

HYDRANGEACEAE HYDRANGEA FAMILY

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Shrubs (in ours) often with shredding bark. LEAVES simple, opposite or fasciculate, sessile to petiolate, persistent or deciduous, entire or toothed, more or less hairy; stipules absent. INFLORESCENCES cymose, or of solitary flowers, bracteate, pedicellate. FLOWERS perfect (in ours), actinomorphic; hypanthium present; sepals 4–5, free (or fused at base); petals 4–5, free; stamens 8–12 (numerous in *Philadelphus*), free or united at the base; ovary 1/4 to 2/3 inferior; carpels 3–5, fused; placentation axile or parietal; styles 3–5, distinct or fused at base, usually persistent; stigmas along length of style or short, capitate. FRUIT a long persistent capsule, septicidal and/or loculicidal. Seeds one to numerous.—17 genera, ca. 237 spp., chiefly of north temperate and sub-tropical regions.

Hydrangea and *Philadelphus* are important cultivated ornamentals.

1. Leaves pinnately veined, frequently over 30 mm long, the margins dentate-crenate; petiole usually over 10 mm long; flowers 5-merous; capsules loculicidal. *Jamesia*
- 1' Leaves palmately 3-veined or veins obscure, usually under 30 mm long, the margins entire; petiole usually less than 2 mm long; flowers usually 4-merous; capsules septicidal.
2. Flowers and fruit 3 to many in a cluster; petals 1.5–3 mm long; fruit 3–5 mm long.
..... *Fendlerella*
- 2' Flowers and fruit solitary, or rarely in groups of 2–3; petals 4–19 mm long; fruit 4–12 mm long.
3. Petals clawed; leaves coriaceous, usually concolorous; fruit 9–12 mm long.....
..... *Fendlera*
- 3' Petals not clawed; leaves submembranous, bicolorous, the lower surface densely covered with white hairs and therefore lighter; fruit 4–9 mm long..... *Philadelphus*

Fendlera Engelm. & A. Gray Fendler Bush

STEMS ascending or spreading; bark red to grey, often exfoliating; twigs glabrous or strigose with branched to unbranched hairs. LEAVES opposite or sometimes fasciculate; sessile to short-petiolate; blade linear to lanceolate or oblong, faintly 3-veined from base, hispid to strigose; margins entire, flat or revolute. FLOWERS solitary or in groups of 2–3, perfect; sepals 4; petals 4, clawed; stamens 8–12, the filaments broad and flat at base, distinct, the alternate filaments often shorter; ovary about one quarter inferior, 4-loculed; placentation axile; styles 4, distinct, persistent and spreading. FRUIT a septicidal capsule. SEEDS 1–3 per locule, fusiform, brown.—2–3 spp. in sw U.S. and Mex. (1 sp. in AZ) (named in honor of Augustus Fendler, 1813–1883, a Prussian botanist and explorer of the sw U.S.).

Fendlera rupicola Engelm. & A. Gray (cliff dweller). Fendler Bush—Shrubs to 2 m tall. LEAVES 10–27 mm long, 3–7 mm wide, sessile or subsessile. FLOWERS pedicellate;

petals 10–16 mm long including claw, 6–11 mm wide. CAPSULES 9–12 mm long; styles 4–5 mm long. [*F. wrightii* (A. Gray) Heller].—Canyons and washes mostly in chaparral and pinyon-juniper woodland: Apache, Cochise, Coconino, Gila, Greenlee, Graham, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai cos.; 1100–2200 m (3500–7250 ft); Apr–Jun; AZ, CO, NM, TX, UT, n. Mex.

Billie Turner annotated specimens from Graham, Greenlee, and Pinal counties as *Fendlera wrightii*. Recognition of *Fendlera wrightii* as a distinct species or as a variety of *F. rupicola* is based on leaf hairs (Turner 2001). Freeman (2016) did not see any specimens of var. *wrightii* from Arizona and states that the variety is known only from New Mexico, Texas and northern Mexico. However, specimens from four different areas in Arizona (Grand Canyon, Verde Valley, Chiricahua Mountains, and White Mountains) have the hairs typical of var. *wrightii*, which is distinguished by two layers of hairs on the abaxial surface—a lower layer of branched minute hairs and an upper layer of longer strigose, appressed hairs. The adaxial surface is densely pubescent. This subspecific taxon is not recognized here because the hairs are difficult to see without at least 40X magnification and are found on specimens widely spread across the state and in close association with specimens lacking these hairs.

