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GYMNOSPERMS

CUPRESSACEAE Gray CYPRESS FAMILY

Robert P. Adams

Trees or shrubs, evergreen in our flora, roots fibrous to woody. **BARK** fibrous and furrowed or exfoliating in plates. **LEAVES** of adults appressed, scalelike, with a generally visible dorsal oil gland, juvenile leaves decurrent (except both adult and juvenile leaves acicular in *Juniperus communis*), resinous and aromatic, persisting 3–5 years, alternate or in whorls of 3. **POLLEN CONES** maturing and shedding annually, solitary and terminal (except axillary in *J. communis*), oblong, sphorophylls overlapping, bearing 2–10 abaxial microsporangia; pollen spherical, not winged. **SEED CONES** maturing in 1–2 years, borne on a short pedicel, persistent in *Cupressus* and deciduous upon maturity in *Juniperus*, terminal (except axillary in *J. communis*), cone scales overlapping, fused in *Juniperus*, abutting in *Cupressus*, but appearing as spherical to ovoid, cone scales woody to fleshy (resembling a fruit in some *Juniperus*), brown to reddish brown to blue when ripe, opening upon maturity in *Cupressus* but the entire seed cone fused in *Juniperus*. **SEEDS** 1–20 per scale or 1 to numerous per cone, not winged, cotyledons 2–9 (Watson and Eckenwalder 1993). Genera 25–30 (1 in our flora), species 110–130 (5 in our flora); our genus widespread in the Northern Hemisphere (Adams 1993). There are collections of *Cupressus arizonica* from our flora, but these plants are cultivated and not reproducing under natural conditions. Therefore, *C. arizonica* is excluded from this treatment along with cultivars of *Juniperus* (e.g., *J. chinensis* and *J. sabina*). *Juniperus deppeana* Steud. (alligator juniper) is not yet reported for the Four Corners flora; however, it has been found in the Zuni Mountains, just south of the study area, and potential habitat exists in McKinley County, New Mexico.

Juniperus L. Juniper, Cedar, Cedro, Sabino

(Latin *juniperus*, name for juniper) Trees, shrubs; columnar or prostrate; evergreen. Branchlets terete, 2–6-angled, variously oriented, but not in flattened sprays. **LEAVES** opposite in 4 ranks or in whorls of 3; adult leaves closely appressed to divergent, scalelike to subulate, free portion to about 10 mm (to about 15 mm in *J. communis*), abaxial gland visible or not, elongate to oval, sometimes exuding white crystalline deposit. **POLLEN CONES** with 3–7 pairs or trios of sporophylls, each sporophyll with 2–8 pollen sacs. **SEED CONES** maturing in 1 or 2 years, globose to ovoid, berrylike, 2–20 mm, remaining closed, usually glaucous; cone scales persistent, 1–3 pairs, peltate, tightly coalesced, thick and fleshy or fibrous to obscurely woody. **SEEDS** 1–3 per scale, 1–6 per cone, round to faceted, wingless, cotyledons 2–6. $x = 11$. Ranging from Arctic, temperate, and deserts to subtropical and from timberline to sea level. Sixty-six species in the Northern Hemisphere, often a weedy, invasive species in North America (Adams 1993), but generally relictual in isolated populations in central Asia, although weedy (*J. communis*) in Europe. *Juniperus* is the only dioecious (sometimes monoecious) genus of *Cupressaceae* in North America. Numerous cultivars of *Juniperus* species are widely used for landscaping. Mutants or "sports" affecting plant habit and foliage are present in all species and are likely related to single-gene mutations. Many have been given formal names or incorrectly ascribed to hybridization. Gymnocarpy (bare seeds protruding from the cone), caused by insect larvae (Zanoni 1978), is found in most juniper species, particularly in the southwestern United States. Specimens with such aberrations may be almost impossible to identify without chemical data.

