Interim Core Map Documentation for the San Joaquin Adobe Sunburst

Version 1
Review Completed: April 2026
Core Map Developer: U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs

Species Summary

The San Joaquin adobe sunburst (*Pseudobahia peirsonii*; Entity ID #600) is a small annual plant covered with woolly hairs and has alternative leaves (FWS, 2023). These plants have yellow, daisy-like flowers that are born singly at the tip of each branch (FWS, 2023). This species has a narrow distribution within the Central Valley of California and the foothills of the northern Sierra Nevada (FWS, 2023). The San Joaquin adobe sunburst was listed as threatened under the Endangered Species Act (Act) on February 6, 1997. Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the San Joaquin adobe sunburst is based on the known locations masked to the California Department of Fish and Wildlife's Area of Conservation Emphasis (ACE) hexagon level. Known occurrences were based on U.S. Fish and Wildlife Service (FWS) (2023) from the latest 5-year review of the species. Known occurrences from California's Natural Diversity Database (CNDBB) were overlaid to ensure extant occurrences were accounted for. FWS documentation does not explicitly state whether this species may be located on agricultural fields. However, CNDBB known occurrences do occur on land the National Landcover Database (NLCD) classifies as cultivated crops; therefore, cultivated land was not removed from the core map.

Figure 1 depicts the resulting interim core map for the San Joaquin adobe sunburst. The size of this core map is approximately 158,400 acres. Landcover categories within the core map area are included in **Table 1**. Landcover within the core map is grassland/herbaceous and cultivated crops, which is consistent with the habitat of this species and ongoing threats of its habitat being converted to agricultural land (FWS, 2023).

The core map developed for the San Joaquin adobe sunburst is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the San Joaquin adobe sunburst. 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 "limited" (3) best professional judgment classification to describe major uncertainties/limitations. The map is based on occurrence data and suitable habitat within the species' range. This core map does not replace or revise any range developed by FWS for this species.

