

5-YEAR REVIEW
Palmate-bracted bird's-beak (*Cordylanthus palmatus* = *Chloropyron palmatum*)

GENERAL INFORMATION:

Species: Palmate-bracted bird's-beak (*Cordylanthus palmatus*)

Date listed: July 31, 1986

Federal Register (FR) citation(s): 51 FR 23765 (Service 1986)

Classification: Endangered

State Listing: Palmate-bracted bird's-beak was listed by the State of California as endangered in 1984.

BACKGROUND:

Species overview:

Palmate-bracted bird's-beak is an annual herb in the broomrape family (Orobanchaceae). The plants are 4–12 inches tall and highly branched. The stems and leaves are grayish green and sometimes are covered with salt crystals excreted by glandular hairs. Pale whitish flowers, up to 1-inch long, are arranged in dense spikes tightly surrounded by leaf-like bracts. The plants bloom from late spring through summer. Like other members of this family, palmate-bracted bird's-beak is partially parasitic, obtaining water and nutrients from the roots of other plants. The species grows on seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 500 feet in the Sacramento and San Joaquin Valleys. The most common visitors to its flowers are western bumble bee (*Bombus vosnesenskii*) and sweat bees (family Lasioglossum). Population fluctuations are common and may be a result of changes in pollination success, rainfall patterns, freshwater influence, and marsh pollution (Service 2009, p. 2).

Most recent status review:

[Service] U.S. Fish and Wildlife Service. 2009. Palmate-bracted bird's-beak (*Cordylanthus palmatus* = *Chloropyron palmatum*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Sacramento, California. 56 pp.

We did not recommend a status change in the 2009 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 the palmate-bracted bird's-beak 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 Fish and Wildlife 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 and land managers to request any data or information we should consider in our review, performed a literature search, and obtained data from an occurrence search of the California Natural Diversity Database (Diversity Database) maintained by the California Department of Fish and Wildlife. Additionally, we reviewed information from our own files, including a review of palmate-bracted bird's-beak 10(a)(1)(A) recovery permit annual reports and projects for which consultation under Section 7 of the Endangered Species Act has been initiated.

Monitoring reports received from land managers indicate the species is still present at previously identified sites (addressed in **Distribution** section below). Most of the sites are surveyed annually. Numbers have fluctuated greatly from year to year and do not follow a consistent trend, even for sites located near one another (see the **Abundance** section below). However, this is to be expected for an annual species occupying a very specific niche such as palmate-bracted bird's-beak (J. Isola, Service, *in litt.* 2022, p. 1). New information on genetics, seed collection, and threats to the species has been incorporated into the relevant sections below.

Distribution:

Historically, palmate-bracted bird's-beak was documented at nine sites between 1916 and 1982 (in Alameda, Colusa, Fresno, Madera, San Joaquin, and Yolo Counties), but only three were known to be extant at the time the species was listed in 1986: two natural populations (Springtown Alkali Sink and southeast of Woodland, which is now known as Alkali Grasslands Preserve) and one transplanted population (Mendota Wildlife Area) (Service 1986, p. 23767). As of our 2009 status review, the species was known to occur as a mosaic of small, isolated patches on approximately 1,500 acres of occupied habitat at eight sites ranging from the northern Sacramento Valley south to the San Joaquin Valley (Sacramento, Colusa, and Delevan National Wildlife Refuges (collectively referred to as the Refuges); Alkali Grasslands Preserve; Springtown Alkali Sink; Western Madera County; Alkali Sink Ecological Reserve; and Mendota Wildlife Area) (Service 2009, p. 20). The Sacramento Refuge population was introduced in 1990 (Service 1998, p. 35); additional sites were located through intensive survey efforts. There have been few changes in the distribution of palmate-bracted bird's-beak since our 2009 status review. The population in Western Madera County is likely extirpated based on recent vernal pool mapping showing that the four occurrences were disked and later converted to agriculture (Witham 2021, unpaginated geodatabase). In addition, no new information is available for the Mendota Wildlife Area population, which may have been extirpated by changing conditions prior to the 2009 status review (Service 2009, p. 15).

Abundance:

Palmate-bracted bird's-beak is an annual plant with population sizes that can vary greatly depending on rainfall, salinity, and available host plants. A small population size one year can be followed by a much larger one the following year when conditions are optimal. This makes population trends difficult to detect. Periodic surveys continue to be completed by the Service and species experts (Table 1, Appendix A lists a complete survey record for these populations).

