northwest Territories, Ontario, Quebec, Saskatchewan), United States (Alaska, California, Idaho, Michigan, Montana, Nevada, Oregon, Utah, Washington, Wyoming).

Reproductive mode: sexual diploid.

88. *Boechea rigidissima* (Rollins) Al-Shehbaz, Novon 13: 389. 2003; *Arabis rigidissima* Rollins, Rhodora 43: 380. 1941. TYPE: United States, California, Trinity Co., Mary Blaine Mt., gravelly or rocky soil, 6400 ft., 3 Aug 1935, *J. P. Tracy 14469* (holotype, GH!; isotype, DS!).

Arabis rigidissima Rollins var. *demota* Rollins. TYPE: United States, Nevada, Washoe Co., Siera Nevadas, Carson Range, Galena Creek, 1.5 air miles ESE of Mt. Rose Peak, T17N, R19E, sec. 18, 7900 ft, 26 Aug 1982, *A. Tiehm 7572* (holotype, GH!; isotypes, CAS!, MO!, NY!, ORE!, RSA!, WS!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, slightly elevated on woody bases or produced near ground surface, arising from center of basal rosettes, 2–6 dm, lower parts with subsessile, 2–3-rayed (rarely simple) trichomes 0.25–0.40 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 2–6 mm wide, entire, ciliate proximally with trichomes to 0.7 mm, blade surfaces sparsely pubescent with subsessile to short-stalked, 2–5-rayed trichomes 0.1–0.4 mm; cauline leaves 5–10, rarely concealing stem proximally, the uppermost glabrous, with auricles 0.5–2 mm. Inflorescences mostly unbranched, 5–16-flowered; fruiting pedicels 4–10 mm, divaricate-ascending, straight, glabrous. Flowers ascending at anthesis; sepals glabrous; petals purple, 6–8 × 1.5–2.0 mm, glabrous; ovules 24–54 per fruit. Fruits 4.0–6.5(–7.6) cm × 2.5–3.5 mm, divaricate-ascending, not appressed to rachises, not secund, straight, with somewhat undulate (non-parallel) edges, glabrous; style 0.2–0.8 mm. Seeds uniseriate, 2.5–3.2 × 1.8–2.5 mm; wing distal, 0.3–1.0 mm wide.

Flowering: Jul–Aug.

Habitat: rocky places in open conifer forest.

Elevation: 1800–1950 m.

Distribution: United States (California, Nevada).

Reproductive mode: apomictic triploid.

89. *Boechea rollei* (Rollins) Al-Shehbaz, Novon 13: 389. 2003; *Arabis rollei* Rollins, Harvard Pap. Bot. 4: 43. 1993. TYPE: United States, California, Siskiyou Co., divide betw. Applegate & Klamath Rivers, Red Butte–Kangaroo Mt.–Lilypad Lake–Towhead Lake area, T47N,

R12W, Sec. 13, 5400–5900 ft., 4 Aug 1983, *W. E. Rolfe 831* (holotype, GH!; isotypes, JEPS!, MO!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, elevated above ground surface on woody bases, arising from center of basal rosettes, 1.5–2.5 dm, glabrous throughout. Leaves at stem bases oblanceolate, 3–8 mm wide, entire, ciliate proximally with simple trichomes 0.2–0.7 mm, blade surfaces glabrous or sparsely pubescent with short-stalked, 2–4-rayed trichomes 0.2–0.4 mm; cauline leaves 6–12, occasionally concealing stem proximally, the uppermost glabrous, with auricles 0.5–2.5 mm. Inflorescences unbranched, 3–7-flowered; fruiting pedicels 4–6 mm, arched, strongly curved proximally, glabrous. Flowers divaricate-ascending at anthesis; sepals glabrous; petals creamy white, 8–11 × 2.0–2.5 mm, glabrous; ovules 14–22 per fruit. Fruits 3.5–6.0 cm × 2.5–3.5 mm, pendent, not appressed to rachises, not secund, straight to slightly curved, with undulate (non-parallel) edges, glabrous; style 0.5–1.0 mm. Seeds uniseriate, 3–4 × 1.5–2.0 mm; wing distal and proximal, 0.3–0.6 mm wide.

Flowering Aug.

Habitat: peridotite rocks on sparsely forested slopes.

Elevation: 1600–1800 m.

Distribution: United States (California/Siskiyou county).

Reproductive mode: sexual diploid.

90 *Boechera rollinsiorum* Windham & Al-Shehbaz, *Harvard Pap. Bot.* 11: 81. 2006. TYPE:

United States, Idaho, Blaine County, near road toward Galena Summit, 18.9 miles N of Ketchum, 18 Jun 1979, *R. C. Rollins & K. W. Rollins 79281* (holotype, GH!; isotype, E!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 3–5 per caudex branch, elevated above ground surface on woody bases, arising from margin of basal rosettes, 1.0–2.5 dm, lower parts with abundant short-stalked, 2–4(–5)-rayed trichomes 0.2–0.4 mm, upper parts moderately to sparsely pubescent. Leaves at stem bases oblanceolate, 3–5 mm wide, entire, ciliate proximally with simple trichomes to 0.6 mm, blade surfaces densely pubescent with short-stalked, 2–4(–5)-rayed trichomes 0.15–0.40 mm; cauline leaves 5–9, not concealing stem, the uppermost sparsely to moderately pubescent, with auricles 0.5–1 mm. Inflorescences mostly unbranched, 5–11-flowered; fruiting pedicels 4–6 mm, descending, straight to slightly recurved, with few appressed, branched trichomes. Flowers divaricate-ascending at anthesis; sepals pubescent; petals pale purple, 6–8 × 1.5–2.0 mm; glabrous. Fruits (immature) pendent, not appressed to rachises, not secund, straight, with parallel edges, glabrous. **Seeds** not seen.

Flowering: Jun.

Habitat: metamorphosed igneous gravel on steep slopes.

Elevation: ca. 2150 m.

Distribution: United States (Idaho).

Reproductive mode: sexual diploid.

Notes: known only from the type locality.