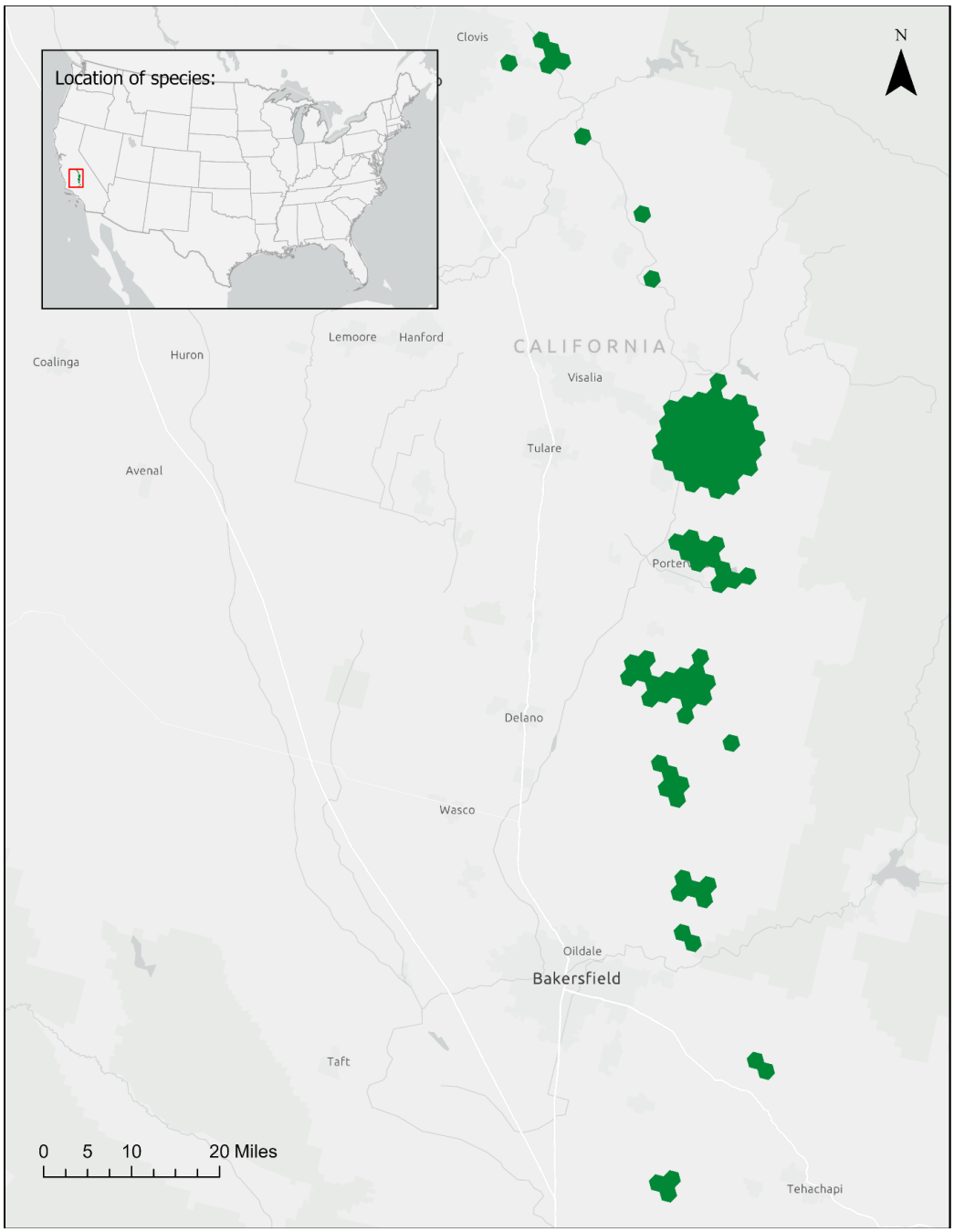

Figure 1. Interim core map for the San Joaquin adobe sunburst. The total acreage of the core map is approximately 158,400 acres.

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

Example pesticide use sites/types	NLCD Class/Value	% Area
Forestry	Deciduous Forest (41)	0%
Forestry	Evergreen Forest (42)	0%
Forestry	Mixed Forest (43)	0%
Agriculture	Pasture/Hay (81)	0%
Agriculture	Cultivated Crops (82)	16%
Mosquito adulticide, residential	Developed Open Space (21)	2%
Mosquito adulticide, residential	Developed Low Intensity (22)	1%
Mosquito adulticide, residential	Developed Medium Intensity (23)	0%
Mosquito adulticide, residential	Developed High Intensity (24)	0%
Invasive species control	Woody Wetlands (90)	0%
Invasive species control	Emergent Herbaceous Wetlands (95)	0%
Invasive species control	Open Water (11)	1%
Invasive species control	Grassland/Herbaceous (71)	76%
Invasive species control	Shrub/Scrub (52)	3%
Invasive species control	Barren Land (31)	0%
Total Acres	Interim Core Map Acres	158,400 Acres

Evaluation of Known Location Information

There are five datasets with known location information for this species:

- Descriptions of locations provided by FWS
- Occurrence locations in California Natural Diversity Database (CNDBB)
- Occurrence locations in iNaturalist
- Occurrence locations in the Global Biodiversity Information Facility (GBIF)
- Occurrence locations in NatureServe

EPA evaluated these sets of data before selecting the type of and developing the core map. CNDBB appeared to have the finest resolution of the location information, which was cited and relied upon in FWS documentation (FWS, 2007, 2023). Occurrences in iNaturalist, GBIF, and NatureServe were consisted with those discussed in FWS documentation and seen in CNDDB. **Appendix 1** includes more information on the available known location information.

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

Approach Used to Create Core Map

EPA compiled available information for the San Joaquin adobe sunburst from FWS, as well as observation information available from various private and publicly available sources (including the CNDBB, iNaturalist, NatureServe, and GBIF). The information compiled for the San Joaquin adobe sunburst is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- Known locations listed in CNDDB
- The 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.

EPA used this information to identify the core map type, which is based on known location information. ACE hexagons were used to mask the precise locations of the species.

The entire range of the species was not used as the core map because the range contains large swaths of areas where the species does not occur and did not include all known locations. Known locations were overlayed to ensure they were accounted in the core map, but precise locations are not part of the core map due to sensitivity of precise occurrence locations for this species. **Appendix 2** provides more details on the Geographic Information System (GIS) analysis and data used to generate the core map.

