

Interim Core Map Documentation for Palmate-Bracted Bird's Beak

January 17, 2025

Developed by US Environmental Protection Agency, Office of Pesticide Programs

Species Summary

The palmate-bracted bird's beak (*Cordylanthus palmatus*; Entity ID 679) is an endangered plant (dicot). FWS has not designated a critical habitat for the palmate-bracted bird's beak. This species occurs in seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 500 ft. The palmate-bracted bird's beak flowers from May to October and is pollinated by bumble bees (*Bombus* sp.). Additional information is provided in **Appendix 1**. This species is currently included in the Vulnerable Species Action Plan.

Description of Core Map

The core map for the palmate-bracted bird's beak is based on biological information, which includes known locations and habitat locations. Since there is no designated critical habitat for this species, critical habitat was not relevant to the development of the core map. Known locations used for this core map include information provided by FWS in the 2023 5-Year Review. **Figure 1** depicts the interim core map for the palmate-bracted bird's beak. The core map includes a subset of the species range as well as some areas outside of the range (because there were two known locations (Springtown Alkali Sink and Sacramento National Wildlife Refuge) recorded outside of the range). The core map represents approximately 96,000 Acres located in California.

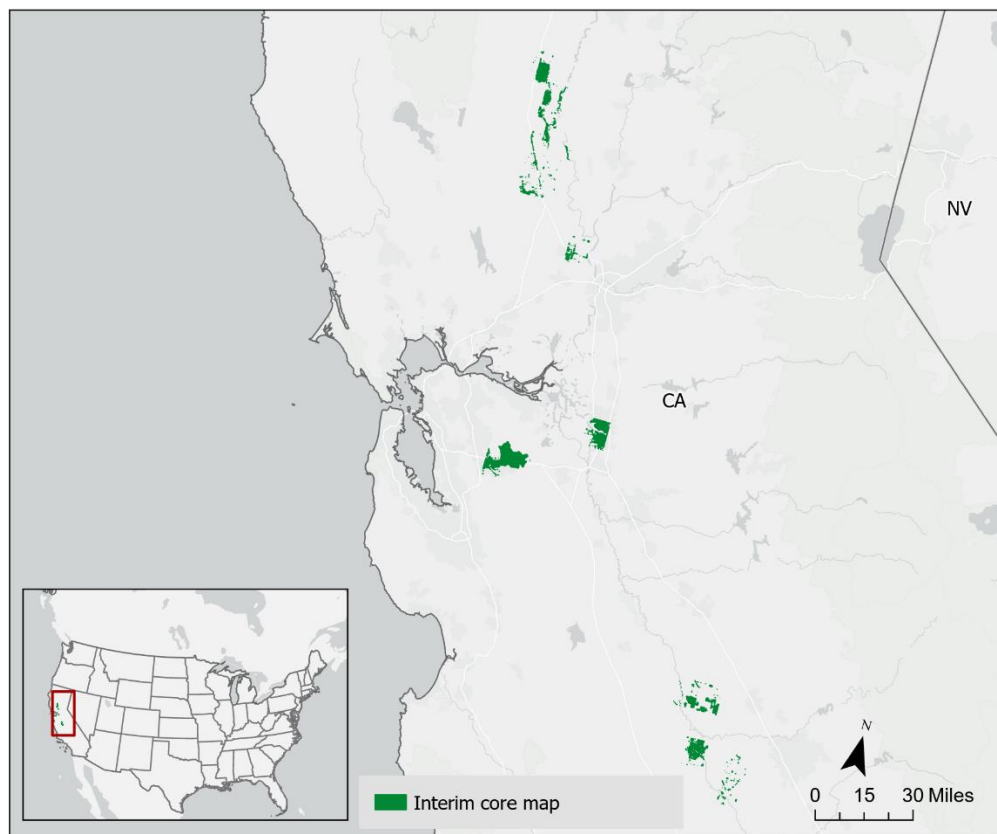


Figure 1. Interim core map for palmate-bracted bird's beak.

Landcover categories within the core map area are included in **Table 1**. The predominant landcovers include herbaceous grasslands and wetlands.