91. *Boechera rubicundula* (Jepson) Windham & Al-Shehbaz, *Harvard Pap. Bot.* 11: 273. 2007;

Arabis arcuata (Nuttall) A. Gray var. *rubicundula* Jepson, *Fl. California* 2: 69. 1936. TYPE: United States, California, Santa Clara Co., Mt. Day, 21 May 1908, *R. J. Smith s.n.* (holotype, JEPS!; isotype, RSA!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, often somewhat elevated

above ground surface on woody bases, arising from center of basal rosettes, 1–5 dm, lower parts with abundant simple trichomes 0.5–1.0 mm, these mixed with long-stalked, 2–3-rayed trichomes 0.1–0.5 mm, upper parts moderately to sparsely pubescent. Leaves at stem bases oblanceolate, 4–8 mm wide, denticulate, ciliate on petiole with trichomes to 1 mm, blade surfaces densely pubescent with long-stalked, 2–5-rayed trichomes 0.1–0.5 mm; cauline leaves 8–25, often concealing stem proximally, the uppermost moderately pubescent, with auricles 1–3 mm. Inflorescences mostly unbranched, 12–34-flowered; fruiting pedicels 5–10 mm, divaricate-ascending to horizontal, straight, with spreading, simple or 2-rayed trichomes. Flowers ascending at anthesis; sepals pubescent; petals purplish, 6–8 × 2.0–2.5 mm, glabrous; ovules 70–102 per fruit. Fruits 4–8 cm × 1.7–2.2 mm, divaricate-ascending to horizontal, not appressed to rachises, not secund, straight or slightly curved, with parallel edges, glabrous; style 0.1–0.3 mm. Seeds uniseriate, 1.4–1.8 × 1.0–1.3 mm; wing continuous, 0.1–0.2 mm wide.

Flowering: Apr–May.

Habitat: mountain slopes.

Elevation: ca. 1200 m.

Distribution: United States (California).

Reproductive mode: apomictic triploid.

Note: known only from the type locality.

92. *Boechera saximontana* (Rollins) Windham & Al-Shehbaz, Harvard Pap. Bot. 12: 248. 2007; *Arabis microphylla* Nuttall var. *saximontana* Rollins, Rhodora 43: 429. 1941; *Arabis williamsii* Rollins var. *saximontana* (Rollins) Rollins, Amer. J. Bot. 70: 627. 1983 (same new combination was superfluously published in Cruciferae Continental North America 209. 1993); *A. pendulocarpa* A. Nelson var. *saximontana* (Rollins) Dorn, Vasc. Pl. Wyoming 295. 1988; *Boechera williamsii* (Rollins) Dorn var. *saximontana* (Rollins) Dorn, Vasc. Pl. Wyoming, ed. 3, 376. 2001. TYPE: United States, Wyoming, Big Horn Co., granitic hillside, Porcupine Creek, near Medicine Mountain, R92W, T56N, 8,500 ft, 6 Jul 1936, *Louis O. Williams & Rua Williams* 3264 (lectotype (plants with pubescent stems) designated by Windham & Al-Shehbaz (2007: 248), GH!; isolectotypes, MO!, 3RM!).

Plants short-lived perennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.7–3.0 dm, lower parts with many short-stalked, 2–6-rayed trichomes 0.06–0.25 mm, upper parts glabrous. Leaves at stem bases narrowly oblanceolate, 1–3 mm wide, entire, ciliate near petiole bases with simple and spurred trichomes to 0.4 mm, blade surfaces sparsely to densely pubescent with short-stalked, 4–8-rayed trichomes 0.04–0.15 mm; cauline leaves 5–9, rarely concealing stem proximally, the uppermost glabrous, with auricles to 0.3–1 mm. Inflorescences mostly unbranched, 5–13-flowered; fruiting pedicels 3–8 mm, divaricate-ascending, straight, glabrous. Flowers ascending at anthesis; sepals pubescent; petals lavender, 4–5 × 0.5–0.8 mm, glabrous; ovules 78–112 per fruit. Fruits (2.5–)3.0–4.7 cm × 1.2–1.7 mm, divaricate-ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.1–0.5 mm. Seeds uniseriate to subbiseriate, 1.1–1.4 × 0.7–0.9 mm; wing continuous, 0.05–0.12 mm wide.

Flowering: Jun–Jul.

Habitat: rocky soil in sagebrush and open conifer forest.

Elevation: 2400–2900 m.

Distribution: United States (Idaho, Wyoming).

Reproductive mode: apomictic triploid.

93. *Boecheera schistacea* (Rollins) Dorn, *Brittonia* 55: 3. 2003; *Arabis schistacea* Rollins, *Contr. Dudley Herb.* 3: 370. 1946. TYPE: United States, Nevada, Nye Co., 15 mi. W of Round Mt., Toiyabe Mts., open slope, 9000 ft., 11 Jul 1938, R. C. Rollins & T. S. Chambers 2512 (holotype, DS!; isotype, GH!).

Plants long-lived perennial, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–5 per caudex branch, elevated above ground surface on woody bases, arising from margin of basal rosettes, 0.8–2.5(–4) dm, glabrous throughout. Leaves at stem bases linear to narrowly oblanceolate, 1.2–2.5 mm wide, entire, ciliate proximally with simple trichomes 0.3–0.7 mm, blade surfaces glabrous or sparsely pubescent with short-stalked, 2–3-rayed trichomes 0.2–0.5 mm; cauline leaves 2–5(–9), not concealing stem, the uppermost glabrous, with auricles 0.2–0.5 mm. Inflorescences mostly unbranched, 5–12-flowered; fruiting pedicels 5–9 mm, reflexed, curved, glabrous. Flowers divaricate-ascending at anthesis; sepals glabrous; petals white to lavender, 4–6 × 1.0–1.5 mm, glabrous; ovules 24–36 per fruit. Fruits 1.8–4.5 cm × 1.5–2.0 mm, pendent, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.2–0.5 mm. Seeds uniseriate, 0.9–1.2 × 0.7–0.9 mm; wingless. $2n = 14$.

Flowering: May–Jul.

Habitat: rocky slopes and gravelly soil in sagebrush, open conifer forest, and subalpine meadows. Elevation: 2400–3200 m.

Distribution: United States (Nevada, Utah).

Reproductive mode: sexual diploid.

94. *Boecheera serotina* (Steele) Windham & Al-Shehbaz, *Harvard Pap. Bot.* 12: 249. 2007; *Arabis serotina* Steele, *Contr. U.S. Natl. Herb.* 13: 365. 1911. TYPE: United States, Virginia, Bath County, Alleghany Mts., vicinity of Millboro, disintegrating shale, 500 m, 21 Aug 1907, Edward S. Steele s.n. (holotype, US!).

