

5-YEAR REVIEW
Calistoga Allocarya (*Plagiobothrys strictus*)
Napa Bluegrass (*Poa napensis*)

GENERAL INFORMATION:

Species: Calistoga allocarya (*Plagiobothrys strictus*)

Date listed: October 22, 1997

Federal Register (FR) citation: 62 FR 55791 (Service 1997)

Classification: Endangered

Species: Napa bluegrass (*Poa napensis*)

Date listed: October 22, 1997

Federal Register (FR) citation: 62 FR 55791 (Service 1997)

Classification: Endangered

State Listing:

Calistoga allocarya was listed by the State of California as threatened in 1990 and Napa bluegrass was listed by the State of California as endangered in 1979.

BACKGROUND:

Species overview:

Calistoga allocarya and Napa bluegrass co-occur in alkaline sites near thermal springs at two extant locations on private land within a radius of 6 kilometers (4 miles) of the city of Calistoga in Napa County, California.

Calistoga allocarya is an annual herb in the borage family (Boraginaceae). The species inhabits pools and swales adjacent to and fed by hot springs and small geysers in grasslands between 90 and 160 meters (300 to 500 feet) in elevation. The extant populations occur on clay soils characterized by high concentrations of boron, arsenic, and sulfate (California Department of Fish and Wildlife [Department] 2005, p. 287). An individual plant can grow from 10 to 40 centimeters (4 to 16 inches) tall from a single stem at the base. Small, usually paired, white flowers appear in March to April in a slender, unbranched inflorescence. The fruit is an egg-shaped nutlet about 0.15 centimeter (0.06 inch) long, keeled on the back and covered with smooth, wart-like projections (Department 2005, p. 287).

Napa bluegrass is an erect, tufted perennial bunchgrass in the grass family (Poaceae). The species inhabits grasslands and moist, alkaline meadows fed by hot springs between 100 and 120 meters (340 to 400 feet) in elevation (Department 2005, p. 290). Individuals grow from 30 to 100 centimeters (12 to 39.4 inches) tall. Longer basal leaves grow to about 20.3 centimeters (8 inches) long, upper leaves to about 15.2 centimeters (6 inches). A few erect flowering stems appear in May and can grow to 69 centimeters (27 inches) tall (Department 2005, p. 290). Pale green to purple flowers bloom in condensed, round-shaped clusters at the end of the few flowering stems (Department 2005, p. 290).

Most recent status review:

[Service] U.S. Fish and Wildlife Service. 2010. *Plagiobothrys strictus* (Calistoga allocarya) and *Poa napensis* (Napa bluegrass). 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California. 22 pp.

We did not recommend a status change in the 2010 status review.

FR notice citation announcing this status review:

[Service] U.S. Fish and Wildlife Service. 2022. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 40 Species in California, Nevada, and Oregon. Federal Register 87:5832–5834.

We did not receive information from the public regarding *Calistoga allocarya* or Napa bluegrass in response to the notice.

ASSESSMENT:

Information acquired since the last status review:

This 5-year review was conducted by the U.S. Fish and Wildlife Service’s (Service) Sacramento Field Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on February 2, 2022. We also contacted species experts, referenced survey reports for *Calistoga allocarya*, performed a literature search, reviewed information from our own files, and obtained data from the California Native Plant Society’s Rare Plant Inventory and an occurrence search of the California Natural Diversity Database (Diversity Database) maintained by the California Department of Fish and Wildlife.

Since our last status review there have been annual surveys for *Calistoga allocarya* at one site (see **Abundance**), two recorded observations of Napa bluegrass (see **Distribution**), updates on threats (see **Threats**), and seed banking has been carried out for Napa bluegrass (see **Conservation**).

Distribution:

Historically, there were only three known populations of both the *Calistoga allocarya* and the Napa bluegrass. The three populations of *Calistoga allocarya* were documented within a 3-kilometer (2-mile) radius of the city of Calistoga in Napa County, California; however, prior to listing one of the populations was extirpated due to urbanization and agricultural land conversion (Service 1997, pp. 55792, 55799). At the time of listing and our 2010 status review, there were two extant occurrences of *Calistoga allocarya*: one within a property that contains Myrtle Dale Hot Springs (hereafter referred to as the hot spring property) and the other on a property where the former Calistoga glider airport is located (hereafter referred to as the airport property) (Service 1997, p. 55792; Service 2010, p. 4). The combined area of the two remaining populations is less than 80 square meters (900 square feet) (CNPS 1990 as cited in Service 1997, p. 55792). The three historical occurrences of Napa bluegrass were also entirely within Napa County: two were on the hot spring property and the third was on the airport property (Service 2010, p. 4). Prior to listing, one of the Napa bluegrass populations on the hot spring property was extirpated (Department 1989, p. 2), and at the time of listing, two populations of Napa bluegrass, one at the hot spring property and one at the airport property, remained (Service 1997, p. 55799).

The total area occupied by Napa bluegrass was estimated to be slightly greater than 100 square meters (1,100 square feet) (Service 1997, p. 55805).