1. Leaves of 1 kind, subulate, with basal abscission zone, spreading; cones axillary (*Juniperus* sect. *Juniperus*) ..... ***J. communis***

1′ Leaves of 2 kinds, whip (subulate, without basal abscission zone) and scalelike; cones terminal (*Juniperus* sect. *Sabina*) ..... (2)

2. Margins of leaves entire (at 20× and 40×) ..... ***J. scopulorum***

2′ Margins of leaves serrate (at 20×) ..... (3)

3. Abaxial glands inconspicuous because embedded in leaf; monoecious, seed cones 8–9 (12) mm, bluish brown, tan beneath glaucous coating, fibrous ..... ***J. osteosperma***

3′ Abaxial glands conspicuous; dioecious, seed cones 6–8 mm, reddish blue to brownish blue, resinous ..... ***J. monosperma***

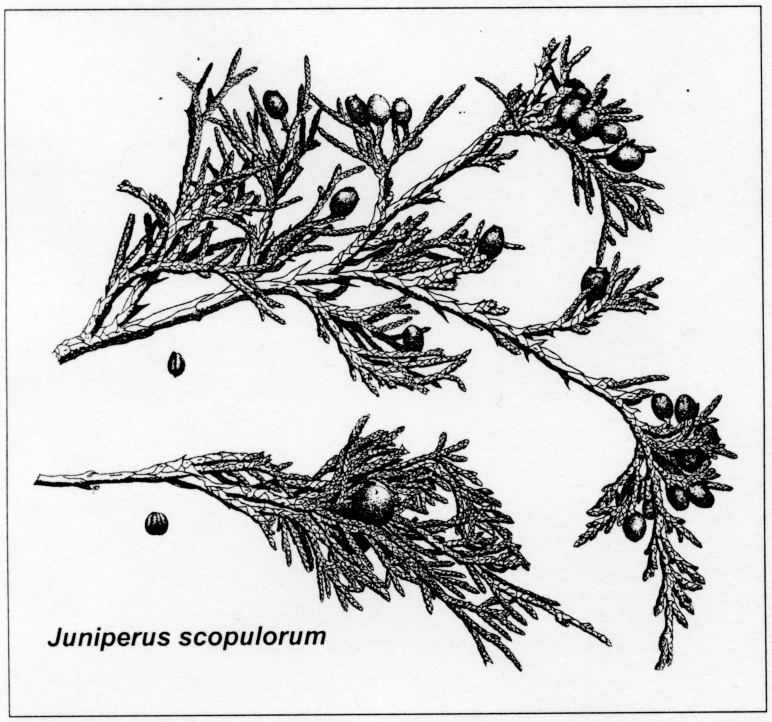
Juniperus communis L. (common) Common juniper. Shrubs prostrate or low with ascending branchlet tips (occasionally spreading shrubs to 3 m). **LEAVES** upturned, to 15 × 1.6 mm, rarely spreading, linear, glaucous stomatal band about

as wide as each green marginal band, apex acute and mucronate to acuminate. **SEED CONES** 6–9 mm, shorter than leaves. $2n = 22$. [*J. canadensis* Lodd. ex Burgsd.; *J. communis* subsp. *depressa* (Pursh) Franco; *J. depressa* Raf. ex M'Murtrie]. Rocky soil, slopes, and summits. ARIZ: Apa; COLO: Arc, Hin, LPl, Min, Mon, RGr, SJn; NMEX: McK, RAr, SJn; UTAH. 2440–3150 m (8000–10335'). Pollen shedding: Apr–May. Canada, high mountains in the western United States, Great Lakes, and New England, and mountain populations as far south as Tennessee and Georgia. *Juniperus communis* varieties were recently reevaluated (Adams and Pandey 2003). Four Corners material belongs to **var. *depressa*** Pursh (depressed or flattened). In Europe, the berries (seed cones) are used for flavoring gin. Used by the Ramah Navajo as an emetic for all ceremonials.