Plants biennials, without evident caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per plant, arising near ground surface from center of basal rosettes, 4–10 dm, glabrous throughout. Leaves at stem bases obovate to oblanceolate, 5–20 mm wide, dentate, not ciliate, blade surfaces glabrous or subapically puberulent with simple trichomes 0.1–0.2 mm; cauline leaves 30–80, not concealing stem, the uppermost glabrous, without auricles. Inflorescences highly branched, 70–150-flowered; fruiting pedicels 6–15 mm, divaricate-ascending to horizontal, straight or gently recurved, glabrous. Flowers divaricate-ascending at anthesis; sepals glabrous; petals white, 2.8–4.0 × 0.6–1.0 mm, glabrous; ovules 30–42 per fruit. Fruits 4.3–7.9 cm × 1.5–1.8 mm, divaricate-ascending to widely pendent, not appressed to rachises, not secund, straight or slightly curved, with parallel edges, glabrous; style 0.1–0.2 mm. Seeds uniseriate, 1.2–1.7 × 0.7–1.0 mm; wing continuous or sometimes distal, 0.1–0.2 mm wide, rarely absent. $2n = 14$.

Flowering: Jul–Sept.

Habitat: shale barrens and wooded slopes of crumbling shale.

Elevation: 100–500 m.

Distribution: United States (Virginia, West Virginia).

Reproductive mode: sexual diploid.

95. *Boecheera serpenticola* Windham & Al-Shehbaz, *Harvard Pap. Bot.* 11: 82. 2006. TYPE: United States, California, Trinity County, North Fork Trinity River, Hobo Gulch Camp and

vicinity, 18 miles NW of Weaverville, along the Hobo Gulch road at Blue Ridge, open serpentine ridge, 3700 ft, T35N, R11W, sect. 7, 8 Jun 1972, *E. Carter 362.01* (holotype, CAS, fruiting material on right side of sheet).

Plants long-lived, caespitose perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.5–1.8 dm, lower parts with abundant short-stalked, 5–8-rayed trichomes 0.1–0.2, upper parts sparsely to moderately pubescent. Leaves at stem bases narrowly oblanceolate, 1–2 mm wide, entire, ciliate on petiole with branched hairs to 0.5 mm, blade surfaces densely pubescent with short-stalked, 5–8-rayed trichomes 0.1–0.2 mm; cauline leaves 4–14, rarely concealing stem proximally, the uppermost densely pubescent, with auricles 0.1–0.5 mm. Inflorescences unbranched, 10–20-flowered; fruiting pedicels 3–7 mm, horizontal, nearly straight, with appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals purple, 6–8 × 1.5–2.5 mm, glabrous; ovules 20–24 per fruit. Fruits 3.0–4.5 cm × 2.5–3.0 mm, horizontal or (rarely) widely pendent, not appressed to rachises, not secund, straight or slightly curved, with parallel edges, sparsely pubescent to nearly glabrous; style 1.5–2.0 mm. Seeds uniseriate, 2.0–2.5 × 1.5–1.8 mm; wing continuous, to 0.2 mm wide.

Flowering: Mar–Jun.

Habitat: serpentine ridges and talus.

Elevation: ca. 1150 m.

Distribution: United States (California/Shasta and Trinity counties).

Reproductive mode: sexual diploid.

96. *Boechera shevockii* Windham & Al-Shehbaz, *Harvard Pap. Bot.* 11: 82. 2006. TYPE:

United States, California, Tulare Co., along ledges of the large rock outcrops, summit of the Needles, Lloyd Meadows Basin, Sequoia National Forest, 8200 ft, 26 Jun 1975, *J. R. Shevock 4501* (holotype, CAS).

Plants long-lived, pulvinate perennials, with woody caudices, with many crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.5–1.0 dm, lower parts with scattered simple trichomes 0.02–0.10 mm, upper parts similarly pubescent. Leaves at stem bases oblong-oblanceolate, 1–2 mm wide, entire, ciliate distally with simple trichomes 0.02–0.10 mm, blade surfaces glabrous; cauline leaves 3–7, not concealing stem, the uppermost glabrous, without auricles. Inflorescences unbranched, 4–7-flowered; fruiting pedicels 5–9 mm, ascending, straight, glabrous. Flowers ascending at anthesis; sepals glabrous; petals lavender, 4–5 × 1.0–1.2 mm, glabrous; ovules 30–34 per fruit. Fruits 2.5–3.0 cm × 1.0–1.5 mm, ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style ca. 0.5 mm. Seeds uniseriate, ca. 1.2 × 0.8 mm; wing distal or continuous, ca. 0.1 mm wide.

Flowering: Jun.

Habitat: ledges of rock outcrops.

Elevation: ca. 2500 m.

Distribution: United States (California/Tulare County).

Reproductive mode: sexual diploid.

97. *Boechera shockleyi* (Munz) Dorn, *Brittonia* 55: 3. 2003; *Arabis shockleyi* Munz, *Bull. S.*

Calif. Acad. Sci. 31: 62. 1932. TYPE: United States, Nevada, Esmeralda Co., Mellin Mt., near Candelaria, May 1884, *W. H. Shockley 366* (holotype, GH!; isotypes, JEPS!, NDG!, US!).

Plants mostly short-lived perennials, with non-woody caudices, rarely with crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, (0.8–)2.0–5.0 dm, lower parts with abundant short-stalked, 7–12-rayed trichomes 0.1–0.2 mm, upper parts densely to sparsely pubescent. Leaves at stem bases oblanceolate, 3–10 mm wide, entire, not ciliate, blade surfaces densely pubescent with short-stalked, 7–12-rayed trichomes 0.1–0.2 mm; cauline leaves 14–60, concealing stem for most of length, the uppermost densely pubescent, with auricles 0.5–4.0 mm. Inflorescences mostly unbranched, 20–70-flowered; fruiting pedicels 7–28 mm, divaricate-ascending, straight, with appressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals lavender, 6–9 × 0.8–1.2 mm, glabrous; ovules 140–190 per fruit. Fruits 4.5–11.0 cm × 1.5–2.0 mm, divaricate-ascending, not appressed to rachises, not secund, curved or rarely straight, with parallel edges, glabrous to sparsely pubescent throughout; style 0.05–0.60 mm. Seeds subbiseriate, 1.0–1.3 × 0.7–0.8 mm; wing distal, 0.05–0.10 mm wide or rarely absent. Flowering: Apr–May.