Leaf color and venation may help distinguish narrow-leaved vegetative specimens of *Fendlera rupicola* and *Philadelphus microphyllus*. *Fendlera rupicola* usually has concolorous leaves and obscured secondary and tertiary veins, while *P. microphyllus* has bicolorous leaves with secondary and tertiary veins often visible.

Fendlerella (Greene) A. Heller Utah Fendlerbush

STEMS ascending or spreading; bark gray, often exfoliating; twigs glabrous or hispid to strigose with unbranched hairs. LEAVES opposite or sometimes fasciculate, sessile to short-petiolate, the blade lanceolate, elliptic to obovate, faintly 3-veined from base, strigose; margins entire, flat or revolute. INFLORESCENCE a many-flowered terminal cluster. FLOWERS 3 to many; sepals 4–5; petals 4–5, white, without a claw; stamens 8–12, the filaments broad and flat at the base, the alternate filaments often shorter, distinct; ovary about one quarter inferior, 3-loculed; placentation axile; styles 3, distinct. FRUIT a septicidal capsule; styles persistent and spreading; seeds 1 per locule, fusiform-ellipsoid, brown.—3 spp. in sw U.S. and Mex. (1 sp. in AZ) (Genus *Fendlera* and Latin *-ella*, diminutive).

Fendlerella utahensis (S. Watson) A. Heller (from Utah). Utah Fendlerbush, Yerba Desierto—Shrubs to 1 m tall. LEAVES 4–30 mm long, (1–)2–6(–10) mm wide, sometimes in fascicles, sessile or subsessile. FLOWERS pedicellate; petals 1.5–3 mm long, 0.5–1 mm wide. CAPSULES 3–5 mm long, 1–2 mm wide; style 1.0–1.3 mm long. – Canyon rims to steep canyon slopes: Cochise, Coconino, Graham, Greenlee, Mohave, Pima, Santa Cruz, Yavapai cos.; 1,100–3,050 m (3,600–10,000 ft); May–Aug; AZ, CA, CO, NM, NV, TX, UT, Mex. (Chih., N.L.).

This taxon is easily separated from *Fendlera rupicola* by the inflorescence (many-flowered terminal clusters) versus solitary axillary flowers in *F. rupicola*. Vegetative specimens may be confused with *F. rupicola* but are easily separated by the presence of distinctly pustulate hairs on the abaxial surface of the leaves in this taxon (versus strigose hairs mostly lacking pustulate bases in *F. rupicola*.)

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Regional floras have recognized two varieties, var. *utahensis* and var. *cymosa*. Variety *cymosa*, with relatively narrower, longer and acute leaves, was reported from the mountains of southern Arizona (Freeman 2016), but specimens with these leaf characteristics have also been found in lower elevations in the Grand Canyon and may represent adaptations to hotter, drier habitats. We found considerable variation in leaf size and shape, even within populations. Common garden experiments may be useful in establishing whether these varieties merit recognition.

Jamesia Torr. & A. Gray Cliffbush

STEMS ascending; bark reddish-brown, peeling in paper-like sheets with a gray or tan layer below; twigs glabrous or with unbranched hairs. LEAVES opposite, petiolate, the blade ovate to circular, pinnately-veined; margins dentate to crenate with apiculate teeth, flat. INFLORESCENCES cymose, many-flowered. FLOWERS 7–35; sepals 5; petals 5, without a claw; stamens 10, the filaments broad and flat at base, distinct; ovary about half inferior, 3–5-loculed, becoming 1-loculed; placentation parietal; styles 3–5, persistent. FRUIT a loculicidal capsule. SEEDS many, fusiform, brown.—2 spp. in w U.S. and n Mex. (1 sp. in AZ) (for Edwin P. James, 1797–1861, American botanist, geologist, geographer, and explorer of sw U.S.).

Jamesia americana Torr. & A. Gray (of the American continent). Cliffbush.—Shrubs to 3 m tall. LEAVES with petioles (3–)10–30(–43) mm long; blades 18–103 mm long, 10–83 mm wide; upper surface green and strigose; lower surface white to gray, pilose to canescent-wooly. FLOWERS long-pedicellate; petals 6–10 mm long, 3–6 mm wide, strigose. CAPSULES 2–8 mm long, 2–5 mm wide; styles up to 7 mm long.—4 vars.; AZ, CA, CO, NM, NV, UT, WY, n Mex.

var. americana—Rocky slopes, moist soils; Cochise, Graham, Pima, cos.: 2130–3267 m (7000–10720 ft); May–Aug. AZ, CO, NM, WY, n Mex.

