

5-YEAR REVIEW
Hartweg's Golden Sunburst (*Pseudobahia bahiifolia*)
San Joaquin Adobe Sunburst (*Pseudobahia peirsonii*)

GENERAL INFORMATION:

Species: Hartweg's golden sunburst (*Pseudobahia bahiifolia*)

Date listed: February 6, 1997

Federal Register (FR) citation: 62 FR 5542 (Service 1997)

Classification: Endangered

Species: San Joaquin adobe sunburst (*Pseudobahia peirsonii*)

Date listed: February 6, 1997

Federal Register (FR) citation: 62 FR 5542 (Service 1997)

Classification: Threatened

State Listing: Hartweg's golden sunburst was listed by the State of California as endangered in 1982 and San Joaquin adobe sunburst was listed by the State of California as endangered in 1987.

BACKGROUND:

Species overview:

Hartweg's golden sunburst and San Joaquin adobe sunburst are members of the sunflower family (Asteraceae). The sunburst genus (*Pseudobahia*) contains three species, and all three species are small annual plants that are covered with woolly hairs and have alternate leaves. They have yellow, daisy-like flower heads that are borne singly at the tip of each branch. Each flower head is approximately 1 inch across. Both species are annuals with narrow distributions in the Central Valley of California (Stebbins 1991, pp. 5, 7, 9, 16, 18) and foothills of the northern Sierra Nevada. The two species have different soil and microhabitat requirements and do not overlap in their current distributions (Vollmar Consulting 2010, pp. 14, 24).

The known occurrences of Hartweg's golden sunburst are concentrated in the eastern San Joaquin Valley in Stanislaus, Madera, Merced, and Fresno Counties. Extant occurrences are found at elevations ranging from 90–140 meters (295–460 feet). Hartweg's golden sunburst occurs almost entirely in non-native grasslands within specific soil types largely derived from the Valley Springs formation. The majority of the occurrences (regions of distribution) are strongly associated with sloping mima mound topography, on slopes with thin soils. Mima mounds are small hillocks a few feet in height that have formed in dense concentrations. Within a mima mound landscape, the plants are nearly always found on the north or northeast-facing slopes of the mounds, with highest plant densities on the upper slopes where grass cover is minimal, Hartweg's golden sunburst is associated with a similar microhabitat in areas without mima mound topography. In all cases, the species is found on thin soils (Vollmar Consulting 2010, pp. 10–19).

San Joaquin adobe sunburst is very similar in outward appearance to Hartweg's golden sunburst with yellow, daisy-like flower heads and alternate leaves. However, San Joaquin adobe sunburst

is much larger in stature (4 to 18 inches tall) and has larger flower heads than Hartweg's golden sunburst. In addition to size, these two congeners (species within the same genus) can be differentiated by the leaf appearance and phyllaries (bracts underneath the flower head). San Joaquin adobe sunburst has bipinnately (twice divided into smaller divisions) lobed leaves and phyllaries that are joined only at their bases, and Hartweg's golden sunburst has entire or three-lobed leaves and phyllaries joined for approximately half their length. The known occurrences of San Joaquin adobe sunbursts are found over a range of approximately 218 kilometers (135 miles) through Fresno, Tulare, and Kern Counties. Extant occurrences range from 122 to 610 meters (400 to 2,000 feet), with one occurrence recorded at 792 meters (2,600 feet) (Vollmar Consulting 2010, pp. 22–28). The species occurs only on heavy adobe clay soils where the water retention properties are high. San Joaquin adobe sunbursts can grow in fairly dense grass cover, but is most commonly recorded in sparsely vegetated landscapes with a mixture of grasses and forbs (Stebbins 1989, p. 21).

Most recent status review:

[Service] U.S. Fish and Wildlife Service. 2007. *Pseudobahia bahiifolia* (Hartweg's golden sunburst) *Pseudobahia peirsonii* (San Joaquin adobe sunburst). 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California. 27 pp.