Habitat: rock outcrops (primarily dolomite) and gravelly soil in desert scrub, sagebrush, and pinyon-juniper woodland.

Elevation: 1200–2200 m.

Distribution: United States (California, Nevada, Utah).

Reproductive mode: sexual diploid.

98. *Boechera sparsiflora* (Nuttall) Dorn, Vasc. Pl. Wyoming ed. 3, 376. 2002; *Arabis sparsiflora* Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 81. 1838; TYPE: United States, “Forest of the Rocky Mountains, towards the source of the Oregon,” *T. Nuttall s.n.* (holotype, BM!; isotype, PH!).

Arabis arcoidea A. Nelson, Bot. Gaz. 53: 220. 1912. TYPE: United States, Idaho, Canyon [Payette] County, New Plymouth, 2200 ft., 21 May 1910, *J. F. Macbride 87* (holotype, RM!; isotypes, E!, GH!, 2MO!, RM!).

Arabis campyloloba Greene, Pittonia 4: 192. 1900. TYPE: United States, California, Siskiyou Co., near Yreka, May 1876, *E. L. Greene 695* (Lectotype designated by Windham & Al-Shehbaz (2006: 83), NDG 5758, fruiting plant to the left).

Arabis peramoena Greene, Repert. Sp. Nov. Regni Veg. 5: 242. 1908; *A. sparsiflora* var. *peramoena* (Greene) Rollins, Res. Stud. State Coll. Wash. 4: 25. 1936. TYPE: United States, Oregon, Malheur Co., dry sandy soil of Willow Creek, 4 May 1900, *W. C. Cusick 2369* (holotype, US!; isotypes, E!, GH!, MO!, NDG!, NY!, ORE!, POM!, RM!, WS!).

Arabis polytricha Greene, Leaf. Bot. Observ. Crit. 2: 72. 1910. TYPE: United States, n California, Siskiyou Co., dry hill near Yreka, 8 May 1909, *G. D. Butler 723* (holotype, NDG!; isotypes, DS!, NDG!, POM!, UC!).

Plants short-lived perennial to biennials, with or without caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 3–8 dm, lower parts with abundant simple and fewer short-stalked, 2-rayed trichomes 0.4–1.5 mm, upper parts glabrous or sparsely pubescent. Leaves at stem bases oblanceolate or linear-oblanceolate, 3–12 mm wide, entire or rarely dentate, ciliate proximally with mostly simple trichomes to 1 mm, blade surfaces densely pubescent with short-stalked, 2–5-rayed trichomes 0.3–0.8 mm; cauline leaves (9–)15–35, often concealing stem proximally, the uppermost glabrous or ciliate, with auricles 3–10 mm. Inflorescences mostly unbranched, 12–50-flowered; fruiting pedicels 3–10(–18) mm, ascending or rarely almost horizontal, straight or slightly recurved, with spreading, mostly simple trichomes or rarely glabrous. Flowers ascending at anthesis; sepals sparsely pubescent; petals lavender to purple or

rarely white, 7–13 × 2–5 mm, glabrous; ovules 90–170 per fruit. Fruits 5–13 cm × 1.7–2.0 mm, ascending or rarely almost horizontal, not appressed to rachises, not secund, usually curved, with parallel edges, glabrous; style 0.05–0.30 mm. Seeds uniseriate, 1.5–2.0 × 1.0–1.5 mm; wing continuous, 0.1–0.2 mm wide. $2n = 14$.

Flowering: Apr–Jun.

Habitat: rocky slopes, clay hills, and sandy soil in sagebrush and mountain shrub communities, meadows, and open conifer forests.

Elevation: 450–2750 m.

Distribution: Canada (British Columbia), United States (California, Idaho, Nevada, Oregon, Utah, Washington).

Reproductive mode: sexual diploid.

99. *Boecheera spatifolia* (Rydberg) Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 84. 2006; *Arabis spatifolia* Rydberg, Fl. Rocky Mts. 361. 1917; *A. fendleri* (S. Watson) Greene var. *spatifolia* (Rydberg) Rollins, Rhodora 43: 394. 1941; *Boecheera fendleri* (S. Wats.) W. A. Weber subsp. *spatifolia* (Rydberg) W. A. Weber, Phytologia 51: 370. 1982; *B. fendleri* var. *spatifolia* (Rydberg) Dorn, Vasc. Pl. Wyoming, ed. 3. 375. 2001. TYPE: United States, Colorado, Larimer Co., Estes Park, 20 Jul 1903, G. E. Osterhout 2808 (holotype, NY!; isotype, RM!).

Plants short- to long-lived perennials, with mostly non-woody caudices, rarely with crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually per caudex branch, arising near ground surface from center of basal rosettes, 1.5–3.5(–5) dm, lower parts many simple and few short-stalked, 2-rayed trichomes 0.3–0.7 mm. Leaves at stem bases narrowly oblanceolate, 1.5–3.0(–4.0) mm wide, entire, strongly ciliate at least on petioles with simple trichomes to 1 mm, blade surfaces glabrous or with few simple and short-stalked, 2-rayed trichomes 0.3–0.7 mm; cauline leaves 5–15(–20), often concealing stem proximally, the uppermost usually glabrous, with auricles 0.5–1.5 mm. Inflorescences mostly unbranched, 10–30-flowered; fruiting pedicels 6–10(–15) mm, horizontal or slightly descending, curved or angled downward, glabrous or rarely with few spreading, simple trichomes. Flowers divaricate-ascending at anthesis; sepals pubescent; petals white or rarely pale lavender, 3.0–3.7(–4.0) × 0.5–0.8 mm, glabrous; ovules 90–126 per fruit. Fruits 3.3–5.7 cm × 1.2–1.8 mm, pendent, not appressed to rachises, rarely slightly secund, straight or gently curved, with parallel edges, glabrous; style 0.1–0.4 mm. Seeds biseriate, 0.7–0.9 × 0.5–0.6 mm; wing distal, 0.05–0.10 mm wide, occasionally absent. $2n = 14$. Flowering: May–Aug.