Surveys completed at Delevan and Colusa Refuges, which contain the largest populations, indicate a slight upward trend in population sizes (M. D’Errico, Service, *in litt.* 2022, unpaginated attachment). Following implementation of a grazing program and other efforts to remove non-native annual grasses in 2011 and 2012, record numbers of palmate-bracted bird’s-beak were observed on Alkali Grasslands Preserve (Center for Natural Lands Management [CNLM] 2021, p. 11). Since our 2009 status review, surveys have been carried out at the Woodland Regional Park site, which was not specifically reported in our 2009 status review but has been known since 1996 and is a sub-population of the Alkali Grasslands Preserve to which it is adjacent (CNLM 2020, p. 1). The City of Woodland is working with the Yolo Habitat Conservancy to establish a conservation easement on the property (K. Hiatt, City of Woodland, *in litt.* 2022, p. 1).

Table 1. Survey results for the palmate-bracted bird's-beak at sites in the Sacramento and San Joaquin Valleys, California, 2017–2021. Site names are the same as those used in the 2009 status review, except for Woodland Regional Park, which is added in this review. N/A = no surveys conducted, UNK = Unknown.

Site	County	Net Occupied (Acres)	2017 (# of plants)	2018 (# of plants)	2019 (# of plants)	2020 (# of plants)	2021 (# of plants)	Source
Sacramento Refuge	Glenn, Colusa	0.25	706	77	78	N/A	10	M. D’Errico, Service, <i>in litt.</i> 2022, unpaginated attachment
Delevan Refuge	Colusa	59	144,891	160,871	188,445	N/A	92,990	M. D’Errico, Service, <i>in litt.</i> 2022, unpaginated attachment
Colusa Refuge	Colusa	62	121,015	52,525	49,237	N/A	20,945	M. D’Errico, Service <i>in litt.</i> 2022, unpaginated attachment
Alkali Grasslands Preserve	Yolo	1	907	2,335	3,254	4,094	517	CNLM 2021, p. 16
Woodland Regional Park	Yolo	UNK	87	42	85	282	N/A	CNLM 2020, pp. 1, 3
Springtown Alkali Sink	Alameda	UNK	1,200	947	N/A	N/A	648	Diversity Database 2022, unpaginated
Alkali Sink Ecological Reserve	Fresno	5	N/A	370	4,171	2,112	136	R. O’Leary, California Department of Fish and Wildlife [Department], <i>in litt.</i> 2022a, unpaginated attachment

Genetics and seed collection research:

Seed collection and distribution is used to augment existing populations or to introduce new populations to areas that were historically occupied by the species or to other areas that contain suitable habitat within the known range of the species. In 1990, the Sacramento Refuge population of palmate-bracted bird's-beak was established using seed collected from the Delevan Refuge population (Service 1998, p. 35). To better inform future seeding efforts, a genetic analysis was completed in 2015 that provided recommendations for maintaining the genetic structure of the sites currently occupied by the species (Ayres et al. 2015, p. 146). All sites were determined to be genetically distinct with the Alkali Sink Ecological Reserve population being most distinct from the others. In addition, two adjacent vernal pools separated by 120 meters on Colusa Refuge were distinct from one another. The authors recommended considering the hydrological conditions under which sites likely evolved when collecting and distributing seed. For seed distribution in hydrologically isolated pools, seeds should be collected from the same pool, whereas for seed distribution at sites that have been cut-off from historical hydrological connections, seeds should be collected from across the whole area that was historically connected by hydrological features to simulate previous patterns of seed dispersal. In addition, seed collection is recommended to occur over multiple years to capture the full range of genetic variation.

Seed collection has occurred annually since 2015 at Alkali Grasslands Preserve, except for 2016. Seed collected in 2019 and 2020 was distributed in 2020 in three areas of the Brauner Unit where the species historically occurred but has not been observed for several years (CNLM 2021, p. 27).

Threats:

Primary threats to the species identified at the time of listing include agricultural conversion, intensive livestock grazing, urbanization, and other activities that altered the valley habitat (Service 1986, p. 23767). Invasive non-native plants, loss of pollinators from use of pesticides, climate change, increased ozone, and dust were additional threats identified in our 2009 status review (Service 2009, pp. 33–36). There is no evidence that the status of these threats has changed substantially. In addition, a lack of funding at Springtown Alkali Sink and Alkali Sink Ecological Reserve makes it difficult to implement management to reduce human disturbance and invasive species, which would improve conditions for palmate-bracted bird's-beak. We provide updated information below related to the threats of intensive livestock grazing, invasive non-native plants, and pesticides.

