Interim Core Map Documentation for the Salt Marsh Bird's-Beak

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Interim Core Map Developer: U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs

Species Summary

The salt marsh bird's-beak (*Cordylanthus maritimus ssp. maritimus*; Entity ID #678) is a hemiparasitic annual plant found in disjunct coastal salt marshes of southern and central California and adjacent northern Baja California, Mexico (FWS, 2009). Plants have naturally patchy distributions in sites subject to only higher tidal influxes in coastal salt marshes (FWS, 2009). Historically, its range included inland salt marsh habitats in Los Angeles, San Bernardino, and San Diego Counties as well as more coastal salt marshes than it occupies today (FWS, 2009). The salt marsh bird's-beak was listed as endangered under the Endangered Species Act (Act) in 1978 and the State Endangered Species Act (CESA) in 1979 (FWS, 2009).

Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the salt marsh bird's-beak is based on extant counties, suitable habitat, and occurrence data.

Figure 1 depicts the resulting interim core map for the salt marsh bird's-beak. The size of this core map is approximately 5240 acres. Landcover categories within the core map area are included in **Table 1**. Landcover within the core map is predominantly emergent herbaceous wetlands, which is consistent with the habitat of this species.

The core map developed for salt marsh bird's-beak is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the salt marsh bird's-beak. This core map incorporates information developed by U.S. Fish and Wildlife Service (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" (3) best professional judgment classification to describe major uncertainties/limitations. The map is based on the range described by FWS with areas removed based on the biological needs and known locations of the species. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

