

The Status of *Buddleja sessiliflora* (Scrophulariaceae) in Arizona

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Abstract--Butterfly bush (*Buddleja sessiliflora*) reaches its northern range in southeast Arizona and herbarium records document seven historic localities from Pima and Santa Cruz counties. We visited all populations between 2014 and 2018, except for one reported from the Tohono O'odham Nation to discover that five historic localities were verified to be extant, and an additional locality was discovered in 2018. A total of 22 plants were documented during this study. All surveyed populations are isolated to 6–15 m areas and contained between one and seven plants. No propagules were found, except for a small 30 cm tall plant at the southernmost locality. It is unclear if any of these plants are still capable of reproducing *in situ* either sexually or vegetatively. Currently *B. sessiliflora* has no recognized state conservation status and is listed as unranked. Impacts to this riparian species with southern affinities may include climate change, diminishing water resources, invasive plant species and possible genetic bottlenecking due to isolation. *Buddleja sessiliflora* may be one of the rarest plants in southern Arizona.

INTRODUCTION

Originally described in 1818, *Buddleja sessiliflora* Kunth occurs from tropical southern Mexico north to southeast Arizona (Shreve and Wiggins 1964). It is found in Mexico in Oaxaca, Coahuila, San Luis Potosí, Sinaloa, Sonora, and Baja California Norte, and in southern Texas and southeast Arizona in the United States. In Sonora, plants are widespread, but somewhat uncommon. The holotype for *B. pringlei* A. Gray was collected from “fields near Tucson, Pima County, Arizona” (Pringle 16, 17 May 1883 GH) and was later synonymized with *B. sessiliflora*.

The common name for this genus is ‘butterfly bush’ due to its role as a strong pollinator attractant. The fragrant flowers emit a robust and pungent aroma which often elicits novel descriptions such as “acridly sweet like carrion or stale urine” (Felger et al 2001, p. 90), or a mixture of vinegar and chocolate. While this type of scent typically attracts flies, a wide assortment of other pollinators also visits the plant including bees, butterflies and ants.

Plants are shrubs but become arborescent at upper elevations in tropical deciduous forest in Sonora, growing to 5 m in height (Felger et al. 2001). Plants require riparian conditions and are always found in moist conditions near springs and along streambeds (Mild 2009) or in areas where water collects to provide subsurface moisture. Mexican populations occur at elevations between 30–1,158 m and Arizona localities were reported to grow up to 914 m (Felger et al 2001; Kearney & Peebles 1960). Hairy, four-petaled, yellowish-green blooms form in the spring between February and May (sometimes into June). Well-watered specimens form massive trunks and branches, creating a somewhat muscular appearance. The specific epithet refers to the characteristic sessile flower heads; a simple and diagnostic feature that separates it from other regional *Buddleja* species.

This species is not ranked as rare or sensitive by any state organizations. The NatureServe Conservation Status Rank for Arizona is unranked, while Texas populations are listed as ‘imperiled’ (S2). A NatureServe Conservation Status of S1 is designated for ‘critically endangered’ (very rare) species with 5 or less localities, or less than 1,000 individuals. S2 listed species occur at less than 20 localities or comprise less than 3,000 individuals. NatureServe state conservation designations are useful management agencies to assist in determining species of concern and conservation priorities.

METHODS

All historic collection localities were visited, except for the Quinlan Mountains site on the Tohono O’odham Nation. Fieldwork took place in 2014, 2016, 2017 and 2018. The presence of *B. sessiliflora* at each site was verified and adjacent areas were searched for additional plants. Additional effort was spent searching nearby Fresno and Coal Mine canyons at the Sonoita Creek site, as these areas appear to support *Buddleja* habitat. Only limited portions of the Santa Cruz River Valley in the Tucson Basin were explored due to highly degraded habitat conditions.

RESULTS

A total of 22 individual plants were found across six sites. All populations were restricted to approximate 6–15 m diameter areas. A single young plant was found at the southernmost locality a few miles from the international border. No plants were found in any downstream adjacent riparian areas although they seemed to provide ideal habitat for propagules. All plants were found between elevations of 858–1,330 m. The herbarium records listed below are all vouchered at the University of Arizona Herbarium (ARIZ), Arizona State University Herbarium (ASU), and University of Sonora Herbarium (USON).