Since the time of listing, additional research has shown that cattle grazing can be both beneficial and harmful depending on how this management tool is applied. A recent study on reducing non-native grasses found that short-duration, high-intensity grazing may increase reproductive fitness of palmate-bracted bird's-beak and the availability of the species' host plants (Wingo 2009, p. 58). Alkali Grasslands Preserve introduced measures to reduce thatch and growth of non-native annual grasses in 2011. A formal grazing program began in 2012, with wet season grazing implemented from 2017 to 2021 after early experiments with spring grazing resulted in increased thatch levels (CNLM 2021, p. 24). Monitoring in the following years recorded the largest increases in that site's palmate-bracted bird's-beak population to a maximum of 4,094 individuals in 2020 (CNLM 2021, p. 11).

The Alkali Grasslands Preserve is also evaluating mowing (CNLM 2021, p. 24) and wildfire as methods for controlling invasive non-native grasses (CNLM 2021, p. 26). The latter is currently being researched through a grant from the Service to study fire effects on vernal pool species and landscapes and includes the Alkali Grasslands Preserve as one of the sites under evaluation (CNLM 2021, p. 29).

The Environmental Protection Agency recently released final biological evaluations assessing the effects of labeled uses of three neonicotinoid pesticides on listed species (EPA 2022a, entire; EPA 2022b, entire; EPA 2022c, entire). The three pesticides (clothianidin, imidacloprid, and thiamethoxam) are registered for use on a variety of agricultural crops; there are also some non-agricultural applications. All three pesticides were determined likely to adversely affect palmate-bracted bird's-beak, primarily due to expected indirect effects to its pollinators. The three pesticides target insect species by acting on their neurotransmitters to cause excessive nervous stimulation, paralysis, and death. The three pesticides are highly toxic to bees and available data suggest that all three pesticides are likely to affect honeybee and bumblebee colonies through brood reduction and declines in numbers of adults. There is stronger evidence supporting the adverse effects of thiamethoxam as these effects are anticipated even when using a less conservative analysis.

Recovery criteria:

The palmate-bracted bird's-beak recovery strategy is described in the Recovery Plan for Upland Species of the San Joaquin Valley, California (Service 1998, p. 180). Downlisting criteria have not been met (Table 2), thus delisting criteria are not assessed here.

Table 2. Downlisting criteria for palmate-bracted bird's-beak, status as of the previous 5-year review (Service 2009, p. 4), and current assessment.

Downlisting criteria	2009 Status	2022 Status
1A. 95% of occupied habitat on public land is secured and specified recovery areas are protected from incompatible uses.	Met	The status remains as described in Service (2009, pp. 4–5). Additionally, a conservation easement on Woodland Regional Park is in progress by Yolo Habitat Conservancy (K. Hiatt, City of Woodland, <i>in litt.</i> 2022, p. 1).
1B. 75% or more of the population at Springtown Alkali Sink and 75% or more of the occupied area and upland nesting habitat for pollinators within 300 meters (984 feet) of the population margins are secured and protected from incompatible uses.	Partially met, approximately 24 percent (72 acres) of the sink was secured and protected.	The status remains as described in Service (2009, pp. 4–5). Since our 2009 status review, an additional 40 acres have been protected to offset wetland impacts associated with a development project in the City of Dublin, California (Service 2018, p. 1). Mitigation associated with the construction of the Garaventa Hills and East Ranch residential developments will conserve an additional 260 acres (Service 2021a, p. 6 and Service 2021b, p. 5). A third project is under consideration that would result in protection of approximately 60 acres (G. Smick, WRA Inc., <i>in litt.</i> 2022, p. 1).
1C. Two or more populations in the San Joaquin Valley are secured and specified recovery areas are protected from incompatible uses.	Partially met, a single population in the San Joaquin Valley had been secured and protected.	The status remains as described in the 2009 status review (Service 2009, p. 5). Alkali Sink Ecological Reserve remains the only protected population in the San Joaquin Valley. Mitigation sites will be acquired to offset any losses of habitat associated with construction of the High-Speed Train System between Merced and Fresno (Service 2019, p. 79), although the Biological Opinion does not require that any acquired sites be in the San Joaquin Valley. With the likely extirpation of the Western Madera County sites, the only other known population in the San Joaquin Valley, it is possible that this criterion can no longer be met.
2. A management plan that includes survival as an objective has been approved and implemented for all protected areas identified as important to continued survival.	Not met. Management plans were in development or not being implemented.	Since our 2009 status review a management plan for the Alkali Grasslands Preserve was completed in 2014 (CNLM 2014, entire). As described in our previous review, Springtown Alkali Sink has a management plan that has not been fully implemented. However, some of the management actions included in the management plan to offset impacts from the Newport Pointe project to vernal pool branchiopods are currently being carried out and also benefit palmate-bracted bird's-beak (Service 2016, p.7). There is a management plan for Alkali Sink Ecological Reserve; however, there are no management actions included for listed plant species (R. O'Leary, Department, <i>in litt.</i> 2022b, p. 1).
3. Populations are stable or increasing through a precipitation cycle.	Not met	Partially met. The linear trend for all extant sites is stable or increasing over a period that includes multiple precipitation cycles as defined in the Recovery Plan, except for Springtown Alkali Sink and Sacramento Refuge sites (Appendix A). Numbers at Springtown have decreased substantially since the early 2000s. The decrease may be due to missing survey data for portions of the site, which is managed by multiple landowners. Sacramento Refuge is an introduced population. Survey data are also lacking for the Mendota Wildlife Management Area and insufficient data exist for a trend analysis.