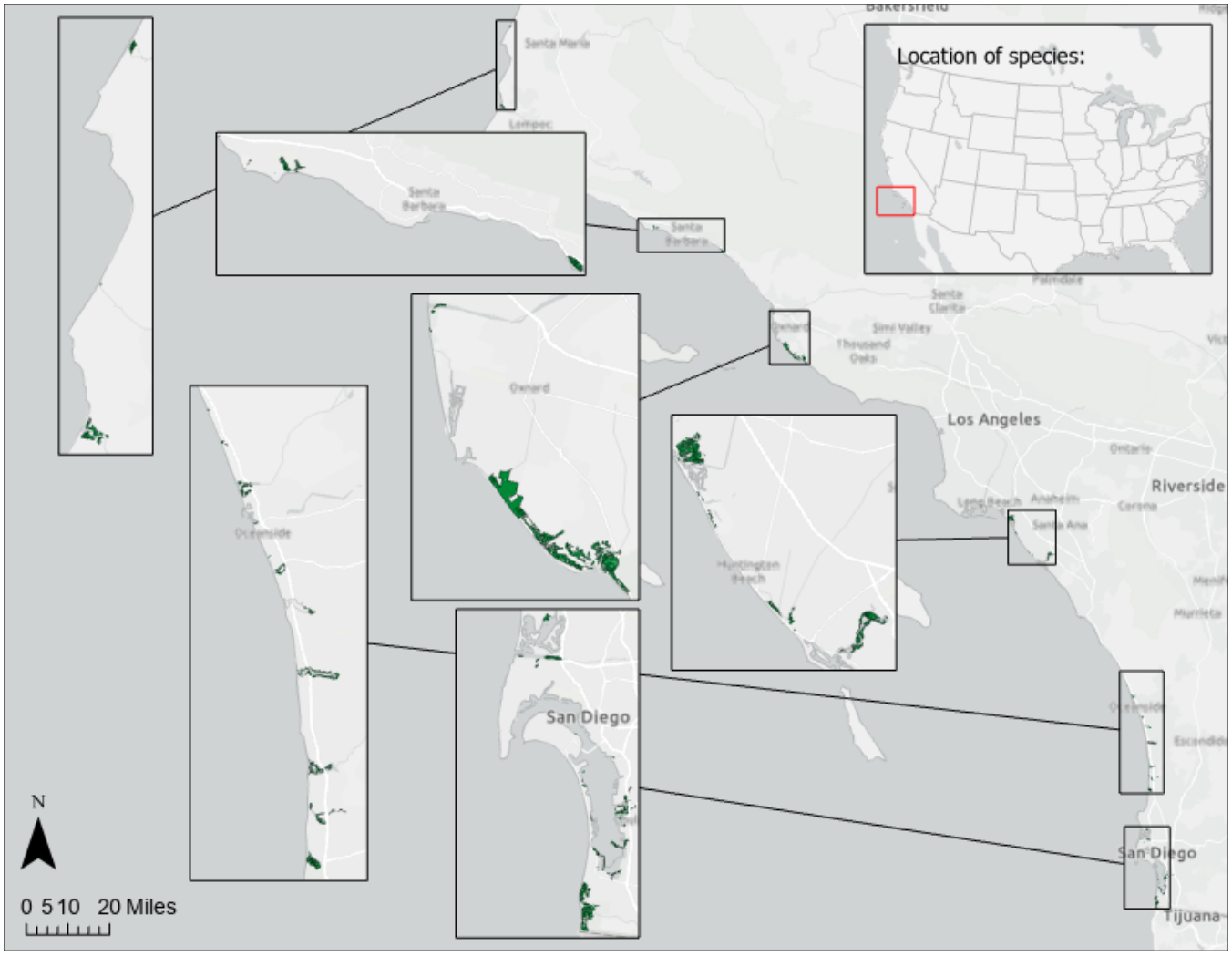

Figure 1. Interim core map for the salt marsh bird's-beak. Total acreage of core map is approximately 5240 acres.

Table 1. Percentage of Interim Core Map Represented by National Land Cover Database (NLCD) 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%
Forestry	Evergreen Forest (42)	0%	0%
Forestry	Mixed Forest (43)	0%	0%
Agriculture	Pasture/Hay (81)	2%	2%
Agriculture	Cultivated Crops (82)	0%	2%
Mosquito adulticide, residential	Developed Open Space (21)	3%	19%
Mosquito adulticide, residential	Developed Low Intensity (22)	8%	19%
Mosquito adulticide, residential	Developed Medium Intensity (23)	6%	19%
Mosquito adulticide, residential	Developed High Intensity (24)	2%	19%

Example pesticide use sites/types	NLCD Class/Value	% Area	Total area for landcover type
Invasive species control	Woody Wetlands (90)	1%	80%
Invasive species control	Emergent Herbaceous Wetlands (95)	59%	80%
Invasive species control	Open Water (11)	14%	80%
Invasive species control	Grassland/Herbaceous (71)	4%	80%
Invasive species control	Shrub/Scrub (52)	1%	80%
Invasive species control	Barren Land (31)	1%	80%
Total Acres	Interim Core Map Acres	~ 5240	

Evaluation of Known Location Information

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

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

EPA evaluated these five sets of data before selecting the type of and developing the core map. CNDDB appeared to have the finest resolution of the location information, which was consistent with FWS documentation (FWS, 2009; FWS, 2020). 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.

Approach Used to Create Core Map

EPA compiled available information for the salt marsh bird's-beak from FWS, as well as observation information available from various publicly available sources (including the California Natural Diversity Database, iNaturalist, NatureServe, and GBIF). The information compiled for the salt marsh bird's-beak is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- FWS (2013) states that the salt marsh bird's-beak occurs only in tidal salt marshes, usually near or in the high marsh zone (Eicher, 1987)

EPA used this information to identify the core map type, which included suitable habitat and known location information. The extant populations are located near or within salt marshes. Therefore, EPA based the core map on the wetland types within the species range. A known location was located just outside of the species range. These locations were added to the core map by including the named location in which the species occurs.

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 all were accounted in the core map. When this was verified, known locations were removed from the final map. **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 using the species range as the core map, however, not only did it include large areas where there were no known locations or suitable habitat, it also did not account for all known locations. EPA also considered using the USA Wetlands layer to refine the species range by accounting for all estuaries and marshes; however, this approach included area that was far removed from where the known locations occurred.