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

EPA considered refining the core map using landcover that describes species suitable habitats. However, FWS documentation did not include specific landcover types/habitats the species requires or in which it cannot survive. Furthermore, the core map includes a large variety of mappable landcovers; therefore, landcover refinements would not likely refine the core map to any great extent.

Appendix 1. Information Compiled for Species

1. **Recent FWS Documents/Links**
   2023 Hartweg's Golden Sunburst & San Joaquin Adobe Sunburst 5-Year Review
   2008 Hartweg's Golden Sunburst & San Joaquin Adobe Sunburst 5-Year Review

2. **Background Information**
   - **Status:** Federally listed as threatened on February 6, 1997

   - **Taxonomy**

Kingdom	Plantae – plantes, Planta, Vegetal, plants
Subkingdom	Viridiplantae – green plants
Infrakingdom	Streptophyta – land plants
Superdivision	Embryophyta
Division	Tracheophyta – vascular plants, tracheophytes
Subdivision	Spermatophytina – spermatophytes, seed plants, phanérogames
Class	Magnoliopsida
Superorder	Asteranae
Order	Asterales
Family	Asteraceae – sunflowers, tournesols
Genus	Pseudobahia Rydb. – sunburst
Species	Pseudobahia peirsonii Munz – San Joaquin adobe sunburst

   - **Resiliency, Redundancy, and Representation**
     - Not discussed explicitly in the FWS documents reviewed.

   - **Life History**
     - **Habitat**
       FWS (2023) states that known occurrences of the San Joaquin adobe sunbursts are found over a range of approximately 135 miles through Fresno, Tulare, and Kern Counties in California. Extant occurrences range in elevation from 400 – 2,000 feet, however, one known occurrence has been recorded at 2,600 feet. This species occurs only on heavy adobe clay soils where water retention properties are high. The 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.

     - **Biology**
       FWS (2023) states that the 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, the 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). The 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.

- **Pollination**
  Pollination was not discussed in the FWS documents reviewed.

- **Relevant Pesticide Use Sires**
  - Pesticide threats to the species were not discussed in the FWS documentation for this species.

- **Threats**
  - According to FWS (2023), the primary threats to the San Joaquin adobe sunburst include: conversion of habitat to residential development and to a lesser extent, to agricultural land, competition from nonnative plants, incompatible grazing practices, transmission line maintenance, recreational activities, mining, road construction/maintenance, a flood control project, and other human impacts.

- **Recovery Criteria**
  - There is no published recovery plan for the San Joaquin adobe sunburst and therefore, no recovery criteria. However, FWS (2023) does include recommended future actions to aid in this species conservation and recovery:
    - Habitat acquisition, management, and restoration
    - Work with landowners to gain access and conduct coordinated surveys
    - Develop a recovery plan
    - Maintain a viable, protected seed collection

3. Description of the Species Range

The species range, last updated on March 21, 2018, comprises of USGS quadrangles that encompass known locations at that time. CNDDB data, accessed on October 1, 2025, shows known occurrences outside of the species range.