Table 1. Percentage of Interim Core Map Represented by NLCD¹ Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Class/Value	% Area	Total area for landcover type
Forestry	Deciduous Forest (41)	0	0
	Evergreen Forest (42)	0	
	Mixed Forest (43)	0	
Agriculture	Pasture/Hay (81)	0	4
	Cultivated Crops (82)	4	
Mosquito adulticide, residential	Open space, developed (21)	4	34
	Developed, Low intensity (22)	7	
	Developed, Medium intensity (23)	16	
	Developed, High intensity (24)	7	
Invasive species control	Woody Wetlands (90)	1	62
	Emergent Herbaceous Wetlands (95)	23	
	Open water (11)	2	
	Grassland/herbaceous (71)	32	
	Scrub/shrub (52)	4	
	Barren land (rock/sand/clay; 31)	0	
Total Acres	Interim Core Map Acres	~95,700 acres	

The core map developed for the palmate-bracted bird's beak is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the palmate-bracted bird's beak. This core map incorporates information developed by FWS and made available to the public; however, the core map has not been formally reviewed by FWS. This interim core map may be revised in the future to incorporate expert feedback from FWS. This interim core map has an "average" best professional classification to describe uncertainties and data interpretation. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

Approach Used to Create Core Map

The core map was developed using the process EPA uses to develop core maps for draft Pesticide Use Limitation Areas for species listed by the U.S. Fish & Wildlife Service (FWS) and their designated critical

¹ Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, <https://doi.org/10.5066/P9JZ7AO3>

habitats² (referred to as “the process”). This core map was developed by EPA using the 4 steps described in the process document:

1. Compile available information for a species;
2. Identify core map type;
3. Develop the core map for the species; and
4. Document the core map.

For step 1, EPA compiled available information for the palmate-bracted bird’s beak from FWS, as well as observation information available from various publicly available sources (including iNaturalist, GBIF and NatureServe). The information compiled for the palmate-bracted bird’s beak is included in **Appendix 1**.

Influential information that impacted the development of the core map includes:

- The available occurrence data from iNaturalist and FWS;
- The species occurs at elevations <500 ft; and
- Species restricted to alkali soils.

For step 2, EPA used the compiled information to identify the core map type. EPA compared the known location data to the range and found that there were known locations outside of the range map (See **Appendix 1**). EPA also found that the range likely captures areas where the species is not expected to occur. The range map follows geo-political boundaries (townships) and includes areas that do not likely represent the habitat of this species. The species has specific habitat and elevation requirements. When weighing that information together, EPA selected the biological information core map type. EPA used known locations and habitat to derive this core map.

For step 3, EPA used the best available data sources to generate the core map. Data sources are discussed in the process document. For this core map, EPA used known locations (FWS) as well as soil and elevation data. **Appendix 2** provides more details on the GIS analysis and data used to generate the core map. For soil data, EPA relied on soils with pH ranging 7.2-9.5 because this represents the pH of neutral to alkali soils. EPA included only those areas that are <155 m in elevation using spatial elevation data.

Evaluation of Known Location Information

There are four datasets with known location information:

- Descriptions of locations provided by FWS.
- Occurrences in iNaturalist;
- Occurrences in GBIF; and,
- Occurrences in NatureServe.

EPA evaluated these sets of data in developing the core map. FWS documentation showed that this species is known to occur in seven refuges or preserves in the state of California. Several of these areas are found partially outside of the current species range. iNaturalist (70 research grade observations), GBIF (15 observations), and NatureServe observations were consistent with the species range and FWS-identified preserve and refuge areas given the precision of the available data. Therefore, the known location information supports using the range refined by habitat type and including named known

² Dated 2024, available online at: <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-draft-pesticide-use-limitation-areas>

locations as the core map. **Appendix 1** includes more information on the available known location information.

Discussion of Approaches and Data that were Considered but not Included in the Core Map

EPA considered various data sets and approaches to generate this core map. EPA could not locate GIS data that mapped “saline-alkaline” soils, which the FWS has designated as a habitat requirement for the species. Therefore, EPA used the pH that best represents the species known habitat. When reviewing the interim core map, it may be possible to improve the confidence of this core map by providing data that maps the more specific saline-alkaline soil type. Known location data from iNaturalist was considered. However, the points were not used to refine the interim core map. When considering positional accuracy of the data, EPA believes that the habitat refinements better captures where the species occurs or may occur.