We recommended no status change to Hartweg's golden sunburst and San Joaquin adobe sunburst in the 2007 status review.

FR notice citation announcing this status review:

[Service] U.S. Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 76 Species in California and Nevada. Federal Register 86:27462–27464.

We did not receive information from the public regarding Hartweg's golden sunburst and San Joaquin adobe sunburst 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 May 20, 2021. We also contacted species experts, performed a literature search, reviewed information from our own files, including a review of Hartweg's golden sunburst and San Joaquin adobe sunburst 10(a)(1)(A) recovery permit annual reports, and obtained data from an occurrence search of the California Natural Diversity Database (Diversity Database) maintained by the California Department of Fish and Wildlife.

Since our last 5-year review, an extensive species status survey report that identified five new occurrences for Hartweg's golden sunburst and ten new occurrences of San Joaquin adobe sunburst was completed (addressed in **Distribution and Abundance**). It concluded that no known occurrences have been extirpated since the time of federal listing. However, the species are coming under increasing threat from encroaching development, conversion of land to

intensive agriculture and lack of cattle grazing leading to an excessive build-up of grass thatch, and climate change (addressed in **Threats**). These threats will undoubtedly continue to increase over the coming years and decades as development and intensive agriculture move towards the eastern edge of the San Joaquin Valley (Vollmar Consulting 2020, p. 30).

Also since the last 5-year review, a study was completed with the following objectives: 1) To identify specific microhabitat requirements and seed dispersal methods allowing for successful relocation of a very small (401 square feet (sq. ft.)) subpopulation of Hartweg's golden sunburst (0.6% of the total population on the site) that will be eliminated due to residential development of the Friant Ranch Project Site in Fresno County, California; 2) to establish a viable population of Hartweg's golden sunburst from seed collected from onsite plants and dispersed in undeveloped areas of the site where this species does not presently occur, so that the project related loss of 401 sq. ft. of Hartweg's golden sunburst will be offset with 1,203 sq. ft. of Hartweg's golden sunburst; and 3) test the hypothesis that excluding grazing from established populations of Hartweg's golden sunburst is beneficial to the population (Live Oak Associates, Inc. 2010, p. 4). The establishment of a small population of Hartweg's golden sunburst was ultimately successful, likely due to understanding the species' basic habitat requirements and taking into consideration the soil chemistry, soil mechanics, and slope for the selection of introduction sites. Soil data was obtained through a soil analysis, identifying appropriate soil types from the Natural Resources Conservation Service, and ascertaining the soil structure and soil moisture capacity. The study found that Hartweg's golden sunburst seeds were still viable in the soil and germinated after three consecutive years (Live Oak Associates, Inc. 2015, p. 28). The study also found a strong correlation between December rainfall and Hartweg's golden sunburst flowering. Lastly, after six years of research it was found that excluding grazing is not beneficial to the species. With the exclusion of cattle, competition from other herbaceous species reduced the abundance of Hartweg's golden sunburst (Live Oak Associates, Inc. 2015, pp. 28-31). Since the 2015 study, it is unknown how the introduced populations have acclimated or their current status.

Distribution and Abundance:

The distribution of Hartweg's golden sunburst remains unchanged since the last status review; however, the distribution of San Joaquin sunburst is now known to extend further south than initially described. The data for many occurrences is outdated and incomplete, with many sites having two or fewer surveys ever conducted (Diversity Database 2023). Most occurrences are located on private property, which makes site visits and surveys difficult due to needing landowner permission. In addition, individual plant numbers at known occurrences of both species can fluctuate widely from one year to another. This fluctuation is likely due to annual climatic conditions, specifically the amount of seasonal rainfall, and also on competition from non-native plants (Stebbins 1989, p. 15; Stebbins 1991, pp. 13, 23). Vollmar Consulting (2010, entire) performed surveys of many occurrences for both species in 2010 and obtained information from other consulting firms about surveys performed at occurrence locations. Areas of suitable habitat for both species were also surveyed in an attempt to discover unrecorded occurrences.