Habitat: rocky slopes and gravelly soil in sagebrush, pinyon-juniper woodland, open conifer forests and subalpine meadows.

Elevation: 1800–2750 m.

Distribution: United States (Colorado, New Mexico).

Reproductive mode: sexual diploid.

100. *Boecheera stricta* (Graham) Al-Shehbaz, Novon 13: 389. 2003; *Turritis stricta* Graham, Edinburgh New Philos. J. 7: 350. 1829; *Arabis drummondii* A. Gray, Proc. Amer. Acad. Arts 6: 187. 1864, not *A. stricta* Hudson, Fl. Angl. 1: 292. 1777; *B. drummondii* (A. Gray) A. Löve & D. Löve, Bot. Not. 128: 513. 1975; *Erysimum drummondii* (A. Gray) Kuntze, Rev. Gen. Pl. 2: 933. 1891; *T. drummondii* (A. Gray) Lunell, Amer. Midl. Naturalist 5: 236. 1918. TYPE: United States, Rocky Mountains, grown from seeds, *Drummond s.n.* (holotype, K!).

Arabis albertina Greene, Pittonia 4: 196. 1900. TYPE: Canada, Alberta, Elbow River, Rocky Mts, Lat 49°40', Jun-Jul 1897, *J. Macoun 18101* (holotype, NDG!).

Arabis connexa Greene, Pittonia 4: 197. 1900; *A. drummondii* var. *connexa* (Greene) Fernald, Rhodora 5: 231. 1903. TYPE: United States, Colorado, Mineral Co., near Pagosa Peak, 10500 ft, Aug 1899, *C. F. Baker 341* (holotype, NDG 7759!; isotypes, E!, K!, MO!, 3NDG!, NY!, RM!, US!).

Arabis oxyphylla Greene, Pittonia 4: 196. 1900; *A. drummondii* var. *oxyphylla* (Greene) M. Hopkins, Rhodora 39: 143. 1937. TYPE: United States, Colorado, Clear Creek Co., near Empire, 1875, *E. L. Greene s.n.* (lectotype designated by Rollins (1941: 371), NDG 5275!).

Arabis philonipha A. Nelson ex Rydberg, Fl. Colorado 164. 1906, TYPE: United States, Wyoming, Albany Co., Telephone Mines, 1 Aug 1900, *A. Nelson 7913* (lectotype designated by Rollins (1941: 371), GH!; isotypes, K!, MO!, 2NY!, ORE!, POM!, RM!, US!).

Streptanthus angustifolius Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 76. 1838, not *A. angustifolia* Lamarck Encycl. 1: 220. 1783; *Boechea angustifolia* (Nuttall) Dorn. TYPE: United States, towards the sources of the Platte, *T. Nuttall s.n.* (holotype, BM!; isotypes, GH!, NY!, PH!).

Plants mostly short-lived perennials or biennials, with mostly non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1–4 per caudex branch, arising near ground surface from center of basal rosette or (rarely) laterally below sterile shoot, 1.5–8.0(–10.2) dm, lower parts glabrous or with few sessile, 2-rayed (rarely simple trichomes) 0.3–0.7 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 1.5–8.0(–14.0) mm wide, entire or rarely dentate, ciliate with sessile, 2-rayed (rarely simple at petiole bases) trichomes, blade surfaces with sessile, 2-rayed (malpighiaceae) trichomes 0.3–0.7 mm or occasionally glabrous; cauline leaves 6–52, concealing stem proximally, the uppermost glabrous, with auricles 0.5–3.0 mm. Inflorescences mostly unbranched, 8–35(–80)-flowered; fruiting pedicels 5–18(–25) mm, erect, straight, glabrous. Flowers erect at anthesis; sepals glabrous; petals white, often aging pale lavender, (5–)7–11 × 1.5–2.7 mm, glabrous; ovules 110–216 per fruit. Fruits 4.0–9.0(–10.2) cm × 1.5–3.5 mm, erect, appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.05–0.30 mm. Seeds biseriolate, 1.3–2.2 × 1.0–1.6 mm; wing distal and lateral, 0.3–0.8 mm wide. $2n = 14$.

Flowering: May–Aug.

Habitat: rocky slopes and gravelly soil in sagebrush and mountain shrub communities, open conifer and hardwood forests, and alpine meadows.

Elevation: 750–3900 m.

Distribution: Canada (Alberta, British Columbia, Northwest Territories, Quebec, Saskatchewan, Yukon), United States (Alaska, Arizona, California, Colorado, Idaho, Iowa, Maine, Massachusetts, Montana, Nevada, New Hampshire, New Mexico, North Dakota, Ohio, Oregon, Rhode Island, Utah, Vermont, Washington, Wisconsin, Wyoming).

Reproductive mode: sexual diploid.

101. *Boechea subpinnatifida* (S. Watson) Al-Shehbaz, Novon 13: 389. 2003; *Arabis subpinnatifida* S. Watson, Proc. Amer. Acad. Arts 20: 353. 1885. TYPE: United States, Oregon, Josephine Co., Waldo, 3 Jun 1884, *T. Howell s.n.* (lectotype designated by Rollins (1941: 454), GH!; isolectotypes, 2NY!, PH! US!)

Plants long-lived perennials, with woody caudices, often with crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1–4(–5) dm, lower parts with abundant short-stalked, 2–6-rayed trichomes 0.1–0.2 mm, upper parts sparsely pubescent. Leaves at stem bases narrowly

oblanceolate, 1–4(–5) mm wide, prominently dentate to subpinnatifid (leaves of sterile shoots often entire), ciliate near petiole bases with simple or 2-rayed trichomes 0.4–0.6 mm, blade surfaces densely pubescent with short-stalked, (2–)4–9-rayed trichomes 0.05–0.2 mm; cauline leaves (10–)20–60, often concealing stem throughout, the uppermost moderately to sparsely pubescent, with auricles 0.5–3 mm. Inflorescences mostly unbranched, 8–30-flowered; fruiting pedicels 5–15 mm, reflexed, strongly recurved, with appressed, branched trichomes. Flowers divaricate-ascending to pendent at anthesis; sepals pubescent; petals purple (rarely lavender), 9–14 × 1.5–3.0 mm, glabrous; ovules 24–42 per fruit. Fruits (3.5–)5.0–8.0 cm × (1.6–)2.0–3.0 mm, pendent, not appressed to rachises, not secund, straight to slightly curved, with parallel edges, pubescent throughout; style 0.5–1.0 mm. Seeds uniseriate, 2.5–3.5 × 1.5–2.2 mm; wing continuous or at both ends, 0.4–0.8 mm wide. $2n = 14$.

