

***Zuckia brandegei* (Gray) Welsh & Stutz ex Welsh**
CHENOPODIACEAE

siltbush

Synonyms: *Grayia brandegei* Gray var. *brandegei*
Grayia brandegei Gray var. *plummeri* Stutz & Sanderson
Zuckia arizonica Standley



General Description.—Siltbush or spineless hopsage is a deciduous shrub or subshrub ranging from 0.1 to 0.8 m in height (Goodrich and Neese 1986). Stems of the current year are thornless and ascending to erect, branching from a persistent, woody base. Leaves are alternate, gray-scurfy and entire to lobed. Overwintering leaf buds are prominent, axillary, and globose (Welsh and others 1987). There are three varieties (Welsh 2000). Diploid ($2x = 18$) *G. brandegei* (Gray) Welsh & Stutz var. *brandegei* is small with narrow, linear leaves. Tetraploid ($4x = 36$) *G. b.* (Gray) Welsh & Stutz var. *plummeri* (Stutz & Sanderson) Dorn (Plummer's siltbush) is larger with ovate to lanceolate leaves. Utricles of both varieties are obcompressed and vertical with two-winged samara-like bracts (see illustration). Utricles of the third variety, *G. b.* (Gray) Welsh & Stutz var. *arizonica* (Standley) Welsh (Arizona siltbush), are dorsiventrally compressed and

mostly horizontal with six-keeled bracts. Flowers of all three varieties develop in small clusters in bract axils. Staminate flowers consist of four or five stamens and a four- or five-lobed perianth. Pistillate flowers contain a single pistil enveloped by two united bracts. Embryos are well developed.

Range.—Siltbush is a narrowly distributed edaphic endemic, largely restricted to the Colorado River drainage. *G. b.* var. *brandegei* occurs primarily in south-central Utah and northeastern Arizona. *G. b.* var. *plummeri* grows in isolated populations in northeastern Utah, south-central Wyoming, western Colorado, and northwestern New Mexico. *G. b.* var. *arizonica* occurs in scattered populations from northern Arizona to northeastern Utah (Goodrich and Neese 1986, Shaw and others 2001, Welsh and others 1987).

Ecology.—Siltbush grows in isolated monotypic populations on shale outcrops in desert shrub and lower juniper communities at elevations of 1,280 to 2,240 m (Goodrich and Neese 1986). Soils on these outcrops are poorly developed, fine textured, and characterized by moderate levels of soluble salts, and high levels of exchangeable sodium and potassium. Micronutrient levels are generally high. Siltbush tissues accumulate sodium and magnesium, but potassium levels and the calcium and magnesium ratio are low (Pendleton and others 1996).

Reproduction.—All siltbush varieties are monoecious and heterodichogamous (Pendleton and others 1988) with individual plants either protogynous (producing pistillate, then staminate flowers) or protandrous (producing staminate, then pistillate flowers). Flowering occurs in late spring or summer and fruits ripen in mid to late summer or fall (Pendleton and others 1988). Protogynous plants generally produce more seed, but protandrous plants may be equally productive in years when precipitation is high and seed predation is low

(Pendleton and others 2000). Wind and gravity disperse the fruits over time; some fruits generally remain on the plant until late winter. There are about 625,000 seeds/kg (Pendleton and others 2000). Germination experiments conducted with seeds of *Z. b. var. brandegei* and *Z. b. var. plummeri* showed that seeds of warm winter populations germinated over a wide range of constant temperatures (15 to 30 °C) (Meyer and Pendleton 1990). Seeds of cold-winter populations were dormant at fall and winter temperatures and required exposure to overwinter chilling to promote germination. Germination generally increased with duration of wet prechilling at 1 °C for up to 8 weeks, dry afterripening for up to 14 months, or bract removal (Meyer and Pendleton 1990). Germination is epigeal.

Growth and Management.—Few data are available. Siltbush is a stress-tolerant species capable of establishing on steep, eroded sites where the combination of salinity, aridity, and fine soils preclude establishment of other species (Pendleton and others 1996). Seedling growth rate and palatability of mature plants are moderate (personal communication with Steve Monsen, USDA-FS-RMRS, Provo, UT, and Howard Stutz, Brigham Young University, Provo, UT). Plants may attract rodents, other small animals, and deer.

Benefits.—Siltbush is a potential revegetation and soil stabilization species for disturbances resulting from mining and other human activities on sites where it is native. Few other species will grow on these outcrops (Pendleton and others 1996).

References

Goodrich, S. and E. Neese. 1986. Uinta Basin flora. U.S. Department of Agriculture, Forest Service, Intermountain Region, Ashley National Forest and USDI Bureau of Land Management, Vernal District, Ogden, UT. 320 p.

Meyer, S.E. and R.L. Pendleton. 1990. Seed germination biology of spineless hopsage: Between population differences in dormancy and response to temperature. In: Proceedings, Symposium on cheatgrass invasion, shrub die-off, and other aspects of shrub biology and management. U.S. Department of Agriculture, Forest Service, General Technical Report

INT-276. Intermountain Research Station, Ogden, UT. p. 187-292.

Pendleton, R.L., D.C. Freeman, E.D. McArthur and S.C. Sanderson. 2000. Gender specialization in heterodichogamous *Grayia brandegei*. American Journal of Botany. 87:508-516.

Pendleton, R.L., E.D. McArthur, D.C. Freeman, and A.C. Blauer. 1988. Heterodichogamy in *Grayia brandegei* (Chenopodiaceae): Report from a new family. American Journal of Botany. 75: 267-274.

Pendleton, R.L., S.D. Nelson, and R.L. Rodriguez. 1996. Do soil factors determine the distribution of spineless hopsage (*Grayia brandegei*)? In: Proceedings, Symposium on shrubland ecosystem dynamics in a changing climate. General Technical Report INT-GTR-338. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Ogden, UT. p. 205-209.

Shaw, N.L., R.L. Pendleton, and E.G. Hurd. 2001. *Zuckia brandegei* (Gray) Welsh & Stutz ex Welsh. In: F.T. Bonner and R.G. Nisley, eds. Woody Plant Seed Manual. U.S. Department of Agriculture, Forest Service, Washington, D.C. <http://wpsm.net/index.html>. 8 p.

Welsh, S.L. 2000. *Zuckia*. Flora of North America. <http://hua.huh.harvard.edu/FNA/zuckia.ed2.html> 3 p.

Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins, eds. 1987. A Utah flora. Great Basin Naturalist Memoirs 9. Brigham Young University, Provo, UT. 894 p.

Nancy L. Shaw, Botanist, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Boise, ID 83702, Rosemary L. Pendleton, Research Ecologist, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Albuquerque, NM 87102, and Emerenciana G. Hurd, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Boise, ID 83702