Juniperus monosperma (Engelm.) Sarg. (one seed) One-seed juniper, sabina. Shrubs or small trees; dioecious, to 7 (–12) m, usually branching near the base; crown rounded to flattened-globose. Bark gray to brown, exfoliating in thin strips, that of small branchlets (5–10 mm diameter) smooth, that of larger branchlets exfoliating in either flakes or strips. Branches ascending to erect; branchlets erect, 4–6-sided, about 2/3 as wide as length of scalelike leaf. **LEAVES** green to dark green, abaxial glands elongate, fewer than 1/5 of the glands (on whip leaves) with an evident white crystalline exudate, margins denticulate (at 20×); whip leaves 4–6 mm, glaucous adaxially, scalelike leaves 1–3 mm, not overlapping, or, if so, by less than 1/4 their length, keeled, apex acute to acuminate, spreading. **SEED CONES** maturing in 1 year, 1 size, with straight peduncles, globose to ovoid, 6–8 mm, reddish blue to brownish blue, glaucous, fleshy and resinous, with 1 (–3) seeds. **SEEDS** 4–5 mm. [*J. monosperma* f. *gymnocarpa* (Lemmon) Rehder; *J. occidentalis* var. *gymnocarpa* Lemmon; *J. occidentalis* var. *monosperma* Engelm.; *J. mexicana* var. *monosperma* (Engelm.) Cory; *Sabina monosperma* (Engelm.) Rydb.]. Dry, rocky soils and slopes. NMEX: McK, RAr, San, SJn. 1800–2500 m (5900–8200'). Pollen shedding: Feb–Apr. Arizona, Colorado, New Mexico, and Texas. Reports of hybridization with *J. pinchotii* were refuted (Adams 1975). Ramah Navajo uses include: decoction for postpartum or menstrual pain and a cold infusion for stomachache; ceremonial medicine used in "bath for purification of burial party"; medicine for burns, sweat bath medicine, inner bark given to newborns "to clean out impurities"; cold infusion used for fever; given to sheep for bloating from eating "chamiso"; wood used for fence posts and hogan roofs; boughs used for the sides and roofs of shade houses or special logs for the "Enemy Way Ceremonial"; bark used as platform for sun-drying roasted corn; and wood used to make hunting bows. Navajo uses include: green bark and berries used as a green dye for wool; wood used to make prayer sticks and to make bows for the canopy of the baby's cradleboard; wood used for firewood; and wood made into charcoal and used for smelting silver.

Juniperus osteosperma (Torr.) Little (bone seed) Utah juniper, bone seed juniper, sabina morena. Trees or shrubs, monoecious, to 6 (–12) m, multi- or single-stemmed, crown rounded. Bark exfoliating in thin gray-brown strips, that of smaller and larger branchlets smooth. Branches spreading to ascending; branchlets erect, 3–4-sided in cross section, about as wide as length of scalelike leaves. **LEAVES** light yellow-green, abaxial glands inconspicuous and embedded, exudate absent, margins denticulate (at 20×); whip leaves 3–5 mm, glaucous adaxially; scalelike leaves 1–2 mm, not overlapping, or, if so, by less than 1/10 their length, keeled, apex rounded, acute, or occasionally obtuse, appressed. **SEED CONES** maturing in 1–2 years, of 1–2 sizes, with straight peduncles, globose, (6–) 8–9 (–12) mm, bluish brown, often almost tan beneath glaucous coating, fibrous, with 1 (–2) seeds. **SEEDS** 4–5 mm. [*J. californica* Carrière var. *osteosperma* (Torr.) L. D. Benson; *J. californica* subsp. *osteosperma* (Torr.) A. E. Murray; *J. californica* var. *utahensis* Engelm.; *J. californica* var. *utahense* Vasey; *J. knightii* A. Nelson; *J. megalocarpa* Sudw.; *J. monosperma* var. *knightii* (A. Nelson) Lemmon; *J. occidentalis* Hook. var. *utahensis* (Engelm.) Kent; *J. tetragona* Schltdl. var. *osteosperma* Torr.; *J. utahensis* (Engelm.) Lemmon; J. *utahensis* var. *megalocarpa* (Sudw.) Sarg.; *J. utahensis* var. *cosnino* Lemmon; *Sabina knightii* (A. Nelson) Rydb.; *Sabina megalocarpa* (Sudw.) Cockerell; *Sabina osteosperma* (Torr.) Antoine; *Sabina utahensis* (Engelm.) Rydb.]. Dry, rocky soil and slopes. ARIZ: Apa, Coc, Nav; COLO: Arc, Dol, LPl, Mon, SMg; NMEX: McK, RAr, San, SJn; UTAH. 1680–2380 m (5500–7800'). Pollen shedding: Mar–May. Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming. *J. osteosperma* is the dominant juniper of Utah. Hybridization with *J. occidentalis* reported (Vasek 1966; Terry, Nowak, and Tausch 2000). Navajo uses include: seeds eaten for headaches; used to wash the hair; green timber used to make corrals. The Hopi used the wood for fuel. A major food for wildlife.