Jamesia americana var. *zionis* N. H. Holmgren & P. K. Holmgren has been found in sw UT near the AZ state line. It should be searched for in northern Mohave County. Variety *zionis* can be distinguished by pale brown to gray bark that peels into strips or flakes (versus reddish brown bark that peels in sheets in var. *americana*) and 4–12-flowered inflorescences (versus 7–35-flowered inflorescences in var. *americana*).

Philadelphus L. Mock-orange

STEMS spreading to arching; bark red-brown, aging gray, sometimes peeling; twigs glabrous or hispid to strigose with unbranched and often pustulate hairs. LEAVES opposite, short-petiolate, the blade narrowly lanceolate to ovate, 3-veined from base, the apex acute to obtuse; margins entire, flat to revolute. FLOWERS solitary; sepals 4; petals 4, without a claw; stamens 20+, the filaments flattened and sometimes united at the base; ovary inferior to half inferior, 4-loculed, placentation axile; styles 4, distinct to united, persistent. FRUIT a septicidal capsule. SEEDS numerous per locule, fusiform, brown—ca 18–50 spp. widely distributed in n hemisphere. (1 sp. in AZ) (Greek *philos*, love; *adelphos*, brother; thought to be named for the Greek king of Egypt, Ptolemy II Philadelphus).

Philadelphus microphyllus A. Gray (small-leaved). Littleleaf Mock-orange—Shrubs to 3 m tall. LEAVES 5–40 mm long, 3–20 mm wide; petiole 0–2 mm long. FLOWERS

pedicellate; sepals 3–6(–7) mm long, glabrous to hairy, ovate to acuminate; petals 4–19 mm long, widely elliptic. CAPSULES 4–9 mm long.—Pinyon, juniper, and oak woodlands in dry, rocky canyons and crevices: Apache, Cochise, Coconino, Gila, Graham, Greenlee, Mohave, Pima, Santa Cruz cos.; 1065–3000 m (3500–9800 ft); May–Aug. AZ, CA, CO, NM, NV, UT, TX, WY, n to c Mex.

This notably variable species has been subject to widely different treatments. Kearney & Peebles (1969) recognized five subspecies of *P. microphyllus* (ssp. *argenteus* (Rydb.) C. L. Hitchc., ssp. *argyrocalyx* (Wooton) C. L. Hitchc., ssp. *occidentalis* (A. Nels.) C. L. Hitchc., ssp. *stramineus* (Rydb.) C. L. Hitchc., and ssp. *typicus* A. Gray) based on the number of stamens, the degree to which the filaments are united, pubescence types on leaf surfaces and the calyx, and the size of leaves and petals. Hu (1956) used many of these same characters to recognize seven species (*P. argenteus* Rydb., *P. crinitus* (Hitchc.) Hu, *P. maculatus* (Hitchc.) Hu, *P. madrensis* Hemsl., *P. microphyllus*, *P. occidentalis* A. Nels., and *P. palmeri* Rydb.) from Arizona. A review of specimens, including many of those cited by Dr. Hu, does not reveal any consistent pattern that warrants recognition of these species. Examination of populations in different parts of Arizona have revealed similar subtle variation of pubescence within populations.

In his review of *Philadelphus*, Hitchcock (1943) noted that “it is largely a matter of interpretation whether these other entities be considered varieties, subspecies, or species, but certain characteristics upon which Rydberg based his species appear to be but normal variations largely accountable for by habitat. Still other differences which were used to characterize some of the segregates are not at all constant even though they may be genetic in origin, so that the maintenance of some of Rydberg’s species, even as subspecific entities, does not seem feasible.” Our review of *Philadelphus* specimens from Arizona further supports a wide range of variation in calyx and leaf pubescence within populations. Freeman (2016) recognizes two Arizona varieties, vars. *microphyllus* and *madrensis* based on leaf vestiture, flower number, and capsule size. He notes that the leaves of var. *microphyllus* are sparsely sericeous-strigose adaxially, inflorescences are 1(–3)-flowered, and capsules 4.4–6 mm long, while var. *madrensis* leaves are sparsely to moderately strigose-sericeous adaxially, inflorescences 1–3(–5)-flowered, and capsules are 5–8 mm long. Because the variation is continuous without a distinct geographic or elevational pattern, we chose not to recognize these subspecific taxa.