Conclusion:

After reviewing the best available scientific information, we conclude that palmate-bracted bird’s-beak remains an endangered species. 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 2009 status review remains an accurate reflection of the species’ current status.

RECOMMENDATIONS FOR FUTURE ACTIONS:

Here we propose several habitat conservation and ecological research recommendations that will aid in the recovery and conservation of the palmate-bracted bird’s-beak. Some of these recommendations have already been discussed in our previous status review (Service 2009, pp. 37–39) and remain valid.

1. Conduct surveys at known occurrences to monitor population trends and habitat changes, including occurrences that are likely extirpated in Madera County and Mendota Wildlife Area to confirm status.
2. Pursue protection of the Springtown Alkali Sink and Woodland Regional Park occurrences through conservation easements and map the net occupied area of these populations.
3. Review existing management plans and revise them to include an objective for survival of palmate-bracted bird’s-beak if this objective is missing.
4. Determine the most effective methods for controlling invasive non-native species at sites where palmate-bracted bird’s-beak occurs and ensure the results are shared with land managers.
5. Consider historical hydrologic connection within populations to maintain genetic variation when collecting and distributing seed. Genetic isolation of populations occurring in vernal pools in the same locality should be maintained. However, seed should be collected and distributed from throughout the population where historical overland flow has been impeded by manmade barriers.
6. Evaluate the need for additional re-introductions and the effectiveness of seeding methods currently employed at the Alkali Grasslands Preserve.
7. Change the scientific name in the Code of Federal Regulations from *Cordylanthus palmatus* to *Chloropyron palmatum*.

Field Supervisor, Sacramento Fish and Wildlife Office

Approve _____ Date _____

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Appendix A – Survey results for the palmate-bracted bird's-beak at sites in the Sacramento and San Joaquin Valleys, California, 1974–2021. Multiple surveys reported in the same year on separate lines. N/A = no surveys conducted. Sources: Service 2009, pp. 17–18 (1974–2007); M. D’Errico, Service, *in litt.* 2022 (Refuges 2007–2021); CNLM 2021, p. 16 (Alkali Grasslands Preserve 2007–2021); CNLM 2020, pp. 1, 3 (Woodland Regional Park); Diversity Database 2022 (Springtown Alkali Sink 2009–2021); R. O’Leary, Department, *in litt.* 2022a (Alkali Sink Ecological Reserve).