Juniperus scopulorum Sarg. (of rocky cliffs) Rocky Mountain juniper, Rocky Mountain redcedar. Trees, dioecious, to 20 m tall, single-stemmed (rarely multistemmed); crown conic to occasionally rounded. Bark brown, exfoliating in thin strips, that of small branchlets (5–10 mm diameter) smooth, that of larger branchlets exfoliating in plates. Branches spreading to ascending; branchlets erect to flaccid, 3–4-sided in cross section, about 2/3 or less as wide as length of scalelike leaves. Leaves light to dark green but often glaucous blue or blue-gray, abaxial gland elliptic, conspicuous, exudate absent, margins entire (at 20× and 40×); whip leaves 3–6 mm, not glaucous adaxially; scalelike leaves 1–3 mm,



Juniperus scopulorum

not overlapping to overlapping by not more than 1/5 their length, keeled to rounded, apex obtuse to acute, appressed or spreading. **SEED CONES** maturing in 2 years, of 2 distinct sizes, generally with straight peduncles, globose to 2-lobed, 6–9 mm, appearing light blue when heavily glaucous, but dark blue-black beneath glaucous coating when mature (or tan beneath glaucous coating when immature), resinous to fibrous, with (1–) 2 (–3) seeds. **SEEDS** 4–5 mm. $2n = 22$. |*J. excelsa* sensu Pursh non M. Bieb.; *J. scopulorum* var. *patens* Fassett, ×*fassettii* Boivin (*horizontalis* × *scopulorum*); *J. scopulorum* var. *columnaris* Fassett (environmentally induced by gases from burning coal, see Adams 1982); *J. virginiana* L. var. *montana* Vasey; *J. virginiana* var. *scopulorum* (Sarg.) Lemmon; *J. virginiana* subsp. *scopulorum* (Sarg.) A. E. Murray; *Sabina scopulorum* (Sarg.) Rydb.|. Rocky soils, slopes, and eroded hillsides. ARIZ: Apa, Nav; COLO: Arc, Dol, Hin, LPl, Min, Mon, SJn, SMg; NMEX: McK, RAr, SJn; UTAH. 1950–2750 m (6400–9020'). Pollen shedding: Mar–May. Vancouver Island and Puget Sound, from Alberta to northern Mexico. Hybridizes with *J. virginiana* (Comer, Adams, and Van Haverbecke 1982) in the Missouri River basin. Occasionally used for fence posts. Navajo uses include: plant taken as a "War Dance Medicine"; plant rubbed on the hair for dandruff; pounded mixture of herbs given to patient during the blackening ceremony of the "War Dance." The Kayenta Navajo used the plant for pain. The Ramah Navajo uses include: lotion for headache and stomachache; cold infusion used as a ceremonial medicine to protect from enemies and witches; taken and used as lotion for colds and fever.

EPHEDRACEAE Dumort. EPHEDRA FAMILY

Stanley L. Welsh & N. Duane Atwood

Dioecious shrubs; branches green to olive-green, opposite or whorled, striate. **LEAVES** scalelike, opposite or whorled, more or less connate. **MALE CONES** compound, borne at the nodes or terminal, with 2–8 microsporophylls, these free or with stalks united, with a calyxlike involucre surrounding the stalks. **FEMALE CONES** solitary or whorled, sessile or peduncled, subtended by firm or scarious bracts. **SEEDS** 1–3, hard, somewhat angled to almost terete.

Ephedra L.

The stems simulate those of an *Equisetum*, especially in being green and striate; the differences are obvious, however. **LEAVES** scalelike, either opposite or in whorls of 3. **CONES** laterally produced; stems with a solid, black pith (Cutler 1939; Benson 1943).

1. Leaves and bracts 3 per node; branches whorled; bracts of female cone scales clawed, 6–10 mm wide, scarious ..... ***E. torreyana***

1' Leaves and bracts 2 per node; branches initially opposite; bracts of female cone scales not clawed, 3–5 mm wide, only the margins scarious ..... ***E. viridis***

Ephedra torreyana S. Watson (for John Torrey, distinguished botanist and colleague of Asa Gray) Torrey's ephedra. Erect shrubs, 2–10 m tall (rarely more). **BRANCHES** blue-green to olive-green, sometimes glaucous, appearing smooth but with many small longitudinal furrows, rigid, terete, to 3.5 mm thick, solitary or whorled at the nodes. **LEAVES** ternate or whorled, 2–5 mm long, dorsimedially thickened, connate for nearly 2/3 their length, at maturity the lobes spreading or recurved, somewhat persistent. **MALE CONES** solitary to several in a whorl, ovate, sessile, 6–8 mm long; bracts ternate in 5–6 whorls, obovate, clawed, scarious except in the center and at the base. **FEMALE CONES**