Appendix 1. Information compiled for species

1. Recent FWS documents

- Palmate-bracted bird's-beak 5-Year Review (07/05/2023) (https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/4236.pdf)
- Palmate-bracted bird's-beak 5-Year Review (06/15/2009) (https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1505.pdf)
- Recovery Plan for Upland Species of the San Joaquin Valley, California (09/30/1998) (https://ecos.fws.gov/docs/recovery_plan/980930a.pdf)

Background information

- **Status**
 - Federally listed as **endangered** on **07/01/1986**.
 - **Resiliency, redundancy, and representation (the 3Rs)**
 - No direct information (no SSA for this species).
- ### 2. Habitat, Life History, and Ecology
- **Habitat**
 - Habitat for palmate-bracted bird's-beak is limited to seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 155 meters (500 feet).
 - Within this elevation range, palmate-bracted bird's-beak grows primarily along the edges of channels and drainages, with a few individuals scattered in seasonally - wet depressions, alkali scalds (barren areas with a surface crust of salts), and grassy areas.
 - Microhabitat suitability for palmate-bracted bird's beak depends primarily on soil pH and to a lesser extent on soil layering, salinity, and moisture.
 - This species occurs on neutral to alkaline soils (pH 7.2 to 9.5) under natural conditions but has been seen growing on acidic soils in green house trials.
 - Palmate-bracted bird's-beak occurs in the Valley Sink Scrub and Alkali Meadow natural communities in association with other halophytes such as iodine bush (*Allenrolfea occidentalis*), alkali heath (*Frankenia salina*), glasswort (*Salicornia subterminalis*), seepweed (*Suaeda moquinii*), and salt grass.
 - At Springtown Alkali Sink, palmate-bracted bird's-beak and hispid bird's-beak occur together.
 - **Diet:** Palmate-bracted bird's beak is partially parasitic, obtaining water and nutrients from the roots of other plants
 - **Pollination:**
 - This species flowers from May – October.

- Pollinators include bumble bees (*Bombus californicus*, *B. occidentalis* and *B. vosnesenskii*).
- Bumble bees nest in the uplands that are more than 100 m from palmate-bracted bird's beak locations.
- Self and cross pollination are both relevant.
- **Taxonomy**
 - Terrestrial Plant - Annual flowering herb in the broomrape family (Orobanchaceae)
 - FWS plant assessment group: dicot flowering plants that require outcrossing with biotic pollination vectors.
- **Relevant Potential Pesticide Use Sites**
 - Mosquito adulticides may impact species' pollinators.
- **Relevant Recovery Criteria and Actions**
 - **Downlist to threatened.**
 - **1st Criteria:** 95% of occupied habitat on public land is secured and specified recovery areas are protected from incompatible uses.
 - Status: **Met**
 - **2nd Criteria:** 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.
 - Status: **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. Mitigation associated with the construction of the Garaventa Hills and East Ranch residential developments will conserve an additional 260 acres. A third project is under consideration that would result in protection of approximately 60 acres.
 - **3rd Criteria:** Two or more populations in the San Joaquin Valley are secured and specified recovery areas are protected from incompatible uses.
 - Status: **Partially met**, a single population in the San Joaquin Valley had been secured and protected. 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, 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.

- **4th Criteria:** A management plan that includes survival as an objective has been approved and implemented for all protected areas identified as important to continued survival.
 - Status: **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. 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. There is a management plan for Alkali Sink Ecological Reserve; however, there are no management actions included for listed plant species.
- **5th Criteria:** Populations are stable or increasing through a precipitation cycle.
 - Status: **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. 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.
- **Relevant Recovery Actions**
 - The recovery goal for palmate-bracted bird's beak is to maintain self-sustaining populations in protected areas representative of the former geographic and topographic range of the species and in a variety of appropriate natural communities.
 - Surveys will be necessary to determine whether natural populations remain in all target areas; if natural populations are not found, reintroduction will be necessary to achieve recovery.

However, reintroduction is expensive and experimental, and thus the preferable course of action is to locate and protect the remaining occupied habitat wherever possible.

- Unoccupied habitat within metapopulations also should be protected to facilitate seed dispersal and pollinator movement.
- Thus, additional elements of the strategy are to protect land in blocks of at least 65 hectares (160 acres) and to avoid fragmenting any metapopulation into more than two blocks of contiguous, protected natural land.
- Buffer zones of 150 meters (500 feet) or more should be protected beyond the population margins to reduce external influences, provide pollinator habitat, and allow for population expansion.
 - To prevent the irreversible decline of palmate-bracted bird's beak, in the near future:
 - The Springtown Alkali Sink metapopulation must be protected from development and from incompatible uses.
 - The occupied habitat on public land also is important to the survival of palmate-bracted bird's beak; management to promote the continued survival of this species must continue.
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3. Description of the Species Range

As of 2009, 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, two of which may now be extirpated**. The species range is approximately 600,000 acres. The shapefile was obtained from FWS's ECOS webpage. Information was accessed on: 10/11/2024. ECOS indicates this range was last updated 11-16-2015.