Flowering: Mar–May.

Habitat: rock outcrops, talus, and gravelly soil, often in sagebrush-grassland communities.

Elevation: 800–2400 m.

Distribution: United States (California, Idaho, Nevada, Oregon, Utah).

Reproductive mode: sexual diploid.

102. *Boechea suffrutescens* (S. Watson) Dorn, *Brittonia* 55: 3. 2003; *Arabis suffrutescens* S.

Watson, Proc. Amer. Acad. Arts 17: 362. 1882. TYPE: United States, Oregon, Baker Co., bluffs of Snake River & vicinity, Apr 1881, *W. C. Cusick 919* (holotype, GH!; isotype, ORE!).

Arabis dianthifolia Greene, Leaflet Bot. Observ. Crit. 2: 76. 1910. TYPE: United States, Oregon, Crater Lake Natl. Park, S Wineglass, 14 Aug 1902, *F. V. Coville 1511* (holotype, US!).

Arabis duriuscula Greene, *Pittonia* 4: 191. 1900. TYPE: United States, Nevada, Donner Lake, 1893, Michner s.n. (lectotype designated by Rollins (1941: 470), NDG 5293!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual (with ellipsoid pollen) or apomictic (with spheroid pollen). Stems usually 1 per caudex branch, elevated above ground surface on woody bases, arising from center of basal rosettes, 1–4(–5) dm, lower parts glabrous or rarely with short-stalked, 2-rayed trichomes 0.1–0.3 mm, upper parts glabrous. Leaves at stem bases narrowly oblanceolate, 1.5–6.0 mm wide, entire, not ciliate or rarely with simple trichomes to 0.7 mm, blade surfaces glabrous or sparsely to densely pubescent with short-stalked, 2–6-rayed trichomes 0.07–0.40 mm; cauline leaves (4–)6–12, occasionally concealing stem proximally, the uppermost glabrous, with auricles 0.5–2 mm. Inflorescences mostly unbranched, 6–12-flowered; fruiting pedicels 4–18 mm, reflexed, usually abruptly recurved at base but otherwise straight, glabrous. Flowers pendent at anthesis; sepals glabrous; petals purple or whitish with rose tips, 4.5–6.0 × 2.0–2.5 mm, glabrous; ovules 20–30 per fruit. Fruits 3–7(–8) cm × 3–5(–6) mm, reflexed to closely pendent, occasionally appressed to rachises, often secund, straight to somewhat curved, with undulate (non-parallel) edges, glabrous; style 0.4–1.2 mm. Seeds uniseriate, 2.5–5.5 × 1.8–3.5 mm; wing continuous, 0.8–1.5 mm wide.

Flowering: Jun–Aug.

Habitat: rocky slopes and gravelly soil, often with sagebrush.

Elevation: 1800–3000 m.

Distribution: United States (California, Idaho, Nevada, Oregon, Washington).

Reproductive mode: sexual diploid.

103. *Boechea texana* Windham & Al-Shehbaz, *Harvard Pap. Bot.* 11: 85. 2006. TYPE: United States, Texas, Culberson County, San Antonio Peak, Sierra Tinaja Pinta, 26 Apr 1961, *R. C. Rollins & D. S. Correll 61142* (holotype, GH!; isotype, LL!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, often slightly elevated above ground surface on woody bases, arising from center of basal rosettes, 2–5 dm, glabrous throughout. Leaves at stem bases oblanceolate, 5–12 mm wide, dentate, ciliate (at least proximally) with mostly simple trichomes 1–2 mm, blade surfaces moderately pubescent with short-stalked, 2–4-rayed trichomes 0.4–0.6 mm; cauline leaves 5–12, often concealing stem proximally, the upper glabrous, with auricles 1–2 mm. Inflorescences mostly unbranched, 10–35-flowered; fruiting pedicels 10–20 mm, horizontal to divaricate ascending, curved or angled downward, glabrous. Flowers divaricate-ascending at anthesis; sepals glabrous; petals white to lavender, 5–8 × 1.5–2.0 mm, glabrous; ovules 80–130 per fruit. Fruits 3.5–5.0 cm × 2.5–3.0 mm, widely pendent, not appressed to rachises, not secund, curved to nearly straight, with parallel edges, glabrous; style 0.2–0.7 mm. Seeds biseriate, 1.1–1.3 × 0.9–1.0 mm; wing distal or continuous, 0.10–0.15 mm wide.

Flowering: Apr.

Habitat: rock outcrops and gravelly soils in desert grassland and evergreen woodland.

Elevation: 1250–1700 m.

Distribution: United States (New Mexico, Texas).

Reproductive mode: sexual diploid.

104. *Boechera tiehmii* (Rollins) Al-Shehbaz, *Novon* 13: 389. 2003; *Arabis tiehmii* Rollins, J. Arnold Arbor. 64: 496. 1983. TYPE: United States, Nevada, Washoe Co., Sierra Nevada, Carson Range, ridge N of Mt. Rose, 3/4 air mi. N-NW of peak, T17N, R18E, Sec. 11, 10,200 ft., near rock outcrops on decomposed granite, 19 Aug 1982, A. Tiehm 7561 (holotype, GH!; isotypes, CAS!, GH!, NY!, RSA!).

Plants long-lived perennials, with woody caudices, covered by persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 2–5 per caudex branch, arising near ground surface from margin of basal rosettes, 0.8–2(–3) dm, glabrous throughout. Leaves at stem bases oblanceolate, (2–)3–7 mm wide, entire or rarely denticulate, ciliate with simple and short-stalked, 2–3-rayed trichomes 0.2–0.4 mm, blade surfaces glabrous; cauline leaves 3–5, not concealing stem, the uppermost glabrous, without auricles or (rarely) to 0.5 mm. Inflorescences mostly unbranched, 10–16-flowered; fruiting pedicels 3–7 mm, ascending, straight, glabrous. Flowers ascending at anthesis; sepals glabrous; petals white to lavender, 4–5 × 1.2–1.7 mm, glabrous; ovules 14–22 per fruit. Fruits 1.5–3.7 cm × 1.4–1.7 mm, ascending, not appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.2–0.6 mm. Seeds uniseriate, 1.7–2.2 × 1.0–1.2 mm; wing absent or distal, to 0.5 mm wide.