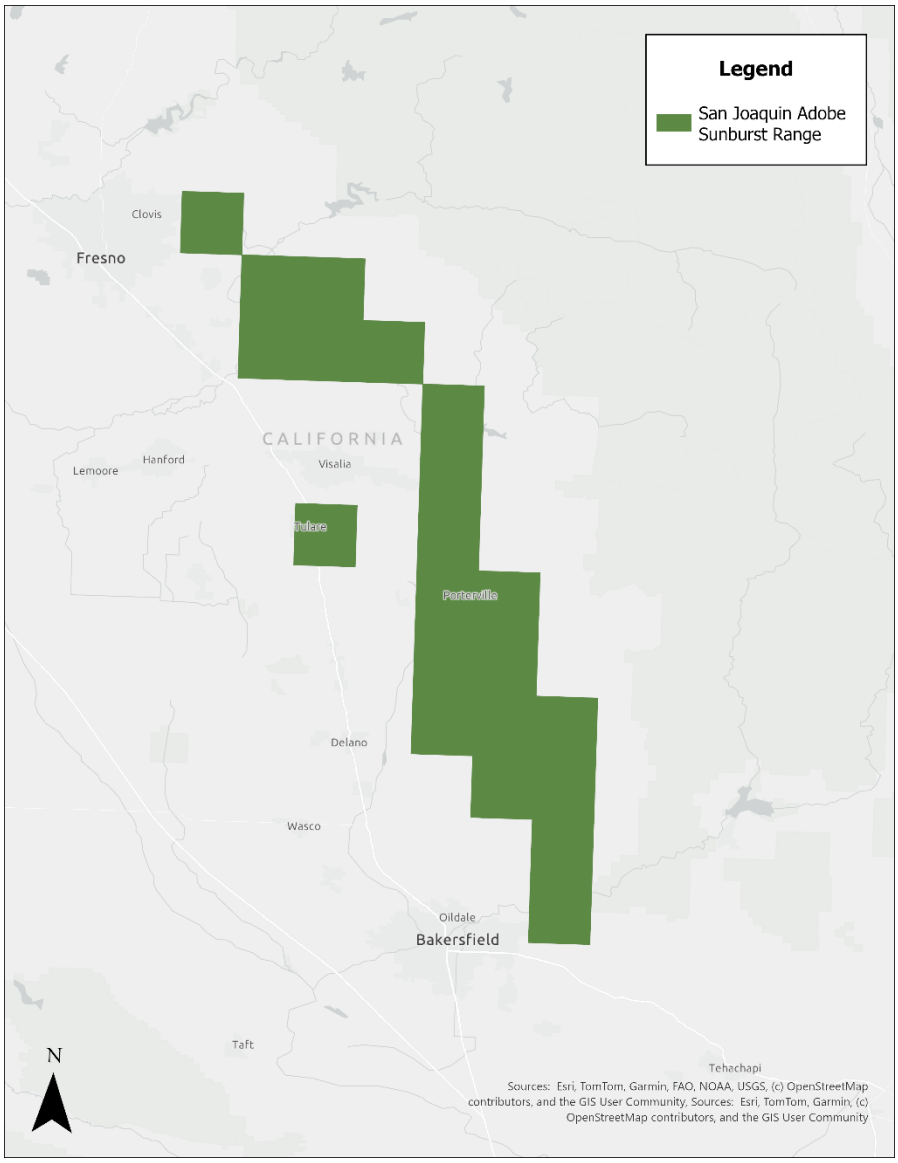

Figure 2. Species range downloaded from Environmental Conservation Online System (ECOS). The species range encompasses approximately 810,000 acres.

4. Critical Habitat

FWS has not designated a critical habitat for this species.

5. Additional Known Locations

- **iNaturalist**
  - Searched on 10/2/2025
  - 23 research grade and verifiable observations made between May 2015 – March 2025
  - iNaturalist observations occurred within the species range, including Fresno, Tulare, and Kern Counties in California.

- **GBIF**
  - Searched on 10/2/2025

- 23 observations made between 2015 –2025
- Locations with coordinates occurred in areas expected for this species.
- All were replicates of either iNaturalist or NatureServe observations

- **NatureServe**
  - Searched on 10/2/2025
  - Observations include both documented occurrences and predictions from NatureServe's generalized habitat model
  - Occurrences were in areas expected for this species.

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

EPA developed the interim core map ("SanJoaquin_AdobeSunburst_update.gdb") based on the where salt marshes and known locations occur within the CNDDB data. Named locations included in FWS reports were also added to the core maps if they were not included in the map after salt marshes refinement.

1. **Datasets and Software**

   Datasets used:

   1.1. FWS species range

   1.2. ACE hexagon layer

   1.3. Occurrences from California Natural Diversity Database, information downloaded 10/2025

   Software used: ArcGIS Pro, version 3.5.2

2. **Creating the core map**

   2.1. Determining outside extent of the core map

   The species range, readily downloadable from ECOS, was used as the initial extent of the core map. As discussed in Appendix 1, FWS has not designated a critical habitat for this species. A review of the species' range determined that it was a compilation of USGS 7.5 minute quads.