Appendix 1. Information Compiled for Species

1. **Recent FWS Documents/Links**
   Salt Marsh Bird's-Beak Recovery Plan (1985)
   Salt Marsh Bird's-Beak 5-Year Review (2009)
   Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (2013)
   Salt Marsh Bird's-Beak 5-Year Review (2020)

2. **Background Information**
   - **Status:** Federally listed as endangered on October 29, 1978

   - **Taxonomy**
     Kingdom: Plantae
     Subkingdom: Viridiplantae
     Infrakingdom: Streptophyta
     Superdivision: Embryophyta
     Division: Tracheophyta
     Subdivision: Spermatophytina
     Class: Magnoliopsida
     Superorder: Asteranae
     Order: Lamiales
     Family: Orobanchaceae
     Genus: Chloropyron Behr
     Species: Chloropyron maritimum (Nutt. ex Benth.) A. Heller – saltmarsh bird's-beak
     Subspecies: Chloropyron maritimum ssp. maritimus Nutt. ex Benth. – saltmarsh bird's-beak

   - **Resiliency, Redundancy, and Representation**
     - Not discussed explicitly in the FWS documents reviewed but can be inferred as low.

   - **Life History**
     - **Habitat**
       FWS (2013) states that the salt marsh bird's-beak occurs only in tidal salt marshes, usually near or in the high marsh zone (Eicher, 1987). The salt marsh bird's-beak is usually most abundant in marsh sites of relatively improved drainage along tidal creek banks and natural levees, cliffed banks of salt pans, alluvial fans at the edges of salt marshes, and stabilized sand deposits in the upper intertidal zone. It is found on sandy marsh substrates with relatively sparse, short salt marsh vegetation, and is usually absent or declining in dense, tall salt marsh vegetation (Kelly and Fletcher, 1994; Parsons and Zedler, 1997).

     - **Biology**
       FWS (2009) states that the salt marsh bird's-beak are hemiparasitic (deriving some of their physiological needs from a host plant) halophytes (a plant tolerating or thriving in alkaline soils). Most plants can manufacture food in their green, photosynthetic tissues, while absorbing water and dissolved nutrients through their roots. Parasitic plants that require host plants to fulfill both functions are termed holoparasites while those that have green photosynthetic tissues and only require hosts to facilitate uptake of water and dissolved nutrients are termed hemiparasites. Species of Chloropyron fall into this latter category. Both holoparasites and hemiparasites secure their nutrition from their host plants through

special structures called haustoria. The roots of salt marsh bird's-beak seedlings establish haustorial connections to host plants to acquire water and dissolved nutrients from host plants.

FWS (2009) goes on to state that all parasitic plants are inherently limited in their geographical and ecological distribution by the distribution of their host plants. Under laboratory conditions, the salt marsh bird's-beak has been found capable of forming haustorial connections to:

- *Distichlis spicata* (saltgrass),
- *Polypogon monspeliensis* (annual beard grass),
- *Salicornia virginica* (pickleweed),
- *Jaumea carnosa* (fleshy jaumea), and
- *Helianthus annuus* (sunflower)

Other plant taxa may serve as hosts for the salt marsh bird's-beak in the field.

- **Pollination**
  FWS (2020) states that several salt marsh bird's-beak pollinator studies have been conducted at Naval Base Ventura County (NBVC) Point Mugu since the 2009 review:

  1. In 2016, observed two bee taxa were observed (*Anthidium edwardsii* and *Melissodes tepida timberlakei*) using the salt marsh bird's-beak at NBVC Point Mugu. They also surveyed pollinators in adjacent upland habitat, and conducted a plant-pollinator network study to identify which plant and pollinator species interacted at the site. Two upland plant species—*Phacelia distans* and *Acmispon glaber*—attracted pollinators most similar to the salt marsh bird's-beak and may be desirable plants for upland habitat restoration.