Flowering: Jun–Aug.

Habitat: rock outcrops and gravelly soils in alpine and subalpine habitats.

Elevation: 3000–3500 m.

Distribution: United States (California/Mono County, Nevada/Washoe County).

Reproductive mode: sexual diploid.

105. *Boechera tularensis* Windham & Al-Shehbaz, *Harvard Pap. Bot.* 12: 249. 2007. TYPE: United States, California, Tulare Co.: Rock Creek, 10,500 ft, 19 Jul 1949, *John T. Howell* 25480 (holotype: CAS!).

Plants short-lived perennials or biennials, with or without caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 2–7 dm, lower parts with few to many,

subsessile, submalpighiaceous trichomes 0.3–0.6 mm, upper parts glabrous. Leaves at stem bases oblanceolate, 3–7 mm wide, entire, ciliate proximally with simple trichomes to 0.8 mm, blade surfaces sparsely to densely pubescent with subsessile, 2–5-rayed trichomes 0.20–0.55 mm; cauline leaves 7–17, often concealing stem proximally, the uppermost sparsely pubescent or glabrous, with auricles 2–5 mm. Inflorescences mostly unbranched, 19–39-flowered; fruiting pedicels 5–13 mm, reflexed, recurved proximally, glabrous. Flowers divaricate to pendent at anthesis; sepals pubescent; petals white to pale lavender, 6–7 × 1.2–2.0 mm, glabrous; ovules 88–104 per fruit. Fruits 4.0–7.0(–8.5) cm × 2.0–2.3 mm, reflexed, rarely appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.3–0.7 mm. Seeds subbiseriate, 2.0–2.5 × 1.1–1.5 mm; wing continuous, 0.15–0.25 mm wide.

Flowering: Jun–Jul.

Habitat: rocky slopes in montane and subalpine habitats.

Elevation: 2350–3200 m.

Distribution: United States (California/Fresno and Tulare counties).

Reproductive mode: apomictic triploid.

106. *Boechera ultraalsa* Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 86. 2006. TYPE:

United States, California, Lake Co., steep, dry bank in scree and loose soil, just above (10 ft) Bear Creek on E side, SW side of Snow Mt., 6000 ft, 1 Aug 1981, *L. R. Heckard & J. C. Hickman 5818* (holotype, JEPS!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; reproductive mode unknown. Stems 1 per caudex branch, arising near ground surface from center of basal rosettes, ca. 1 dm, lower parts with many stalked, (2–)3–6-rayed trichomes 0.2–0.5 mm, upper parts subglabrous. Leaves at stem bases oblanceolate, 4–6 mm wide, entire, not ciliate, blade surfaces moderately pubescent with long-stalked, 3–6(or 7) rayed trichomes 0.2–0.5 mm; cauline leaves 2–5, concealing stem proximally, the uppermost pubescent, without auricles. Inflorescences unbranched, 3- or 4-flowered; fruiting pedicels 4–5 mm, erect-ascending, straight, glabrous or with few appressed, branched trichomes. Flowers not seen; ovules ca. 16 per fruit. Fruits 3–4 cm × ca. 5 mm, erect-ascending, occasionally appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.5–0.7 mm. Seeds uniseriate, 5.5–6.5 × 4.0–4.5 mm; wing continuous, 1–2 mm wide.

Flowering: Jun–Jul.

Habitat: rocky soil.

Elevation: ca. 1800 m.

Distribution: United States (California)

Reproductive mode: sexual diploid.

Note: known only from the type collection.

107. *Boechera villosa* Windham & Al-Shehbaz, Harvard Pap. Bot. 11: 86. 2006. TYPE: United States, New Mexico, Taos County, Sangre de Cristo Mts., bottom of Rio Grande Canyon, 2 miles N of confluence with Red River, 6800 ft, pinyon-juniper woodland on Quaternary basalt, 17 May 1979, *W. L. Baker 1113* (holotype, NMC!; isotype, NCU).

Plants short-lived perennials, with non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems 1–3 per caudex branch, arising near ground surface, produced laterally below sterile shoots, ca. 2.5 dm, lower parts with many simple and 2-rayed trichomes 0.25–0.70 mm, upper parts glabrescent. Leaves at stem bases oblanceolate to obovate, 2.5–50 mm wide, entire, ciliate on petioles with simple trichomes to 1 mm, blade surfaces

densely pubescent with simple and short-stalked, 2- or 3-rayed trichomes 0.25–0.50 mm; cauline leaves 4–6, not concealing stem, the uppermost sparsely pubescent, with auricles ca. 1 mm. Inflorescences unbranched, 6–10-flowered; fruiting pedicels 6–10 mm, ascending, straight, glabrous or with few subappressed, branched trichomes. Flowers ascending at anthesis; sepals pubescent; petals lavender, 4–5 × 1.0–1.5 mm, glabrous; ovules ca. 64 per fruit. Fruits 4–5 cm × ca. 1 mm, divaricate-ascending, not appressed to rachises, not secund, slightly curved, with parallel edges, glabrous; style ca. 0.2 mm. Seeds uniseriate, (none mature).

Flowering: May.

Habitat: basalt outcrop in pinyon-juniper woodland.

Elevation: ca. 2100 m.

Distribution: United States (New Mexico).

Reproductive mode: sexual diploid.

Note: known only from the type collection.

108. *Boechera williamsii* (Rollins) Dorn, Vasc. Pl. Wyoming ed. 3. 376. 2001; *Arabis williamsii* Rollins, Syst. Bot. 6: 62. 1981. TYPE: United States, Wyoming, Fremont Co., off Wyoming Hwy. 28, E of Continental Divide on SE approach to Wind River Mts., coarse granitic soil, 7800 m, 26 Jun 1979, R. C. & M. L. Rollins 79332 (holotype, GH!; isotypes, BRY!, GH!, MO!, RM!, UC!).

