***Cercocarpus montanus* Raf.** true mountain-mahogany
ROSACEAE

Synonyms: *Cercocarpus betuloides* Nutt. in T. & G.
Cercocarpus betulifolius Nutt. ex Hook.
Cercocarpus parvifolius Nutt.
Cercocarpus flabellifolius Rydb.

General Description.—True mountain-mahogany, also known as mountain cercocarpus, birchleaf cercocarpus, birchleaf mountain-mahogany, alderleaf mountain-mahogany, blackbrush, deerbush, tallowbrush, and lintisco (Spanish), is a long-lived, unarmed, mostly deciduous shrub, with few to many ascending stems generally 1 to 4 m tall and 0.5 to 5 cm in diameter at the base. Mature bark is smooth and light gray. Stout tap and lateral roots penetrate deep into available soil and rock crevices. Leaves are simple and alternate. Leaf length varies from 6 to 44 mm. Leaf blade shape is oblanceolate to roundish with shallow forward-pointing teeth on the terminal margin. The upper surface is glabrous while the lower surface is generally pubescent (Welsh and others 1987). Perfect, apetalous flowers, 10 to 17 mm long, occur singularly or in small clusters arising from axiles or on short spur branchlets along upper portions of 2-year-old stems. Hard, pale green to light brown fruits are pubescent, cylindrical achenes, approximately 1 to 2 mm wide and 8 to 15 mm long with a persistent twisted or spiraled style or tail 3 to 10 cm in length. The numerous 1 to 2 mm long hairs present on this appendage extend almost perpendicular to the style axis when dry and facilitate wind dispersal. Because of the reflective nature of these hairs, abundant seed crops give plants a frosted look in sunlight.

Taxonomy.—Nine varieties of true mountain mahogany are recognized of which var. *montanus* Raf. is most widespread (Marshall 1995, NatureServe Explorer 2002). Varieties with southwestern United States distributions include vars. *argenteus* (Rydb) F.L. Martin, *glaber* (S. Wats.) F.L. Martin, and the evergreen *paucidentatus* (S. Wats) F.L. Martin. Closely related species of the Southwest and Mexico include: *C. mexicanus* Hendrickson, *C. rzedowski* Hendrickson, and *C. fothergilloides* Kunth, suggesting a southern North American origin (Stutz 1990). Coastal California has varieties with restricted distributions including the critically imperiled (S1) Santa Catalina mountain-mahogany or *C. montanus traskiae* (Eastw.) F.L. Martin, which is sometimes treated as a separate species, and the vulnerable (S3) Island mountain-mahogany or *C. montanus blancheae* (Schneid.) F.L. Martin (NatureServe Explorer 2002). True mountain-mahogany is known to hybridize with other mountain-mahogany species where populations are in contact (Stutz 1990, Walker and Turley 1999). Hybrids derived from crosses with the more tree-like and evergreen curlleaf mountain mahogany (*Cercocarpus ledifolius* var. *intermontanus* N. Holmgren) are evergreen, intermediate in stature and leaf shape, and usually sterile. In contrast, hybrids formed with *C.*

ledifolius Nutt. spp. *ledifolius*, are quite fertile and backcross with parent populations (Stutz 1990).

Range.—True mountain-mahogany, like other members of the genus, is endemic to dry coastal and interior foothills and mountains of the Western United States and Mexico (Marshall 1995, Stutz 1990). In the United States, it is centrally located in Colorado, Utah, and Wyoming and to lesser degrees in South Dakota, Nebraska, Kansas, Oklahoma, Texas, New Mexico, Arizona, Nevada, California, Oregon, Idaho and Montana (Davis 1990, NatureServe Explorer 2002). Within its range it grows at elevations of 1,000 and 3,000 m (Davis 1990).

Ecology.—True mountain-mahogany grows in solid, sometimes extensive stands, and in mixtures in sagebrush and mountain shrublands and pinyon-juniper woodlands. This species is also found in openings of ponderosa pine, mixed conifer, and aspen forests. It does best in full sun. Annual precipitation ranges from 250 to 600 mm. Soils are well drained, near-neutral to slightly basic, and deep to absent (rock crevices). Nitrogen fixation in root nodules and ectomycorrhizal facilitation of phosphorus uptake (Hoeppel and Wollum 1971) are probably critical for the success of this species on infertile soils. Plants often appear hedged from heavy winter use by wildlife. Regeneration by crown sprouting is best after early season fires (Marshall 1995). Ferguson (1983) suggested that the ability to sprout following fire might be ecotype dependent. Stand regeneration by seed is slow.

Reproduction.—Anthesis for this wind pollinated species occurs between April and early July depending on elevation, latitude, and aspect. Fruits ripen and disperse from July to October. A unique pattern of resource partitioning is commonly observed in which branches with few seeds and long leader growth occur concurrently with branches sporting many fruits and little leader development (Walker and Turley 1999). Abundant fruit production may occur at intervals of 1 to 10 years (Plummer and others 1968). A high percentage of nonviable (empty) fruit is common for this species and the genus *Cercocarpus* in general. Means of 90,000 and 130,000 cleaned seeds per kg (fruits with tails removed) have been reported in the literature (Kitchen and others 1989, Deitschman and others 1974). Primary seed dispersal is by wind. However, seeds are also gathered and likely cached by rodents. The possible significance of rodents as secondary dispersers of mountain-mahogany seeds is unknown.

Growth and Management.—Although within-plant flowering and fruit maturation are well synchronized, some within-population asynchrony is expected. Ripened fruits are easily dislodged and collected by striking or shaking branches over hand-held hoppers. Optimal season for harvest varies from June to September. During harvest and handling, fruit hairs dislodge and can cause considerable discomfort to eyes and skin, revealing the motivation for the cowboy moniker, "hell feathers" (Plummer and others 1968). Commercially available seed is typically cleaned to 95 percent purity and 85 percent viability. Seeds have been warehouse-stored for 7 years without significant loss in viability (Stevens and others 1981). Although primary dormancy is apparently absent for some collections of true mountain-mahogany seed (Deitschman and others 1974), moist chilling (stratification) treatments of 2 to 12 weeks are typically required to break dormancy (Kitchen and Meyer 1990). In one study, seeds germinated in chilling (2 ^{o}C) between 7 and 15 weeks of treatment (Kitchen and Meyer 1990). A germination inhibitor may play a role in germination regulation (Moore 1963). Laboratory viability evaluations using standard TZ (tetrazolium chloride) tests can be problematic due to difficulty in extracting undamaged embryos from fruits (Kitchen and others 1989). Seeds are used in restoration plantings of highly disturbed sites (e.g. surfacing mines) and for wildlife habitat improvement. Seedling vigor is fair and growth rate is slow to moderate. Plants reach maturity in 5 to 15 years. Plants are tolerant of moderate to heavy use by browsers (Turley 2000) and shoots of true mountain-mahogany provide adequate nutrition as winter forage for wildlife. Productivity decreases when plants are protected from herbivory over extended periods (Waugh 1990). Decadent stands can be rejuvenated using light to moderate top removal techniques such as one-way chaining (Davis 1990). Both containerized and bare-root stock (1 and 2 year old) is available from select nurseries.

Benefits.—True mountain mahogany is an important, often dominant shrub in many parts of the Western United States. It provides valuable winter forage for wildlife. It also provides protection for, and increases the fertility of, naturally occurring and human-caused (e.g. mine spoils) infertile soils.

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