   2.2. Refining species range based on known locations

   A review of CNDBB known locations determined that extant occurrences did not occur in every quadrangle within the species range. Furthermore, several extant locations occurred outside of the species range.

3. **GIS Process Used**

   3.1. Refined CNDDB known occurrences to ensure all are extant

   A review of the CNDDB known location attribute table showed that the presence for many of the Elemental Observations was either *possibly extirpated, presumed extant, or extirpated.* Therefore, the *Select by Layer By Attribute* tool was used to refine the known occurrences to only those determined to be *presumed extant* or *possibly extirpated* (**Figure 3**).

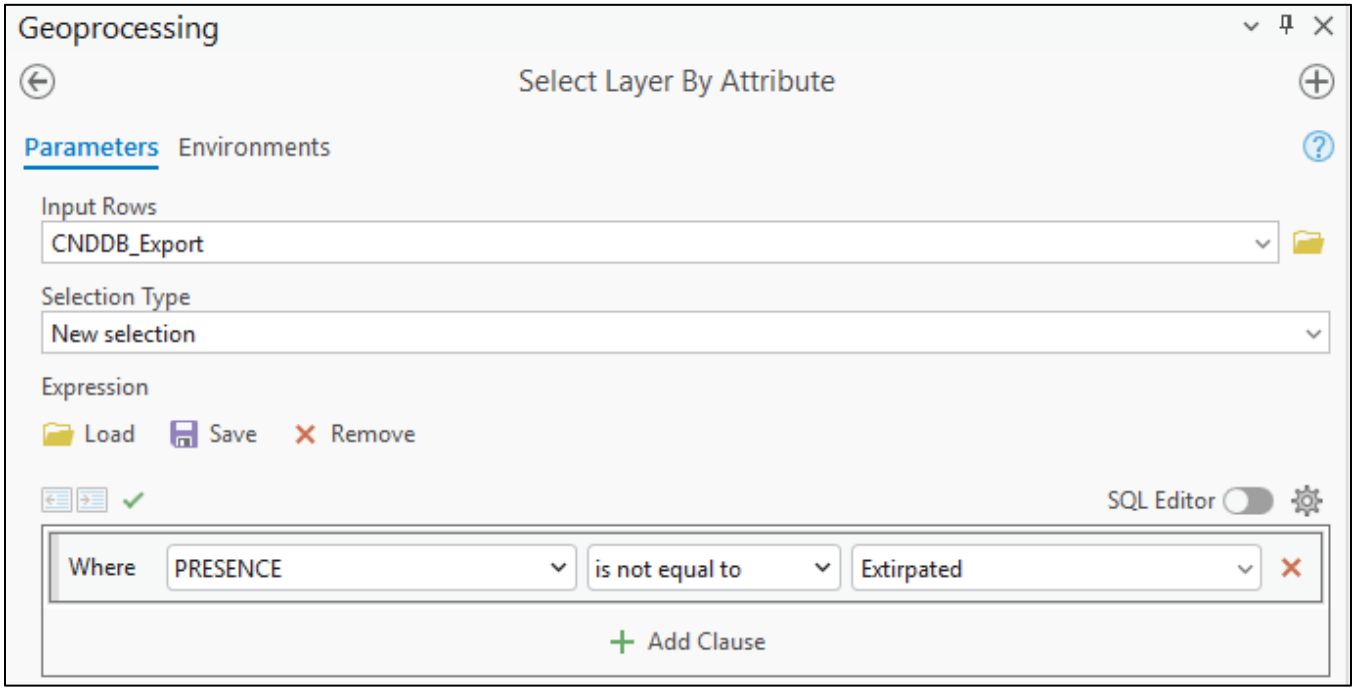

Figure 3. Setup of the Select Layer by Attribute tool used to refine the CNDDB occurrence to those that are presumed extant.

3.2. Compared known locations to the species range

The species range from FWS and known locations from CNDDB were added to the map to determine where in the known locations occur. This showed that no known locations occurred in several quadrangles. Additionally, several known locations occurred outside of the species range south near Caliente.