Hartweg's golden sunburst

The current species distribution and abundance of Hartweg's golden sunburst is similar to what we described in our final listing rule and 2007 status review (Service 1997, p. 5543; Service

2007, p. 2). The known occurrences of Hartweg’s golden sunburst are concentrated in the eastern San Joaquin Valley in Stanislaus, Madera, Merced, and Fresno Counties (Table 1; Service 2007, p. 6). At the time of the last 5-year review, the distribution of the majority of Hartweg’s golden sunburst occurred in two isolated clusters, including six extant occurrences near the community of Friant along both sides of the San Joaquin River in high pumice content soils (Fresno and Madera Counties) and six extant occurrences near Cooperstown in Stanislaus County (Service 2007, p. 6). The three occurrences (Diversity Database occurrence numbers 6, 7, and 17) near Cooperstown house the largest known populations of Hartweg’s golden sunburst and have measured at over 10,000 individual plants (Diversity Database 2023). Currently, there are six known Diversity Database occurrences of Hartweg’s golden sunburst that have had over 1,000 individuals estimated or counted during a survey (Vollmar Consulting 2010, pp. 64, 119). In addition, five Diversity Database occurrences of Hartweg’s golden sunburst were discovered since the 2007 status review. Two of the new occurrences (Diversity Database occurrences 37 and 38) contained over 1,000 individuals when they were discovered; (Vollmar Consulting 2010, pp. 1, 18; Diversity Database 2023). Abundance of Hartweg’s golden sunburst fluctuates greatly from year to year due to weather conditions such as rainfall. The surveys completed since the previous 5-year review do not alter our understanding of the species’ current distribution or abundance and population estimates or trends have not been determined.

Table 1: Hartweg’s golden sunburst Diversity Database occurrences. Occurrences in **bold** are new since the 2007 5-year review.

Occurrence Number	Presence	County
1	Possibly Extirpated	Madera
3	Presumed Extant	Stanislaus
5	Possibly Extirpated	Stanislaus
6	Presumed Extant	Stanislaus
7	Presumed Extant	Stanislaus
8	Presumed Extant	Stanislaus
10	Extirpated	Sutter, Yuba
11	Possibly Extirpated	Stanislaus
15	Presumed Extant	Stanislaus
17	Presumed Extant	Stanislaus
21	Presumed Extant	Fresno
23	Presumed Extant	Fresno
24	Presumed Extant	Fresno
25	Presumed Extant	Madera
27	Presumed Extant	Stanislaus
28	Presumed Extant	Stanislaus
29	Presumed Extant	Merced
30	Presumed Extant	Merced
31	Presumed Extant	Merced
32	Presumed Extant	Merced
33	Presumed Extant	Merced
34	Presumed Extant	Stanislaus, Tuolumne

Occurrence Number	Presence	County
37	Presumed Extant	Merced
38	Presumed Extant	Merced
39	Presumed Extant	Merced
40	Presumed Extant	Merced
41	Presumed Extant	Stanislaus

San Joaquin adobe sunburst

The current species distribution of San Joaquin adobe sunburst is similar to what we described in our final listing rule and 2007 status review, with occurrences found in Fresno, Tulare, and Kern counties (Table 2; Service 1997, p. 5543; Service 2007, p. 3). Since the 2007 status review, an additional ten new occurrences were added to the Diversity Database, although one is a historical occurrence that is possibly extirpated (Diversity Database occurrence 54; Diversity Database 2023). The known occurrences of San Joaquin adobe sunburst are in three major population concentrations east of Fresno in Fresno County, west of Lake Success in Tulare County, and northeast of Bakersfield in Kern County (Diversity Database 2023). Two new occurrences (52 and 51) expand the known range of San Joaquin adobe sunburst approximately 15 miles south (Diversity Database 2023). Typically, all occurrences report fewer than 5,000 plants and more often only a few hundred plants (Diversity Database 2023). However, occurrence 53, located at Tollhouse Ranch owned by The Nature Conservancy, observed approximately 3,000 plants in 2015 and then over 11,090 plants in 2016 (Diversity Database 2023). Abundance of San Joaquin adobe sunburst fluctuates greatly from year to year due to weather conditions such as rainfall. The surveys that have been completed since the previous 5-year review do not significantly alter our understanding of the species' current distribution or abundance and population estimates or trends have not been determined.