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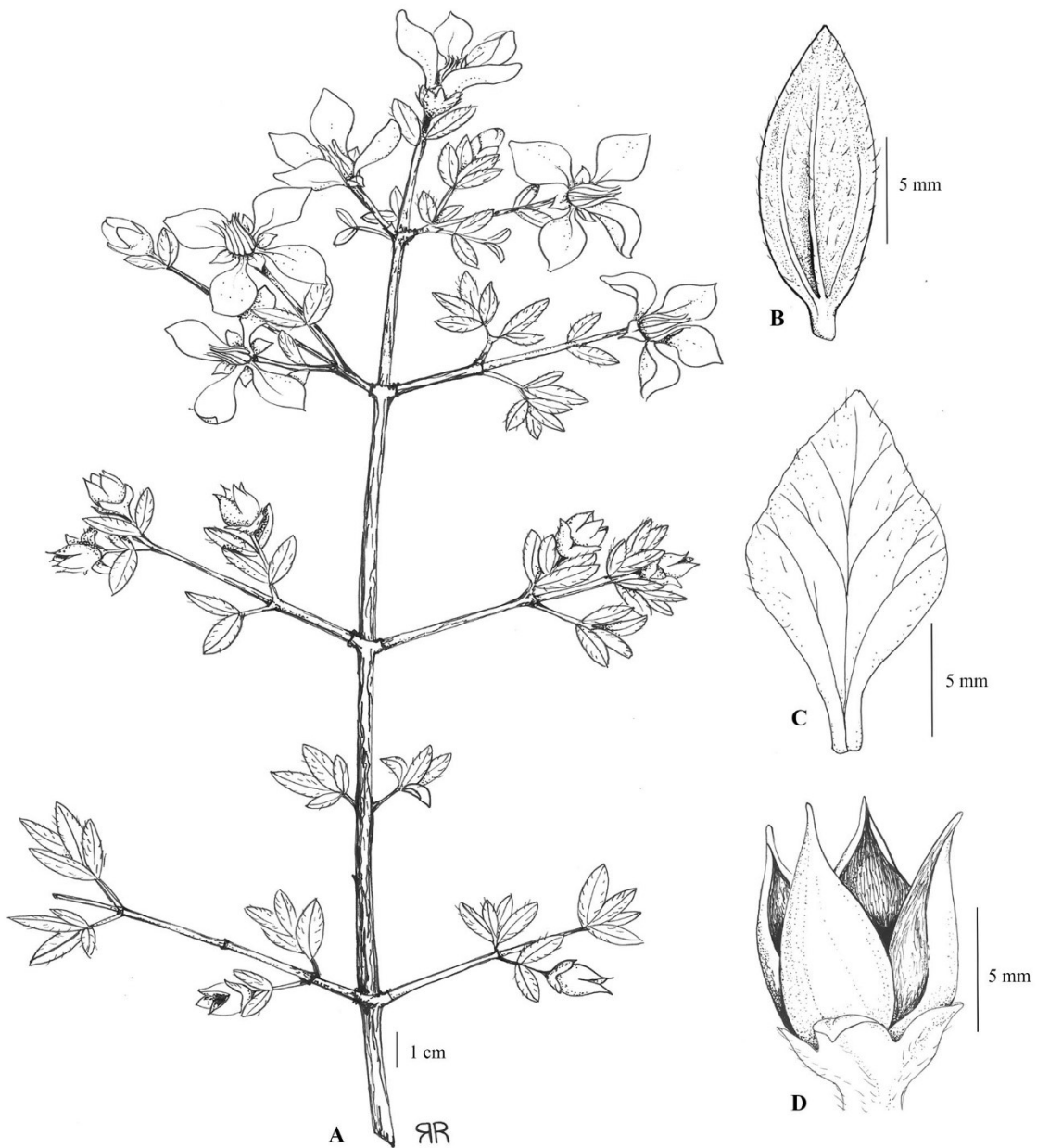
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Hydrangeaceae. Figure 1. *Fendlera rupicola*. (A) habit; (B) leaf; (C) petal; (D) capsule. Illustration by Rachael Rubin.