  2. During separate 2017 pollinator surveys at Point Mugu, two salt marsh bird's-beak pollinators were observed: metallic sweat bees (Lasioglossum subgenus Dialictus sp.) and longhorned bee (Melissodes sp.) (NBVC Point Mugu 2018a, p. 6).

  3. In 2017, the 2016 survey was repeated at Point Mugu. One taxa (Bombus sonorus) was seen that was not observed in 2016. Two additional bee taxa were observed using the salt marsh bird's-beak that was not seen in 1985 or 2016: Ceratina sp. and Hylaeus sp. At Carpinteria Salt Marsh, they observed another pollinator taxon (Agapostemon sp.) using the salt marsh bird's-beak.

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

- **Threats**
  - According to FWS (2020), the primary threat to the salt marsh bird's-beak was the loss of coastal salt marshes at the time of listing. While urbanization is no longer considered a major threat to the species, development of the surrounding coastal wetlands interacts with other threats. These include: altered hydrology and climate change. Nonnative plants are considered a moderate threat. Other threats of less magnitude include: unauthorized off highway vehicle usage, predation, foot traffic/trampling, dune encroachment.

- **Recovery Criteria**
  - FWS (2020) discusses downlisting and delisting criteria for this species:
    1. *Downlisting criteria:* 15 acres of secured and protected high marsh habitat at appropriate elevation is required at a minimum of eight marshes for a period of at least five consecutive years.
    2. *Delisting criteria:* 20 acres of secured, protected, and managed high marsh habitat at appropriate elevation is required at each of the 12 major marshes within the historical range of the plant for a period of at least 10 years

  - FWS (2020) states that the salt marsh bird's-beak has been continuously present for at least five years at eight of nine marshes, however, only seven marshes contain at least 15 acres. Additionally, the high marsh habitat is not considered sufficiently secure and protected due to threats from sea level rise.

3. Description of the Species Range

FWS (2020) states that at the time of listing, the historical range of the salt marsh bird's-beak was considered to extend from Santa Barbara County to San Diego County, and south into northern Baja California, Mexico (**Figure 3**).

The salt marsh bird's-beak is currently extant at nine coastal marsh complexes across the species' range. Seven marsh complexes are in the United States (Morro Bay, Carpinteria Salt Marsh, Ormond Beach/Mugu Lagoon, Upper Newport Bay, San Diego River Mouth, San Diego Bay (including Sweetwater Marsh) and Tijuana Estuary. Two marsh complexes are in Baja California, Mexico: Estero Punta Banda, and Bahía de San Quintín (**Figure 3**) (FWS, 2020).

FWS (2020) states that the salt marsh bird's-beak was introduced at the Huntington Beach Wetlands in 2015 and 2016. Plants were reported in three subsequent years (2017, 2019, and 2020) and are reproducing and dispersing on site. However, the location is not yet considered an established population and additional monitoring is needed. So, although salt marsh-bird's beak currently occurs at Huntington Beach Wetlands, FWS didn't include this site in their count of extant marshes.

Figure 2. Species range downloaded from ECOS. The species range encompasses approximately 1,228,633 acres (1,919 square miles).

Figure 3. Current range of the salt marsh bird's-beak, showing the nine coastal marsh complexes where the subspecies is considered extant. Taken from FWS (2020).

4. Critical Habitat

FWS has not designated a critical habitat for this species.

5. Additional Known Locations

- **iNaturalist**
  - Searched on 6/3/2025
  - 879 research grade and verifiable observations made between July 2010 – June 2025
  - iNaturalist observations included multiple subspecies
    - *Chloropyran maritimum maritimum*
    - *Chloropyron maritimum palustre*
    - *Chloropyron maritimum canescens*
  - iNaturalist observations included atypical locations for the salt marsh bird's-beak, including Utah, Nevada, and Oregon. These locations do not align with the documentation provided by FWS and are likely a subspecies. As such, the core map was not expanded to include locations outside of California.