The current distribution of both species is the same as we described in the final listing rule and the 2010 status review (Service 1997, pp. 55792, 55799; Service 2010, pp. 4–5). The population of *Calistoga allocarya* that occurs at the edge of the airport property is composed of two adjacent clusters of individual plants. The number of individuals within each of the two mapped clusters varies from year to year, and no individuals have been observed outside of these two areas (Wyrick-Brownworth *et al.* 2021, p. 5). The *Calistoga allocarya* population on the hot spring property is composed of one much smaller cluster of individual plants. The presence of *Calistoga allocarya* at the airport property was last confirmed in 2009 (Service 2010, p. 9). The Napa bluegrass populations at the hot spring property and the airport property were last observed in 2011 and 2021, respectively (Diversity Database 2023; Greenberger *in litt.* 2022, p. 1; Yarger *in litt.* 2022, pp. 1–2).

Abundance:

Calistoga allocarya

In 1994, near the time of listing, the population of *Calistoga allocarya* at the airport property had approximately 5,000 plants within 180 square meters (2,000 square feet) (J. Ruygt 1996 as cited in Service 2010, p. 5). Surveys carried out prior to the last status review in 2009 estimated the airport property population size at between 3,310 and 5,000 individual plants (Service 2010, p. 6).

Since the 2010 status review, the population of *Calistoga allocarya* at the airport property has been surveyed annually from 2013–2022, except for 2020 due to Covid restrictions (Wyrick-Brownworth *et al.* 2021, p. 3) (see specific counts in **Table 1**, below). The number of plants counted during these annual surveys is heavily influenced by the survey methods. Surveys consisting of weekly walk-throughs of the property from early spring to early summer (January – May) are preferable as identification of individuals is difficult later in the summer when the plants have already senesced and lost their flowerheads. In 2019, the total population for *Calistoga allocarya* equated to 297,963 plants within the airport property (Wyrick-Brownworth *et al.* 2021, p. 6).

Table 1. Estimated *Calistoga allocarya* population size from 2013–2020. Values are much lower in 2018 due to incomplete surveys. No data is available for 2020 as surveys were not conducted due to Covid restrictions (Wyrick-Brownworth *et al.* 2021, p. 6).

Year	Population Size
2013	5,706
2014	20,000
2015	345,560
2016	318,130
2017	74,797
2018	8,052
2019	297,963
2020	No Data

The annual surveys show a greater number of plants in years with more rainfall. The species appears to be most successful with multiple years of significant rainfall. Additionally, the largest plants were found in areas with saturated soil, such as close to an underground pipe leak (Wyrick-Brownworth *et al.* 2021, p. 10). Saturated soils may benefit *Calistoga allocarya* by extending the amount of time a plant can produce seeds, which may add to the seed bank each year.

At the time of listing, the *Calistoga allocarya* population at the hot spring property had not been surveyed and the population size was unknown. At the time of the 2010 status review, we noted that *Calistoga allocarya* was scattered over 4 hectares (10 acres) on the hot spring property and the number of individuals in the population had fluctuated between 100 and 10,000 plants (Service 2010, p. 6). During one unofficial observation in 2009, it was estimated that several hundred plants were present on this property (Service 2010, p. 9). Access to the *Calistoga allocarya* population on the hot spring property has been unavailable in recent years, so the current size of this population is unknown.

Napa bluegrass

Historically, Napa bluegrass likely had larger populations before hot spring resources were developed in the *Calistoga* region (Department 1989, p. 2). The Napa bluegrass population at the airport property was thought to be extirpated due to construction activities that took place in 1981. However, prior to listing hundreds of Napa bluegrass plants were counted at the airport property from 1987 to 1996 (Service 1997, p. 55799). Prior to the 2010 status review, in 2008, approximately 520 Napa bluegrass plants at 26 locations on the airport property were identified and in 2009 a survey during the blooming period found 244 plants at 31 locations on the airport property (WRA 2009, p. 1; Service 2010, p. 6). There have been no surveys of the Napa bluegrass on the airport property since the 2010 status review.

In the early 1980s prior to listing, the Napa bluegrass population at the hot spring property was comprised of several thousand plants (Service 1997, p. 55799). Access to the hot spring property has been denied since the years preceding listing (Service 1997, p. 55799; Service 2010, p. 6), so surveys have not been carried out at the property.

Threats:

Historically, urbanization, agricultural land conversion, development of recreational hot springs, and construction activities at the airport property have reduced habitat for *Calistoga allocarya* and Napa bluegrass (Service 1997, p. 55799). At the time of listing, the primary threats to *Calistoga allocarya* and Napa bluegrass were identified as recreational activities, airport maintenance, urbanization, inadequate regulatory mechanisms, stochastic events, competition from invasive plant species, and alteration of hot spring hydrology (Service 1997, pp. 55791–55792, 55803). Grass mowing, vehicle traffic, and parking were also identified as threats to both species at the airport property (Service 1997, p. 55802).