Santa Cruz River Valley, Tucson, Pima County; extirpated; 732 m; river was completely dry by the late 1940s (Glennon 2002). (ARIZ: *Thornber 7571, 23 Mar 1916*)

Gibbon Springs, Santa Catalina Mtns foothills, Pima County; one plant; 858 m site is currently owned by a golf course, the springs are being pumped to support an artificial lake by the clubhouse; springs only support minimal surface flow (ARIZ: *Thornber 5409, 15 Jun 1913 “escaping from cultivated areas”; Thornber 8097, 15 Apr 1915; Herndon s.n., 23 Apr 1916; Fonseca s.n., 21 Jun 2013*)

Mendoza Canyon, Coyote Mtns, Pima County; two plants; 1030 m; spring site has been invaded by a near monoculture of carrizo (*Arundo donax*) (ARIZ: *Parker 5799, 22 Apr 1945; Goodding 456-59, 2 Apr 1959; Bohrer 838, 4 Apr 1965; Halse s.n., 28 Apr 1973 (“common”). ASU: Butterwick 7776, 24 Jun 1981 (“uncommon”).*

Sonoita Creek, Santa Cruz County; six plants; 1103 m; located in minor slot canyon with weak spring; growing in shady understory; (ARIZ: *McLaughlin 6842, 20 Apr 1993*)

Rock Corral Canyon, Tumacacori Mtns, Santa Cruz County; seven plants; 1142 m; located at perennial spring site among boulders; all plants clustered within ~9 m area; (ARIZ: *Toolin 2184, 6 Jun 1986; Verrier 468, 4 July 2016*)

Grubstake Mine, Pajarito Mtns, Santa Cruz County; four plants; 1186 m; spring has been enclosed in concrete box and adjacent riparian trees have failed; groundwater being pumped at site for upslope livestock tanks; In 2005 P. Jenkins described a plant at this site as over 2.4 m (*pers. comm.* P. Jenkins, 2005); in 2016 largest plant is currently less than 1 m; (ARIZ: *Scholz 351, 9 Jun 2005; Verrier 467, 30 May 2016*)

Cumero Mountain, San Luis Mtns, Pima County; two plants; 1330 m; population discovered by A. Flesch and S. Jacobs in 2018; the smaller plant is the only seedling or vegetative propagule located in this study; (ARIZ: *Verrier 1308, 11 Mar 2018*)

Quinlan Mountains, Pima County, Tohono O’odham Nation; site not visited due to lack of access; (USON: *Nichols s.n., 21 Feb 1940*).

DISCUSSION

This highly riparian species is restricted to a small group of isolated locations in Arizona. None of the six known populations exceed a single 5–16 m area, suggesting that these plants may no longer be capable of producing viable seeds (Baskin and Baskin 2014). It is also surprising that plant material distributed downstream during seasonal flooding events does not produce additional clonal plants, as cuttings of this taxon effortlessly root in horticultural settings. The single 30 cm seedling or vegetative clone found in the San Luis Mountains site represented the only possible reproductively successful plant, suggesting that more plants or populations may occur in the vicinity of this site.

Populations are clustered near the international border, with distances between individual colonies of 18–32 km. This contrasts with the northern two sites that are separated from the others by 56–90 km. Population connectivity is essential to preserve genetic variation, particularly in small populations. Reduced allelic diversity from isolation can induce a genetic bottleneck (Broquet et al. 2010) and may explain the lack of sexual propagation. Butterfly bush has large, soft foliage that are susceptible to desiccation, and the hotter and drier conditions at the northern edge of its range may negatively impact these plants. The two northernmost sites are also at the lowest elevations of all sites surveyed.

Diminishing water resources may be another significant influence in the decline of *B. sessiliflora* in Arizona. All sites have experienced anthropogenic groundwater pumping or diversion, in addition to the lack of water recharge as a consequence of long-term drought and increasing temperatures.

Additional surveys in Sonoita Creek, and in the San Luis and Pajarito mountains are likely to identify a handful of additional localities, but the total number of statewide plants may not exceed 50 individuals. This species is extremely habitat specific and may be one of the rarest species in Arizona. Butterfly bush appears to be retracting to the south and current Arizona populations represent historic climatic conditions from the past.

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