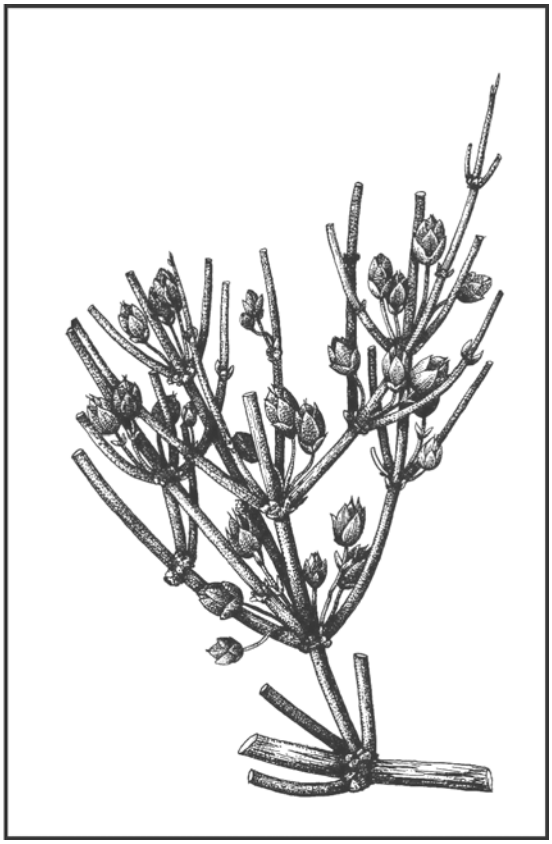
***Ephedra nevadensis* S. Wats.** Nevada ephedra
EPHEDRACEAE

Synonyms: *Ephedra aspera* Engelm. ex S. Wats
Ephedra reedii Cory
Ephedra antisyphilitica sensu S. Watts in King



General Description.—Nevada ephedra, also known as Nevada jointfir, gray ephedra, or mormon tea, is an erect, 0.3 to 1.5 m tall, coniferous shrub with opposite spreading branches. Roots are deep and fibrous extending from an expanded root crown. Stems are jointed and grooved. Internodes are 1.5 to 6 cm long (Cronquist and others 1972). The combination of small cones, ring porous wood, wide multiseriate rays, and vessels in older stems separate *Ephedra* from other gymnosperms (Stevenson 1993). Bark on older branches is gray and fissured. The erect, photosynthetic branchlets (1 to 5 mm wide) are pale green to gray, glaucous and smooth. Leaves are reduced to 2 to 5 mm long, deciduous scales, positioned in opposite pairs at the nodes. A thickened gray base remains after leaf-fall. One to several oval-shaped male cones, 4 to 8 mm long, are subtended by several pairs of membranous bracts attached at the nodes (Cronquist and others 1972). Egg-shaped female cones, 5 to 11 mm long and light-brown to yellowish-green, are attached on short stalks (peduncles) and partially enclosed by 8 to 10 bracts at young nodes. Fruits are smooth brown nutlets, 4 to 9 mm long, 2 to 4 mm wide, and occur individually or in pairs (Cronquist and others 1972). The inner cone scales enclose the seed mimicking the angiosperm pericarp. The embryo has two cotyledons.

Taxonomy.—*Ephedra* is monotypic to Ephedraceae with a worldwide distribution (except for Australia) and is represented by approximately 60 species (Stevenson 1993). Two varieties, of Nevada ephedra are recognized; *E. nevadensis* var. *nevadensis* and var. *aspera* (Engelm. ex S. Wats) L. Benson (Kartesz 1994). Chromosome number is 2n = 14 or 28 (Stevensen 1993).

Range.—Nevada ephedra is endemic to arid and semiarid parts of the Great Basin, Colorado Plateau, and desert Southwest of western North America. Its range extends from Oregon and California on the north and west, into Texas in the east, and Mexico in the south (Tirmenstein 1990). In Utah it grows from 1,220 to 1,830 m in elevation (Dittberner and Olson 1983).