In the 2010 status review, altered hot spring hydrology, urbanization (including possible future development), trampling, restricted habitat and range, extirpation from random events, possible loss of fitness due to inbreeding in small populations, invasive plant species, and climate change were identified as threats to both species (Service 2010, pp. 7–9, 13–15). The airport property was unused and vacant by 2010, and mowing, parking, and grading had ceased at the property.

However, potential land conversion was identified to be a greater threat in the 2010 status review as the airport property landowner intended to develop the property (Service 2010, pp. 8–9) and construction of a new hospital on the hot spring property had been proposed (Service 2010, p. 8). Most of the threats identified in the 1997 listing rule and the 2010 status review continue to affect both species.

Since the 2010 status review, additional information relevant to the threats of climate change and land development has become available. Current climate predictions for Northern California project declines in snowpack, and increases in temperature, extreme precipitation events, and the frequency of drought and wildfire (Bedsworth *et al.* 2018, p. 22). Climate change models estimate an increase in annual average temperature of up to 2.7 degrees Fahrenheit by 2039 and up to 5.8 degrees Fahrenheit by 2069 (Bedsworth *et al.* 2018, p. 23; Pierce *et al.* 2018, pp. 17–19). Since both species depend on moist habitat created by thermal springs, a decline in spring waters or complete drying of the springs could lead to population decline or extirpation (Service 2010, p. 8; Wyrick-Brownworth *et al.* 2021, p. 10). The effects of climate change may also favor invasive grasses by increasing the length of growing seasons, decreasing cold mortality events, changing precipitation cycles, and increasing the threat of wildfires (Abatzoglou and Kolden 2011, p. 475). The effects of climate change, in combination with other population-level stressors, pose a significant risk to *Calistoga allocarya* and Napa bluegrass population viability.

Since the 2010 status review, large scale land development has not occurred at the airport property (Calistoga Planning Commission *in litt.* 2022, p. 1) or the hot spring property (Napa Valley Planning Commission *in litt.* 2022, pp. 1–4).

Conservation

As mentioned in the 2010 status review, the Department was funded through section 6 of the Endangered Species Act to conduct a seed banking project for rare plant species of critical conservation concern, including Napa bluegrass (Service 2010, p. 7). Following the last status review, the Department started seed collection and banking efforts for Napa bluegrass in 2010 and 2011 (Burton and Won-Nakata 2011, pp. 40–47). The goal of this project was to collect and store seeds in long-term conservation storage at the Rancho Santa Ana Botanic Garden (Burton and Won-Nakata 2011, p. 1). In 2010 seed collection from four Napa bluegrass plants along Myrtle Dale Road yielded 16 seeds and in 2011 seed collection from 14 plants yielded 6,630 seeds (Burton and Won-Nakata 2011, pp. 40–41). The number of individual plants sampled falls short of the best practices for seed banking; however, the genetic diversity of the collected seeds may be high enough to be sufficient (Burton and Won-Nakata 2011, p. 41).

Recovery criteria:

There is currently no recovery plan for *Calistoga allocarya* or Napa bluegrass.

Conclusion:

After reviewing the best available scientific information, we conclude that *Calistoga allocarya* and Napa bluegrass remain endangered species. The evaluation of threats affecting these species under the factors in section 4(a)(1) of the Endangered Species Act and analysis of the status of these species in our 2010 status review (Service 2010) remain an accurate reflection of the current status of these species.

RECOMMENDATIONS FOR FUTURE ACTIONS:

Here we propose several habitat conservation and ecological research recommendations which will aid in the recovery and conservation of Calistoga allocarya and Napa bluegrass. Some of these recommendations were discussed in the last status review (Service 2010, p. 16) and remain valid.

1. Partner with private landowners, the California Department of Fish and Wildlife, the City of Calistoga, and the California Native Plant Society to ensure protection of all known populations of Calistoga allocarya and Napa bluegrass.
2. Work with the California Department of Fish and Wildlife, the City of Calistoga, and the California Native Plant Society to ameliorate or eliminate any threats to Calistoga allocarya and Napa bluegrass from hydrological changes and competition from invasive plants.
3. Collect seeds from both populations of both species and store them in Center for Plant Conservation certified botanic gardens to guard against extirpation from chance catastrophic events.
4. Follow policy CON-17 and associated conservation measures as stated in the Napa County General Plan to “Preserve and protect native grasslands, serpentine grasslands, mixed serpentine chaparral, and other sensitive biotic communities and habitats of limited distribution” (Napa County Department of Conservation, Development, and Planning 2009, p. CON-28).
5. Follow policies P1.1-3 and P1.1-4 and associated actions as stated in the Open Space and Conservation Element (Updated 2012) of the City of Calistoga General Plan to continue “efforts to identify and map biological resources on the gliderport property [airport property], which provides an important and unique habitat area within the city limits” and “explore the possibility of designating parcels as Natural Resource Preservation Areas in areas of the city known to contain sensitive and unique species, in order to protect these resources” (City of Calistoga 2012, p. OSC-23).
6. Conduct a population assessment for each species and continue monitoring annually.

Field Supervisor, Sacramento Fish and Wildlife Office

Approve _____ **Date** _____

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