Table 2: San Joaquin adobe sunburst Diversity Database Occurrences. Occurrences in **bold** are new since the 2007 5-year review.

Occurrence Number	Presence	County
1	Presumed Extant	Kern
2	Presumed Extant	Kern
3	Extirpated	Kern
4	Presumed Extant	Kern
5	Extirpated	Tulare
6	Extirpated	Tulare
7	Extirpated	Tulare
8	Extirpated	Tulare
10	Presumed Extant	Tulare
11	Extirpated	Tulare
12	Presumed Extant	Tulare
13	Extirpated	Tulare
14	Presumed Extant	Fresno
15	Presumed Extant	Fresno
16	Presumed Extant	Fresno

Occurrence Number	Presence	County
17	Possibly Extirpated	Tulare
18	Presumed Extant	Kern
19	Presumed Extant	Tulare
21	Presumed Extant	Tulare
22	Presumed Extant	Kern
23	Presumed Extant	Tulare
24	Presumed Extant	Tulare
25	Presumed Extant	Kern
26	Presumed Extant	Tulare
28	Presumed Extant	Tulare
29	Presumed Extant	Kern
30	Presumed Extant	Fresno
31	Presumed Extant	Fresno
32	Presumed Extant	Tulare
33	Presumed Extant	Tulare
34	Presumed Extant	Tulare
35	Presumed Extant	Tulare
36	Presumed Extant	Fresno
37	Extirpated	Tulare
38	Presumed Extant	Tulare
39	Presumed Extant	Tulare
40	Presumed Extant	Tulare
41	Presumed Extant	Tulare
42	Presumed Extant	Tulare
43	Presumed Extant	Tulare
44	Presumed Extant	Tulare
45	Presumed Extant	Tulare
46	Presumed Extant	Tulare
47	Presumed Extant	Kern
48	Presumed Extant	Tulare
49	Presumed Extant	Tulare
50	Presumed Extant	Tulare
51	Presumed Extant	Kern
52	Presumed Extant	Kern
53	Presumed Extant	Kern
54	Possibly Extirpated	Tulare

Threats:

At the time of listing, the primary threats to the Hartweg’s golden sunburst and the San Joaquin adobe sunburst were conversion of habitat to residential development, and to a lesser extent, agricultural land conversion, competition from nonnative plants, incompatible grazing practices, transmission line maintenance, recreational activities, mining, road construction and

maintenance, a flood control project, and other human impacts (Service 1997, p. 5542). Threats to the species' identified at the time of the 2007 status review include residential development, agricultural conversion, and flooding (Service 2007, pp. 7–10). There is no evidence that the status of these threats has changed except for grazing, which is now seen as an important management tool to control thatch and invasive plant species. Native large grazers from the San Joaquin Valley, including pronghorn antelope (*Antilocapra americana*) and Tule elk (*Cervus canadensis nannodes*), have been replaced with domestic livestock and the livestock grazing appears to be important for preventing the build-up of heavy growth and thatch from the non-native grasses which tends to reduce or eliminate Hartweg's golden sunburst and San Joaquin adobe sunburst and other annual native wildflowers (Vollmar Consulting 2010, p. 19). Currently, the primary threats to Hartweg's golden sunburst and San Joaquin adobe sunburst throughout their range are habitat loss and fragmentation due to agricultural and urban development, competition with nonnative grasses, and climate change (Diversity Database 2023). Climate change is identified as a new threat to the species and described below.