Ecology.—Nevada ephedra grows in well drained, sandy to rocky soils on arid hills, alluvial fans, and plains, and on ridges and canyons partially to completely devoid of trees (Stanton 1974). It is moderately salt-tolerant (Stanton 1974, Plummer 1977). It occurs in large pure stands and in mixed pinyon-juniper woodlands, salt-desert, sagebrush, and hot-desert transitional shrublands, and mountain and desert grasslands (Tirmenstein 1990). Mean annual precipitation varies from 150 to 400 mm. Plants sprout from the woody crown and from roots following fire (Young and Evan 1978, West and Hassan 1985). Fire seasonality, intensity, and severity affect plant capacity to recover after burning (Stanton 1974, Wright 1980, McLaughlin and Bowers 1982). A lack of fuel continuity in many Nevada ephedra communities results in fire being a rare event. Plants spread

vegetatively through underground stolons in response to burial. Natural recruitment from seeds is often from rodent caches (Tirmenstein 1990). Of North American ephedra, Nevada ephedra is considered to be the most important forage species (Tirmenstein 1990). It is used extensively by mule deer (*Ococolius hemionus*), pronghorn (*Antilocapra americana*), and bighorn (*Ovis canadensis*) and domestic sheep during winter and in periods of drought (Stanton 1974, Smith and Beale 1980). Nutritive value and palatability of young branchlets is considered to be fair to good (Tirmenstein 1990).

Reproduction.—Nevada ephedra is dioecious (occasional monoecious) with female and male cones occurring on separate plants. Male plants are more common on dry slopes and female plants dominate more favorable locations, maximizing reproductive output (Freeman and others 1976). Plants are wind-pollinated. The timing of cone maturation, or coning, and pollination is weather-dependent and generally occurs over a period of 1 to 2 weeks between early March and early June (Stanton 1974, Turner and Randall 1987). Seeds ripen between May and August. Turner and Randall (1987) observed considerable inter-annual variation in timing of phonological development. Cones are not produced every year, and good seed crops are typically several years apart for any given population (Plummer and others 1968). Years of good cone production are apparently synchronized among most plants of a population by an interaction between years of above-average precipitation and time since last major seed crop. There are approximately 45,000 seeds (nutlets) per kg (Kitchen and others 1999).

Growth and Management.—Once ripe, seeds are easily dislodged. Ripened seeds can be collected by gently striking or shaking seed-bearing branches over tarps or hand-held hoppers. In good years, large quantities of seeds can be harvested in relatively short time if harvests are well timed. After drying, seeds are cleaned to remove light, unfilled seeds, stem fragments, cone scales, and other inert material. Purity and viability levels of commercially available seed are generally high. Seed germination is rapid across a wide range of temperatures (5 to 20 ^{o}C) with little or no dormancy (Young and others 1977, Kitchen and others 1999). Seed viability has remained high for up to 5 years (Stevens and others 1981). Although seedlings tolerate drought well, they are slow growing and may take 5 to 10 years to reach 60 cm in height (Plummer and others 1968). Plants establish well from direct seeding when more competitive species are controlled. Successes with transplants and cuttings to revegetate minelands and other degraded shrublands have also been reported (Luke and Monsen 1984, Shaw and Monsen 1984).

Benefits.—Nevada ephedra provides forage and cover for numerous species of wildlife, especially during winter and periods of drought (Stanton 1974, Smith and Beale 1980, Dittberner and Olsen 1983). It is also used as forage by domestic sheep and cattle but is considered poor forage for horses. The species is used effectively in restoration planting on harsh sites (Plummer and others 1968, Luke and Monsen 1984, Shaw and Monsen 1984). Indigenous humans used roasted seeds in foods and various concoctions from seeds and stems to treat a variety of symptoms including coughs, headaches, cold, fever, and kidney ailments (Steward 1938, Tirmenstein 1990). Mormon pioneers also made teas from stems. All members of the genus produce unique secondary compounds with potential medicinal applications (Caveney and others 2001). Nevada ephedra, and other North American members of the genus, lack the nueroactivating ephedrine alkaloids found in some Old World species. However, a class of compounds with antimicrobial potential, kynurenates, are found in Nevada ephedra (Caveney and others 2001). It is occasionally used as an ornamental (Cronquist and others 1972).

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