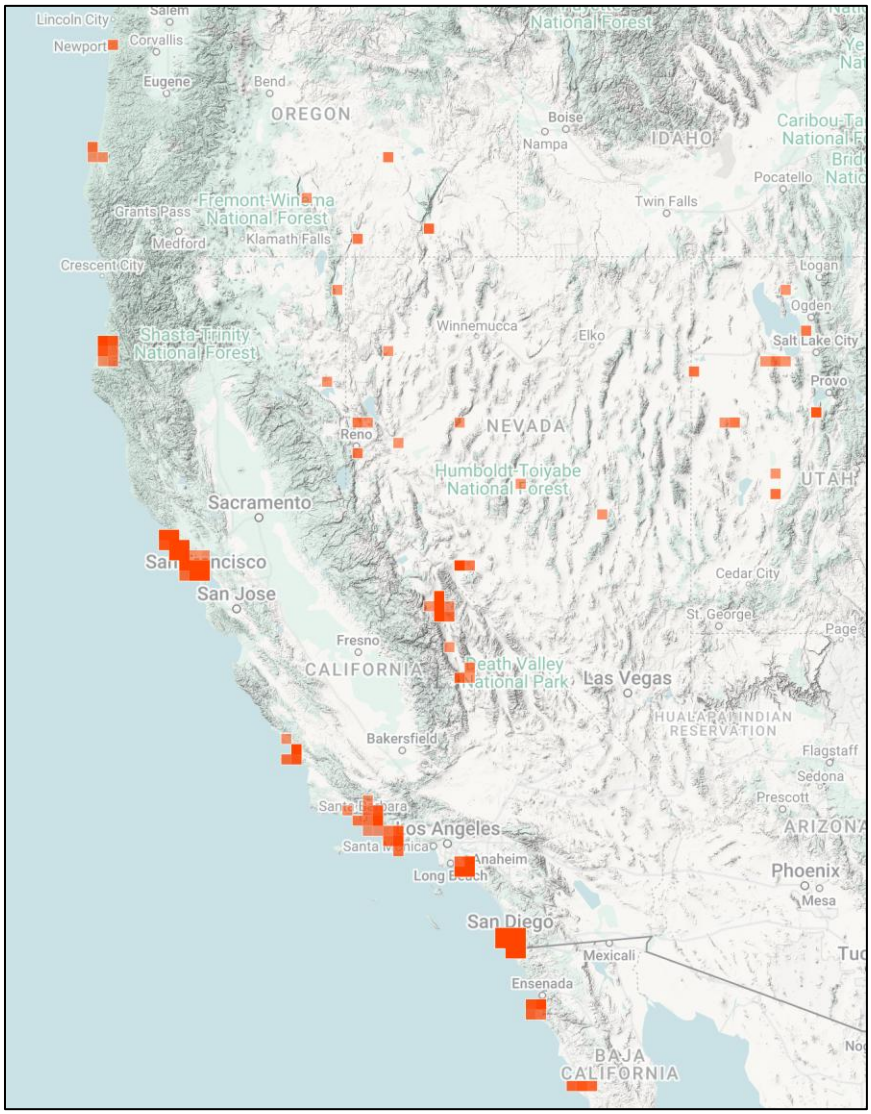

Figure 4. Screenshot of observations of the salt marsh bird's-beak in iNaturalist

- **GBIF**
  - Searched on 6/3/2025
  - 7 observations made between 2010 –2025
  - None of the occurrences included coordinates
  - All were replicates of NatureServe observations

- **NatureServe**
  - Searched on 6/3/2025
  - Observations were consistent with other datasets.

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

EPA developed the interim core map by refining the species range based on where salt marshes and known locations occur within the. CNDDB data were considered and compared to the range and named locations. A named location was added to the core map to account for a known location occurring outside of the salt marsh refinement.