3.3. Refining ACE hexagon layer

Based on the findings in **Section 3.2**, it was determined that the San Joaquin adobe sunburst is not found within the following quadrangles within its range: Orange County North, Reedley, Tulare, and Woody. Additionally, known locations occurred within the following quadrangles that are not included in the range: Chickencoop Canyon, Frazier Valley, Oiler Peak, Tejon Ranch, and Tejon Hills.

To refine the species map, the *Spatial Join* tool was used to select ACE hexagons where known locations occur (**Figure 4**).

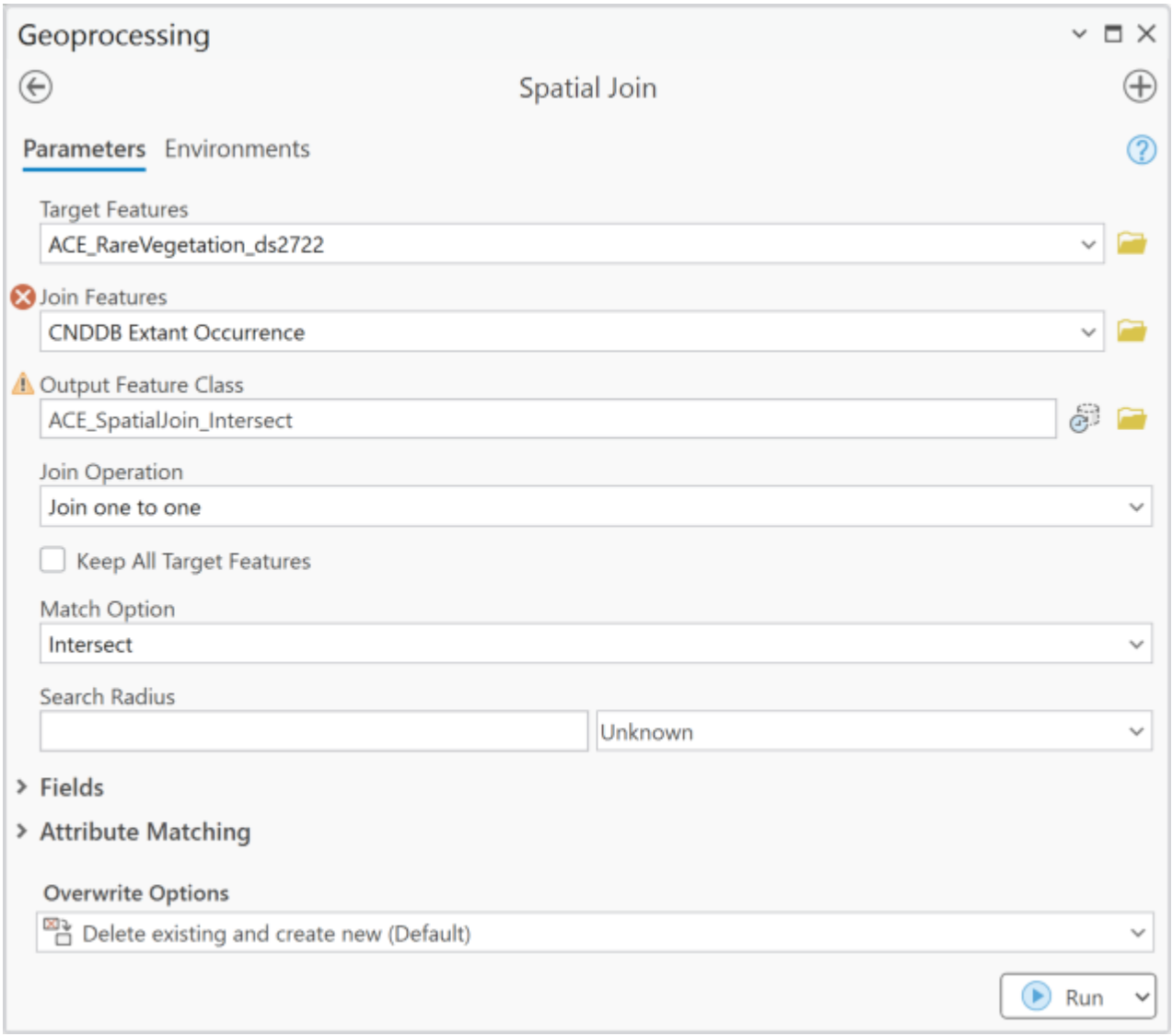

Figure 4. Setup of the *Spatial Join* tool used to select the ACE hexagons within the species range.