County	Glenn, Colusa	Colusa	Colusa	Yolo	Yolo	Alameda	Madera	Fresno	Fresno
Year	Sacramento Refuge	Delevan Refuge	Colusa Refuge	Alkali Grasslands Preserve	Woodland Regional Park	Springtown Alkali Sink	Western Madera County	Mendota Wildlife Area	Alkali Sink Ecological Reserve
1974	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A
1979	N/A	N/A	N/A	20	N/A	N/A	N/A	N/A	N/A
1982	N/A	N/A	N/A	5,000 <50	N/A	N/A	N/A	N/A	N/A
1984	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	225 <150	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	800	N/A	2,000-5,000	N/A	20-30	N/A
1987	N/A	N/A	500	800 400	N/A	N/A	Present	800	N/A
1988	N/A	N/A	N/A	1,400	N/A	10,000	N/A	40	N/A
1989	N/A	2,500	N/A	N/A	N/A	N/A	N/A	40	N/A
1990	N/A	1,000	300	N/A	N/A	9,000	N/A	1	N/A
1991	N/A	10,000	5,000	N/A	N/A	10,000	N/A	1	N/A
1992	N/A	100,000 75,300-125,500	50,000 36,000-70,000	2,660	N/A	36,000	N/A	450	N/A
1993	441	100,000 32,000-201,000	50,000 15,000-41,000	262	N/A	12,000	65	450	N/A
1994	N/A	N/A	>100,000	N/A	N/A	N/A	N/A	N/A	N/A
1995	296	154,600	N/A	400	N/A	N/A	N/A	N/A	N/A
1996	300	N/A	N/A	1,660	N/A	N/A	N/A	N/A	N/A

County	Glenn, Colusa	Colusa	Colusa	Yolo	Yolo	Alameda	Madera	Fresno	Fresno
Year	Sacramento Refuge	Delevan Refuge	Colusa Refuge	Alkali Grasslands Preserve	Woodland Regional Park	Springtown Alkali Sink	Western Madera County	Mendota Wildlife Area	Alkali Sink Ecological Reserve
1997	320	126,250	35,500-46,700	N/A	N/A	N/A	N/A	N/A	N/A
1998	210	85,900	6,200	2,010 1,500-2,000	N/A	N/A	N/A	N/A	1,600
1999	205	40,000	41,200	N/A	N/A	N/A	N/A	N/A	N/A
2000	1,410	183,540	68,882	N/A	N/A	N/A	N/A	N/A	N/A
2001	1,460	80,070	62,040	200	N/A	N/A	N/A	N/A	N/A
2002	1,155	270,220	9,077	N/A	N/A	N/A	N/A	N/A	N/A
2003	2,000	423,435	183,388	325	N/A	N/A	N/A	N/A	N/A
2004	1,486	100,000 147,010 "tens of thousands"	50,000 69,693 6,500-15,500	150 175-200 & 125	N/A	15,000 20,000-50,000	N/A	185	1,000 465 & "hundreds"
2005	2,465	N/A	119,248	50-125 <100	N/A	N/A	N/A	5,000 1,000	N/A
2006	1,630	257,415	95,501	374	N/A	N/A	N/A	5,000	N/A
2007	798	181,914	94,827	479 350-1,000	N/A	N/A	Nature and extent of population unknown	Failure to germinate due to extreme drought in area	N/A
2008	3,457	N/A	204,946	444	N/A	N/A	N/A	N/A	N/A
2009	2	13,034	107,073	539	25	388	N/A	N/A	N/A
2010	N/A	N/A	91,047	278	N/A	1000s	N/A	N/A	N/A
2011	1,482	170,324	137,547	140	0	N/A	N/A	N/A	N/A
2012	580	115,701	38,574	198	N/A	1100	N/A	N/A	N/A
2013	1,838	215,137	218,973	216	N/A	100s	N/A	N/A	3,524

County	Glenn, Colusa	Colusa	Colusa	Yolo	Yolo	Alameda	Madera	Fresno	Fresno
Year	Sacramento Refuge	Delevan Refuge	Colusa Refuge	Alkali Grasslands Preserve	Woodland Regional Park	Springtown Alkali Sink	Western Madera County	Mendota Wildlife Area	Alkali Sink Ecological Reserve
2014	340	83,471	120,356	920	N/A	N/A	N/A	N/A	N/A
2015	1,028	177,870	141,747	2,071	N/A	N/A	N/A	N/A	209
2016	437	274,845	133,444	1,524	N/A	N/A	N/A	N/A	N/A
2017	706	144,891	121,015	907	87	1,200	N/A	N/A	N/A
2018	77	160,871	52,525	2,335	42	947	N/A	N/A	370
2019	78	188,445	49,237	3,254	85	N/A	N/A	N/A	4,171
2020	N/A	N/A	N/A	4,094	282	N/A	N/A	N/A	2,112
2021	10	92,990	20,945	517	N/A	648	N/A	N/A	136