1. **Datasets and Software**

   Datasets used:

   1.1. FWS species range

   1.2. North America Blue Carbon Salt Marsh

   1.3. Ormond Beach

   1.4. California Department of Forestry and Fire Protection: California County Boundaries

   1.5. Occurrences from California Natural Diversity Database, information downloaded 6/2025

   Software used: ArcGIS Pro, version 3.5.1

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 outer extent of the core map. As discussed in Appendix 1, FWS have not designated a critical habitat for this species.

   2.2. Refining species range based on suitable habitat

   A review of FWS's documentation discovered a key aspect of the suitable habitat for this species, which is:

   - FWS (2013) states that the salt marsh bird's-beak occurs only in tidal salt marshes, usually near or in the high marsh zone (Eicher, 1987)

   Additionally, the known locations from the CNDDB, which were the basis for FWS's documentation showed that the species only occurred in a subset of the counties within the range: Ventura, Santa Barbara, Orange, and San Diego

   Therefore, the California counties was refined to select these four counties within the species range. Similarly, the Salt Marsh layer was used to select areas where salt marshes occur.

   The known locations of the species was then overlaid to determine whether all were captured on the map. One known location existed outside of the map: Elemental Occurrence 24. The attribute table for this EO discussed the location data, stating it occurred within Ormond Beach. A layer outlining Ormond Beach was found, visually reviewed to ensure it was appropriate, and then added to the coremap.

3. **GIS Process Used**

   3.1. Refined CNDDB known occurrences to ensure all are extent

   A review of the 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* (**Figure 5**).

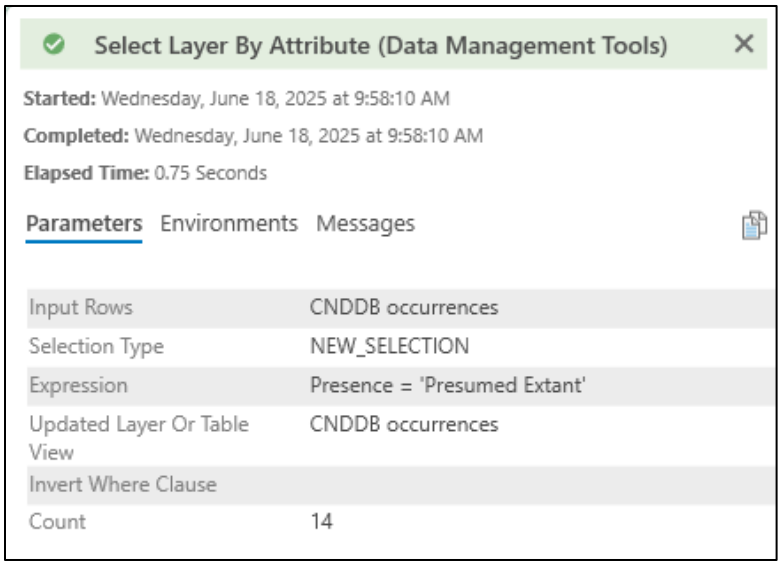

Figure 5. Setup of the Select Layer by Attribute tool used to refine the CNDDB occurrence to those that are presumed extant.

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 range known locations occur. This showed that no known locations occurred north of Naples, California. Additionally, several known locations occurred outside of the species range south of Port Hueneme and north of La Jolla Nature preserve.

3.3. Refining California County layer

Based on the findings in **Section 3.2**, it was determined that the salt marsh bird's-beak is only found in Ventura, Santa Barbara, Orange, and San Diego counties. These areas were selected from the California County layer with the following steps:

Use the *Select Layer by Attribute* tool to select the counties where the salt marsh bird's-beak is known to occur (**Figure 6**).