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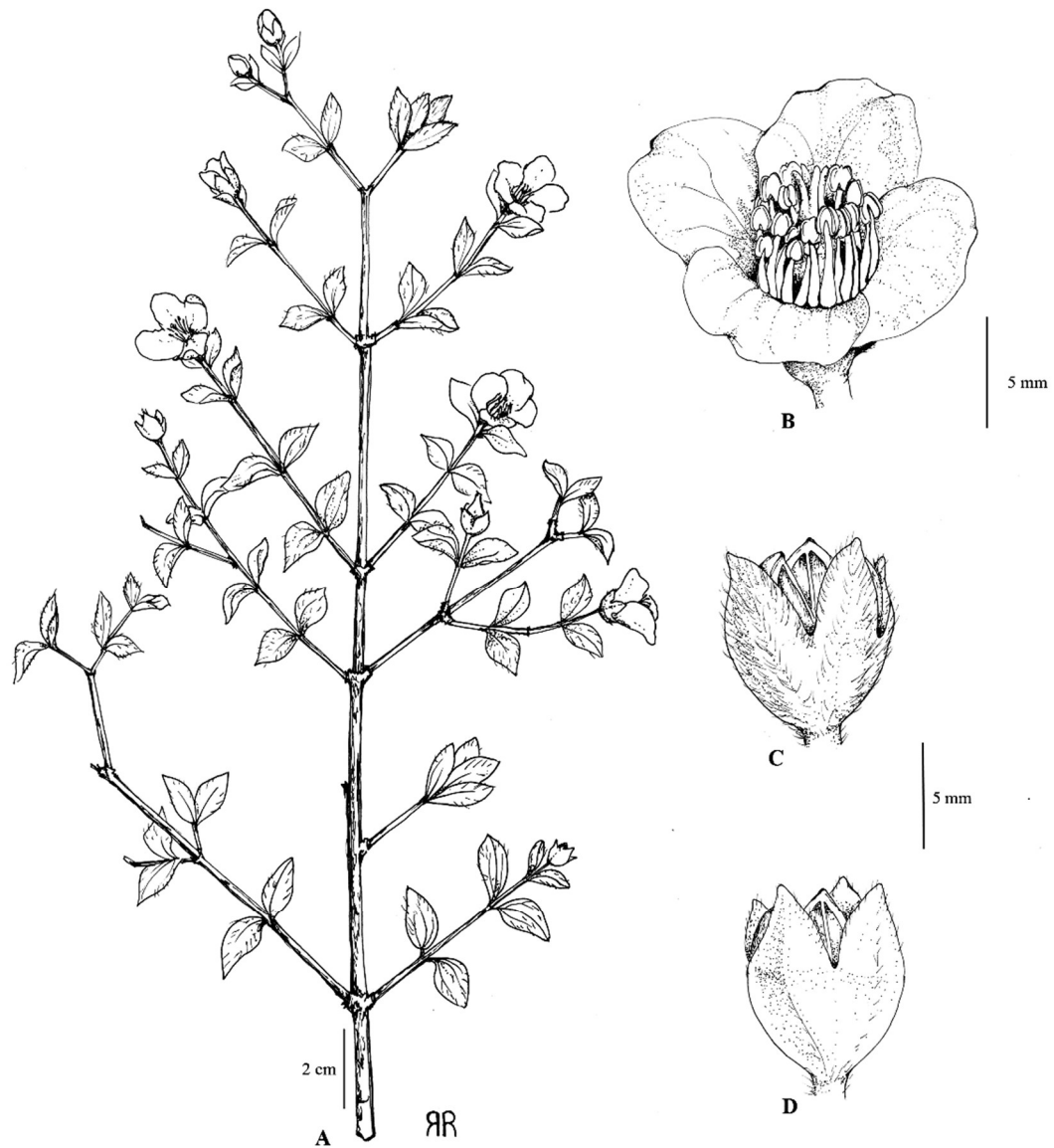


Hydrangeaceae. Figure 2. *Fendlerella utahensis*. (A) habit; (B) inflorescence; (C) fruit; (D) leaf, abaxial surface. Illustration by Rachael Rubin.



Hydrangeaceae. Figure 3. *Jamesia americana*. (A) habit; (B) leaf margin; (C) flower; (D) immature fruit. Illustration by Rachael Rubin.