- **States/US Territories** in which this population is known to or is believed to occur: **California**.
- **US Counties** in which this population is known to or is believed to occur: Alameda, Colusa, Contra Costa, Fresno, Glenn, Madera, Sacramento, San Joaquin, Sutter and Yolo
- **USFWS Refuges** in which this population is known to occur: Colusa National Wildlife Refuge, Delevan National Wildlife Refuge, North Central Valley Wildlife Management Area, Sacramento National Wildlife Refuge and Willow Creek-Lurline Wildlife Management Area

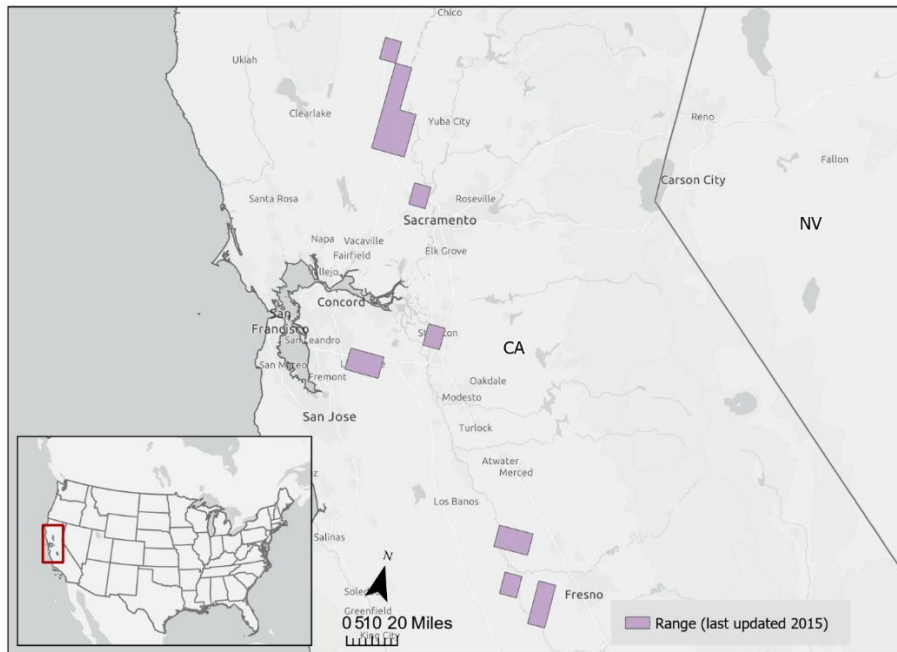


Figure A1-1. ECOS Range for palmate-bracted bird's beak. Total acreage of range is approximately 600,000 acres (range file available from ECOS https://ecos.fws.gov/docs/species/shapefiles/usfws_Q1UT_P01_Cordylanthus_palmatus_current_range.zip).

Critical Habitat

- Critical Habitat has not been designated or proposed for palmate-bracketed bird's beak.

Known Locations

- Summary of known locations from the FWS 2023 5-year review
 - 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)
 - 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).
 - The Sacramento Refuge population was introduced in 1990; additional sites were located through intensive survey efforts.

- There have been few changes in the distribution of palmate-bracted bird's beak since 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.
- Currently the species is known to occur in 7 refuges or preserves in California. Several of these areas are found partially outside of current species range. These areas were named in the Table 1 of the 5 Year Review (see Table A1-1 below).

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

Table A1-1. Seven palmate-bracted bird's beak refuges and preserves in California

- **iNaturalist:** [Link for research grade observations](#)
 - 70 research grade observations are available on iNaturalist dated between June 2012 and May 2024 found in an around the Central Valley of California. The majority of these points are found in the Liverland Wetland Reserve, Woodland Regional Reserve, Delevan refuge and Suisun City. All locations are likely within the species range or named refuge locations when considering point accuracy; see map below.