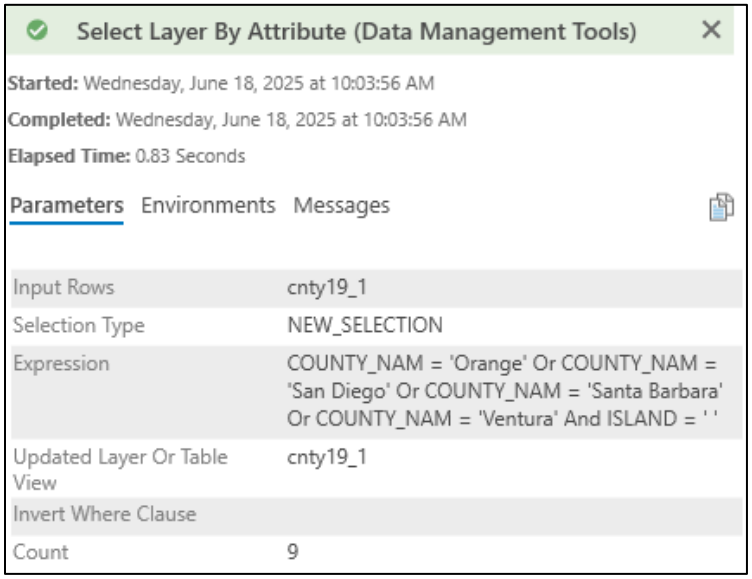

Figure 6. Setup of the *Select Layer by Attribute* tool used to select the California counties where the salt marsh bird's-beak exists.

Use the *Export Features* function to create a new layer of only the counties where the species occurs (**Figure 7**):

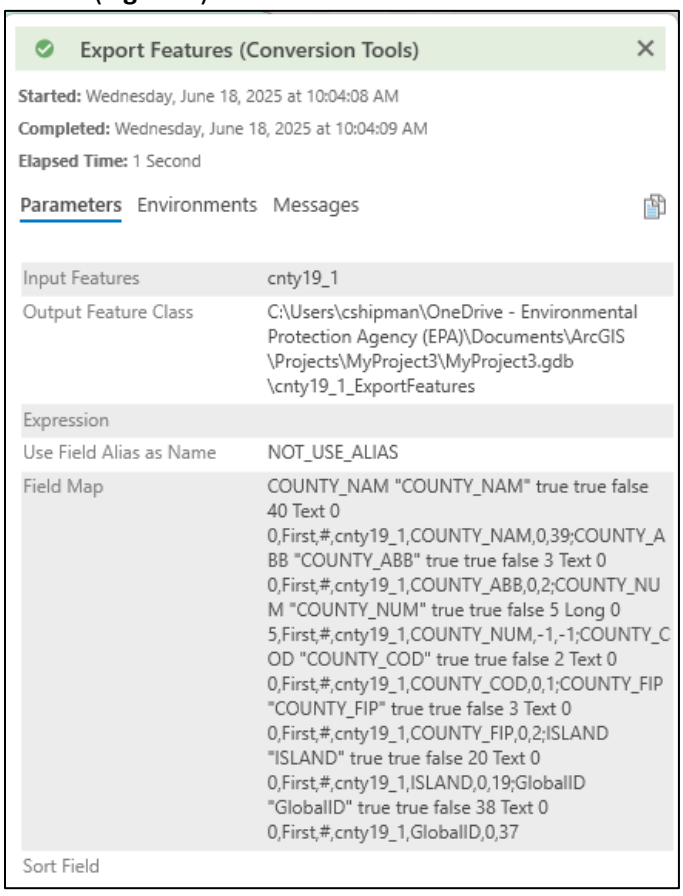

Figure 7. Set up of the *Export Features* tool used to export the selected counties into a new layer.

Use the *Dissolve Boundaries* tool to remove all internal boundaries of the four counties (**Figure 8**):