California's Fourth Climate Change Assessment was published in 2018 (Thorne et al. 2018, entire) and has included subsequent regional reports on the different regions of California, including the San Joaquin Valley (Fernandez-Bou et al. 2021, entire). This region of California overlaps the core range of the Hartweg's golden sunburst and the San Joaquin adobe sunburst and is expected to experience significant impacts from climate change. Models of projected future precipitation in the San Joaquin Valley show an increasing duration of the dry season with 20% less precipitation expected to occur overall on average (Fernandez-Bou et al. 2021, p. 8). Because both Hartweg's golden sunburst and San Joaquin adobe sunburst are annual plants, with the projected decrease in precipitation seeds will be less likely to germinate. Increased duration of the dry season will also likely negatively impact species survival and possibly other demographic factors such as reproduction. With climate change, the Central Valley and the foothills of the Sierra Nevada, where Hartweg's golden sunburst and San Joaquin adobe sunburst are found, are extremely vulnerable to species loss (Loarie 2008, p. 2).

Recovery criteria:

There currently is not a published recovery plan for the Hartweg's golden sunburst and San Joaquin adobe sunburst.

Conclusion:

After reviewing the best available scientific information, we conclude that Hartweg's golden sunburst remains an endangered species and San Joaquin adobe sunburst remains a threatened species. Although there has been an increase in the number of occurrences reported in the Diversity Database, these new sightings do not expand the known range of Hartweg's golden sunburst, but do increase the range of San Joaquin adobe sunburst approximately 15 miles south. Overall, the species has small population sizes that fluctuate greatly due to precipitation levels with relatively few occurrences growing in very specific micro-environments. Furthermore, the current status of many of these occurrences is unknown as they are not regularly monitored, and threats such as development and climate change are increasing throughout the species' range. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Endangered Species Act and analysis of the status of the species in our 2007 5-year review (Service 2007, entire) remains an accurate reflection of the species current status.

RECOMMENDATIONS FOR FUTURE ACTIONS:

Here we propose several habitat conservation and ecological research recommendations which will aid in the recovery and conservation of the Hartweg's golden sunburst and San Joaquin adobe sunburst. Some of these recommendations have already been discussed in the previous 5-year review (Service 2007, pp. 17–18) and remain valid.

1. *Habitat Acquisition, Management, and Restoration.* Known occupied sites with Hartweg's golden sunburst and San Joaquin adobe sunburst present should be protected. Resource agencies and private partner groups should work to ensure land protection through acquisition or easement, and large unprotected areas currently occupied by the species should be given the highest priority. Large, formerly occupied sites that are unoccupied but have a high restoration potential and the sites with recent occurrences should also be considered. Protected lands must also be adequately managed or restored based on the best available science to enhance the growth of the species.
2. *Work with Landowners to Gain Access and Conduct Coordinated Surveys.* Gaining access to private lands where no surveying and monitoring has occurred will provide more information on the species. Coordinate surveys in these previously known occurrences and continue surveys in potentially suitable habitat based on soil type and habitat characteristics, similar to the work Vollmar Consulting conducted in 2010.
3. *Develop a Recovery Plan.* Hartweg's golden sunburst and San Joaquin adobe sunburst were initially included in a "Draft Recovery Plan for Fifteen Plants from the Southern Sierra Foothills, California". This plan was in development in 2007, however, the plan was never finalized. Much information contained in Stebbins' two studies (1989, 1991) is still valid and is directly applicable to a recovery plan. Additionally, the methods of establishing a new population of Hartweg's golden sunburst at Friant Ranch can be incorporated (Live Oak Associates 2015, entire).
4. *Maintain a Viable, Protected Seed Collection.* For both Hartweg's golden sunburst and San Joaquin adobe sunburst ensure sufficient seeds, approximately 5,000 per site (Cypher 2006, pp. 2–3), are taken from as many sites as possible to maintain genetic heterogeneity. Currently, there are 4,057 seeds of Hartweg's golden sunburst and 37,069 seeds of San Joaquin adobe sunburst stored (California Plant Rescue 2023, unpaginated).

Field Supervisor, Sacramento Fish and Wildlife Office

Approve _____ Date _____

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