The *Pairwise Dissolve* tool was then used to remove all internal boundaries (**Figure 5**):

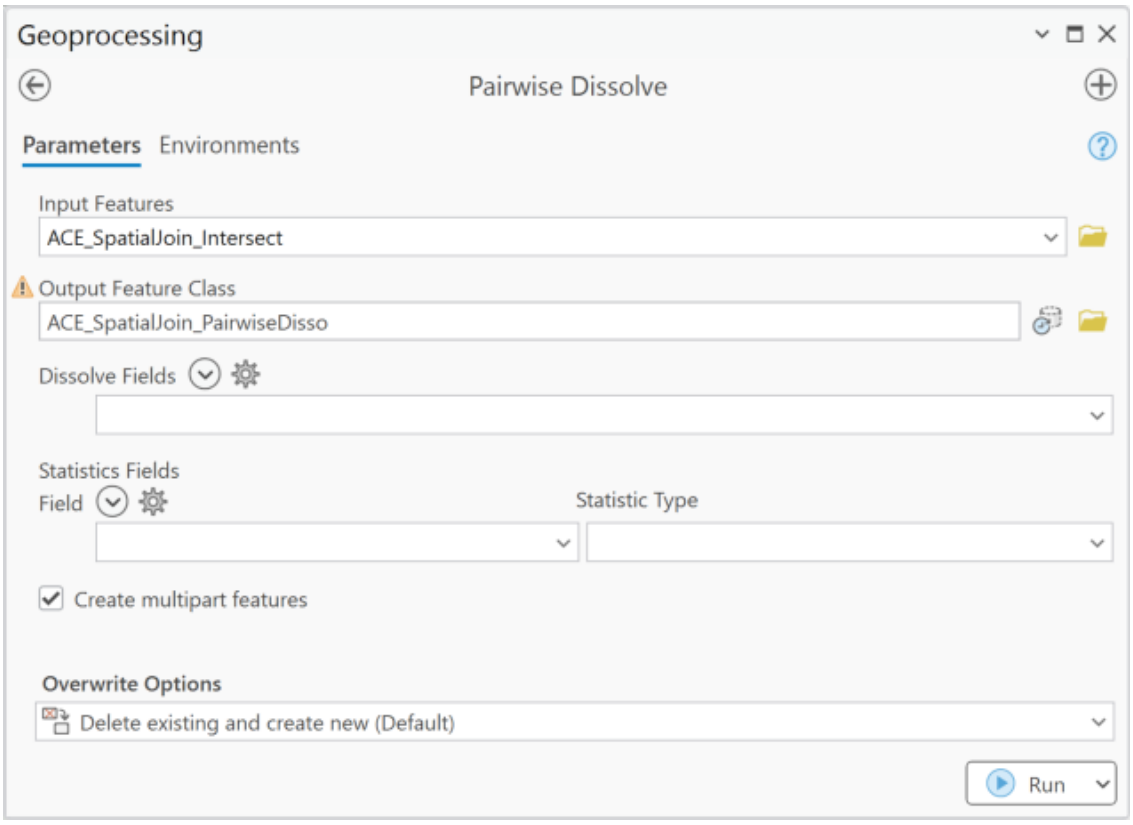

Figure 5. Setup of the *Dissolve* tool to dissolve internal boundaries from the new layer.

A review of this map with known locations overlaid showed all known locations were accounted for within the ACE hexagons. This review also showed that while the ACE hexagons mask the exact location of this species, they are also much more refined than the quad level.