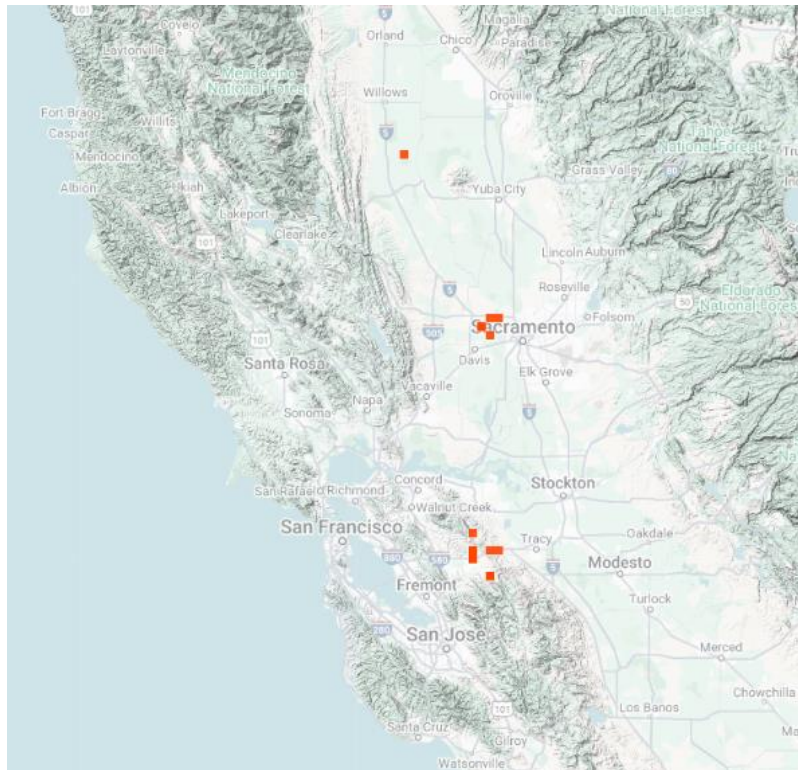


Figure A1-2. Map of observations from iNaturalist.

- **GBIF:** [Link for species](#)
 - GBIF included [15 human observations or occurrences](#) dated since 2009, these occurrences are dated between 2004 and 2021. Only 1 occurrence has coordinates from PlantNet, and it is in the same general location as the iNaturalist location; east of the San Francisco Bay area. The remaining occurrences are from NatureServe and do not have coordinates.



Figure A1-3. Map of observations from GBIF.

- NatureServe Explorer Pro³: [Link for species](#)
 - Available public occurrences from NatureServe Explorer Pro are in the same general areas of California as the range and occurrences from iNaturalist. There 4 distinct areas, 1 south of San Francisco and west of Fresno, 1 to the east of San Francisco, 1 around Sacramento and one north of Sacramento. There are additional occurrences north of Sacramento compared to iNaturalist; however, one of these occurrences is from 1997. They are in the same general area as the iNaturalist occurrence and are within the species range. No additional areas are identified based on this data.

³ <https://explorer.natureserve.org/pro/Welcome>



Figure A1-4. Map of observations from NatureServe.

Appendix 2. GIS Data Review and Method to Develop the Core Map

EPA developed the interim core map by identifying areas within the species range that satisfied the species habitat requirements (i.e. elevation <155 m and soils with a pH of 7.2-9.5) and layering that with species known locations provided by FWS. INaturalist data were considered but not used to refine the interim core map.

1. References and Software

- USFWS Species Range: <https://ecos.fws.gov/ecp/species/1616>
- PAD-US Protection Status by GAP Status Code layer ([PAD-US Protection Status by GAP Status Code - Overview \(arcgis.com\)](#))
- Vegetation – Springtown Alkali Sink layer ([Vegetation - Springtown Alkali Sink \[ds2965\] - Overview \(arcgis.com\)](#))
- USGS Elevation Layer ([TNM Download v2 \(nationalmap.gov\)](#))
- California SSURGO data ([Gridded Soil Survey Geographic \(gSSURGO\) Database | Natural Resources Conservation Service \(usda.gov\)](#))
- FWS Recovery Plan 1998: Recovery Plan for Upland Species of the San Joaquin Valley, California https://ecos.fws.gov/docs/recovery_plan/980930a.pdf
- Software used: ArcGIS Pro version 3.2

2. Datasets Used in Core Map Development

2.1. Setting the outer extent of the core map

This species is known to occur on 7 refuges and preserves in California, noted Table A1-1 in **Appendix 1**. Several of these named locations were found partially within the species range. For this reason, these named locations combined with the species range were used to set the outer extent of the core map.