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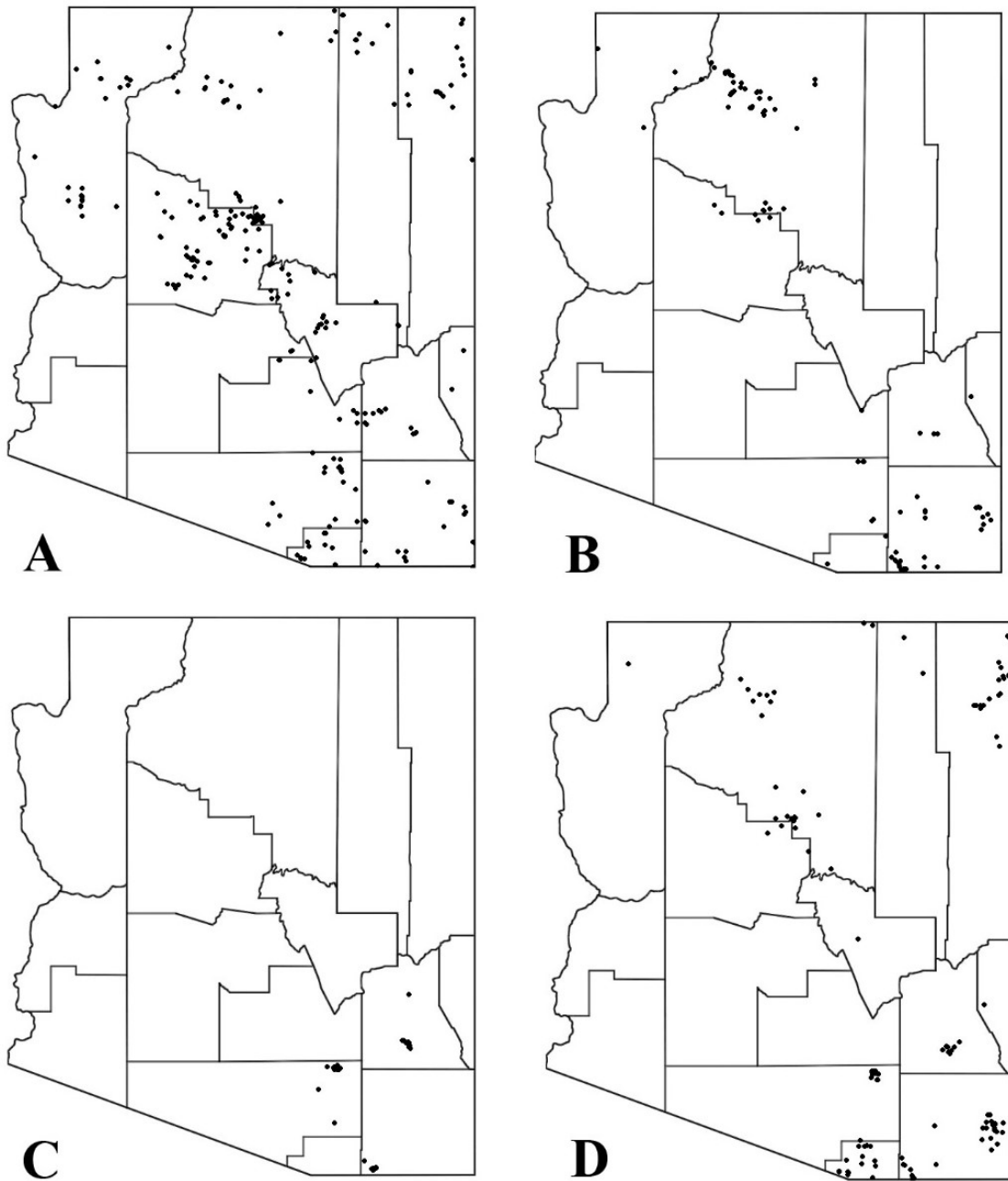


Hydrangeaceae. Figure 4. *Philadelphus microphyllus*. (A) habit; (B) flower; (C) capsule with pubescent hypanthium; (D) capsule with almost glabrous hypanthium. Illustration by Rachael Rubin.



Hydrangeaceae. Figure 5. (A-C) *Fendlera rupicola*; (D-E) *Fendlerella utahensis*; (F-G) *Jamesia americana*; (H-I) *Philadelphus microphyllus*. (all photos by Max Licher)

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Hydrangeaceae. Figure 6. Distribution of: (A) *Fendlera rupicola*; (B) *Fendlerella utahensis*; (C) *Jamesia americana*; (D) *Philadelphus microphyllus*.