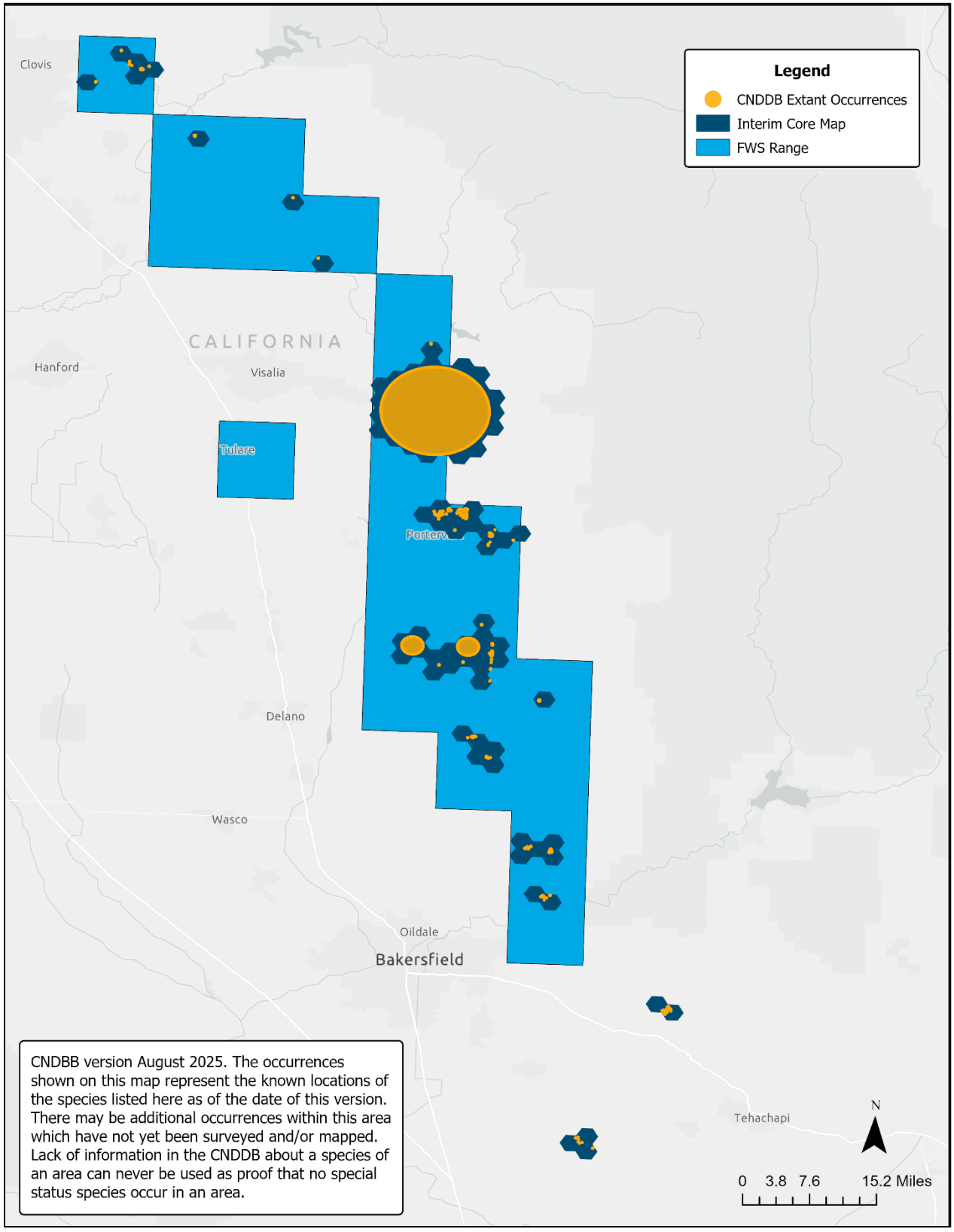

Figure 6. Comparison of the species range, based on quadrangles, interim core map, based on ACE hexagons, and extant occurrences from the CNDDB.

References

FWS, 2007. *5-Year Review: Hartweg's Golden Sunburst (Pseudobahia bahiifolia), San Joaquin Adobe Sunburst (Pseudobahia peirsonii)*. December 2007. Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Service.

FWS, 2023. *5-Year Review: Hartweg's Golden Sunburst (Pseudobahia bahiifolia), San Joaquin Adobe Sunburst (Pseudobahia peirsonii).* August 2023. U.S. Fish and Wildlife Service.