Plants short-lived perennials, with non-woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 0.7–2.2 dm, glabrous throughout. Leaves at stem bases oblanceolate, 1–2 mm wide, entire, ciliate near petiole bases with simple trichomes to 0.4 mm, blade surfaces sparsely to densely pubescent with short-stalked, 4–8-rayed trichomes 0.03–0.10 mm; cauline leaves 6–11, occasionally concealing stem proximally, the uppermost glabrous, with auricles to 0.5 mm. Inflorescences unbranched, 5–17-flowered; fruiting pedicels 2–4(–7) mm, erect, straight, glabrous. Flowers erect at anthesis; sepals glabrous; petals white, 3–4 × 0.5–0.8 mm, glabrous; ovules 60–96 per fruit. Fruits 2.0–3.5 cm × 2.2–2.5 mm, erect, usually appressed to rachises, not secund, straight, with parallel edges, glabrous; style 0.05–0.20 mm. Seeds subbiseriate, 0.7–0.9 × 0.5–0.6 mm, wingless or minutely winged distally.

Flowering: May–Jun.

Habitat: gravelly soil in sagebrush-grassland communities.

Elevation: 2350–2800 m.

Distribution: United States (Wyoming).

Reproductive mode: sexual diploid.

109. *Boechera xylopoda* Windham & Al-Shehbaz, Harvard Pap. Bot. 12: 250. 2007. TYPE: United States, *Arabis pulchra* M. E. Jones ex S. Watson var. *gracilis* M. E. Jones, Contr. W. Bot. 8: 41. 1898; *Boechera pulchra* (M. E. Jones ex S. Watson) W. A. Weber var. *gracilis* (M. E. Jones) Dorn, Brittonia 55: 3. 2003. TYPE: United States, California, Inyo Co., Shepherd's Canyon, Argus Mts., 4800 ft, 1 May 1897, M. E. Jones s.n. (holotype, POM!; isotypes, MO!, UC! (plant or the right), US!, UTC).

Arabis pulchra var. *glabrescens* Wiggins, Contr. Dudley Herb. 1: 100. 1929. TYPE: United States, California, San Diego Co., gravelly slope between Julian and Banner, 20 Mar 1926, I. L. Wiggins 2015 (holotype, DS!; isotypes, GH!, RSA!, US!).

Arabis pulchra var. *viridis* Jepson, Fl. Calif. 2: 70. 1936. TYPE: United States, California, San Diego Co., summit of Mountain Springs, ca. 3000 ft, 17 Apr 1927, W. L. Jepson 11810 (holotype, JEPS!).

Arabis trichopoda Greene, Repert. Sp. Nov. Regni Veg. 5: 242. 1908, not *A. trichopoda* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 13: 63. 1840. TYPE: United States, California, Inyo Co., Shepherd's Canyon, Argus Mts., 4800 ft, 1 May 1897, *Marcus E. Jones s.n.* (lectotype designated by Rollins (1941: 461), POM!; isolectotypes, UC!, US1, UTC).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; apomictic, with spheroid pollen. Stems usually 1 from per caudex branch, elevated above ground surface on woody bases, arising from center of leaf tuft, (3–)5–7.5 dm, lower parts with short-stalked, 2–5-rayed trichomes 0.25–0.90 mm., upper parts similarly pubescent. Leaves at stem bases linear-oblongate to oblanceolate, 3–7 mm wide, entire or somewhat dentate, ciliate near petiole bases with simple trichomes to 1.5 mm, blade surfaces densely pubescent with short-stalked, 4–8-rayed trichomes 0.15–0.5 mm; cauline leaves 8–18, usually not concealing stem, the uppermost sparsely pubescent, with auricles 1–2 mm. Inflorescences mostly unbranched, 20–38-flowered; fruiting pedicels 9–20 mm, descending-divaricate, usually recurved, with subappressed, branched trichomes (rarely glabrous). Flowers divaricate to pendent at anthesis; sepals pubescent; petals purple, 9–12 × 2.0–3.5 mm, often with a few trichomes abaxially; ovules 98–126 per fruit. Fruits 5–7 cm × 2.0–2.5 mm, reflexed, not appressed to rachises, not secund, straight, with parallel edges, glabrous proximally, sparsely pubescent distally; style 0.1–0.5 mm. Seeds subbiseriate, 2.0–2.5 × 1.3–1.6 mm; wing continuous, 0.20–0.25 mm wide.

Flowering: Mar–May.

Habitat: rock outcrops and gravelly slopes, often under shelter of shrubs in desert scrub, sagebrush, and chaparral communities.

Elevation: 900–2000 m.

Distribution: United States (California, Nevada).

Reproductive mode: apomictic triploid.

110. *Boechea yorkii* S. Boyd, Madroño 51: 387. 2004. TYPE: United States, California, Inyo Co., Last Chance Range, N of canyon 440 m S of Last Chance Mt, 37°16'35.9"N, 117°41'47.2"W, 2410 m, 16 May 2001, *D. York & K. Davis 2611* (holotype, RSA!; isotypes, CAS!, MO!).

Plants long-lived perennials, with woody caudices, lacking crowded, persistent leaf bases; sexual, with ellipsoid pollen. Stems usually 1 per caudex branch, arising near ground surface from center of basal rosettes, 1–3 dm, lower parts with abundant short-stalked, 4–7-rayed trichomes 0.1–0.5 mm mixed proximally with simple and short- to long-stalked, 2–3-rayed trichomes to 1.5 mm, upper parts moderately pubescent. Leaves at stem bases linear-oblongate, 1.5–3.0 mm wide, entire, ciliate proximally with simple and 2- or 3-rayed trichomes to 1.5 mm, blade surfaces moderately pubescent with short-stalked, 4–7-rayed trichomes 0.3–0.6 mm; cauline leaves 9–17, concealing stem proximally, the uppermost moderately pubescent, without auricles. Inflorescences mostly unbranched, 8–35-flowered; fruiting pedicels 1.5–2.0 mm, reflexed, straight, with appressed, branched trichomes. Flowers pendent at anthesis; sepals pubescent; petals yellowish proximally and brick-red distally, rarely of one color throughout, 9–10 × 0.8–1.0 mm, glabrous. Fruits (immature) ca. 4 cm, reflexed, often appressed to rachises, not secund, straight, with parallel edges, pubescent throughout; style ca. 0.3 mm. Seeds not seen.

Flowering: May.

Habitat: crevices and ledges of calcareous rock outcrops.

Elevation: 2250–2400 m.

Distribution: United States (California/Inyo County).