Several datasets were used to identify and extract these areas using select by attribute. A shapefile for two named locations could not be found, Alkali Grassland Preserve and Woodland Regional Park so they were not included. However, these locations are referred to as southeast of Woodland, California, an area that is largely covered by the interim core map so they are likely included in the interim core map.

2.1.1. Identifying the Species Range

- 1) Downloaded species range layer using the EPA data services available at [Species Ranges - Overview \(arcgis.com\)](https://species.ranges-arcgis.com/). These data services are updated from the FWS ECOS Database each week. Using the Diced Species layer used **Select by Attributes** feature to select species by entity ID (#679)

2.1.2. Mapping Species Known Locations Based on Named Locations

- 1) From PAD-US Protection Status by GAP Status Code layer selected Sacramento Refuge, Delevan Refuge, Colusa Refuge, and Alkali Sink Ecological Reserve using **Select by Attributes** (Column Name: Unit Name)
- 2) The Vegetation -- Springtown Alkali Sink layer only contained the Springtown Alkali Sink and no modification was needed.

2.2. Mapping Species Elevation Requirements

The palmate bracketed bird beak occurs in lowland plains and basins and elevation of less than 155 meters or 500 feet. These areas were identified using the USGS elevations grids using the following steps (FWS 5-Year Review 2023).

- 1) Downloaded digital elevation model (DEM) tiles in areas that overlapped with species range from USGS website: tile IDs n37w120, n37w121, n38w121, n38w122, n39w121, n39w122, n39w123, n40w122, and n40w123.
- 2) Used **Mosaic tool** to merge DEM tiles into one layer
- 3) Used **Zonal Statistics as Table** to calculate statistics for elevation within the species range
- 4) Used **Int tool** to convert elevation values to integers
- 5) Used **Raster to polygon** tool to convert elevation raster to polygon
- 6) Used **Select by Attributes** feature **where gridcode is less than or equal to 155** to exclude all elevations above 155 m
- 7) Used **Clip tool** to clip elevation to species range.

2.3. Mapping Species Soil Requirements

The palmate bracketed bird beak requires neutral to alkali soil which are defined as soils with a pH less than 9.5 but greater than 7.2 (FWS Recovery Plant 1998; pg 33). Soils meeting these requirements were

extracted from the California SSURGO data (Gridded Soil Survey Geographic (gSSURGO) Database using the following steps.

- 1) Added soil map unit layer named MUPOLYGON to map.
- 2) Used **Clip tool** to clip MUPOLYGON to range.
- 3) Added Horizon table (Chorizon) to map. This table contains soil pH (Column Name: pH H2O – Representative Value).
- 4) Added Component table to map. This table includes MUKEY attribute used to join tables with soil attribute to MUPOLYGON.
- 5) Under layer properties used add join to combine Component table to Horizon table (by component key) so that Horizon table would have MUKEY.
- 6) Under layer properties used add join to combine updated Horizon Table to MUPOLYGON (by MUKEY (Mapunit Key)).
- 7) Exported MUPOLYGON with the joined table attribute using **Export Features** to make changes permanent.
- 8) Used Select by attribute tool **where pH H2O – Representative Value is less than or equal to 9.5 and pH H2O – Representative Value is greater than or equal to 7.2.**
- 9) Created layer from selection.

3. Creating the Core Map

Combined the two habitat layers, one representing alkali soils within the species range and one representing areas with elevation <155 m within the species range, with the layers containing the named known locations for this species using the following steps.

- 1) Used **Intersect** tool to find areas soil pH and elevation overlap
- 2) Used **Merge** tool to merge new soil/elevation intersect layer with layers containing known locations.

These named known locations include refuges and preserves where this species is known to occur. The resulting core map includes the alkali soils found in areas with an elevations <155m within the species range and the available named known locations. Core map file name is: Habitat and Named Locations

4. Additional Consideration of Occurrence Data

The developer compared the available research grade observations of the species downloaded from iNaturalist with the resulting core map. While some data points were located outside of the interim core map, the core map is within the positional accuracy of these points. For this reason, no additional refinement was conducted based on the iNaturalist data.