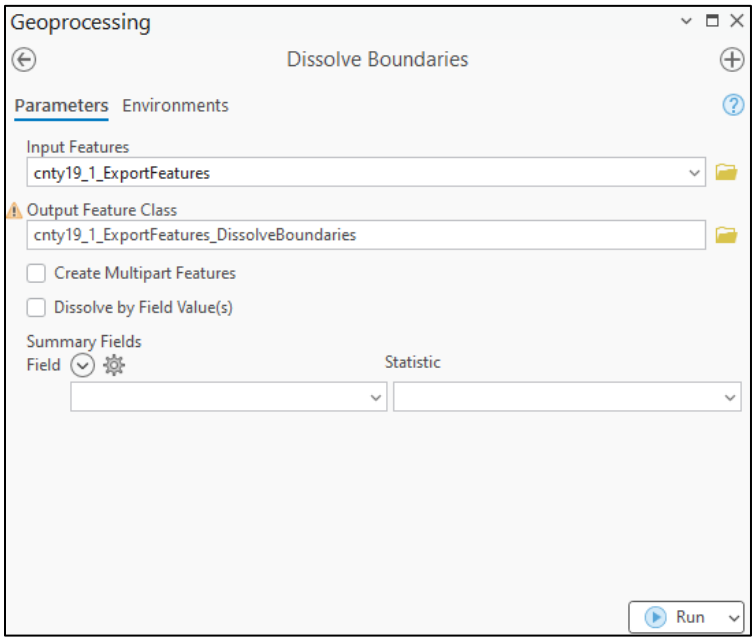

Figure 8. Setup of the *Dissolve Boundaries* tool to dissolve internal boundaries from the new county layer.

Use the *Pairwise Clip* tool to clip the North American Salt Marshes layer to the counties the species is none to occur in (**Figure 9**):

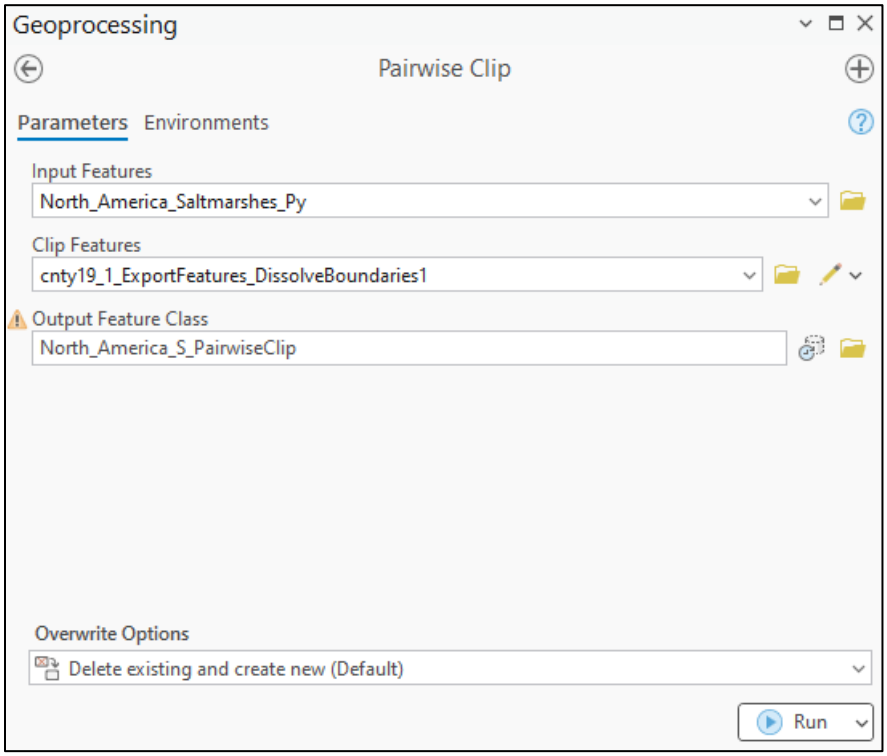

Figure 9. Setup of the *Pairwise Clip* tool used to refine the North American Salt Marsh layers to those that occur within the four counties where the species is known to exist.

A review of this map with known locations overlaid showed one known location was not either within nor adjacent to the map. A review of the metadata for the known occurrence stated that it occurred within a named place: Ormond Beach. Therefore, an Ormond Beach layer was searched for and found. Since it was not from a known source (*ex.* Living Atlas), it was reviewed to ensure it seemed appropriate. Once that was determined, the *Merge* tool was used to add this location to the map (**Figure** 10).

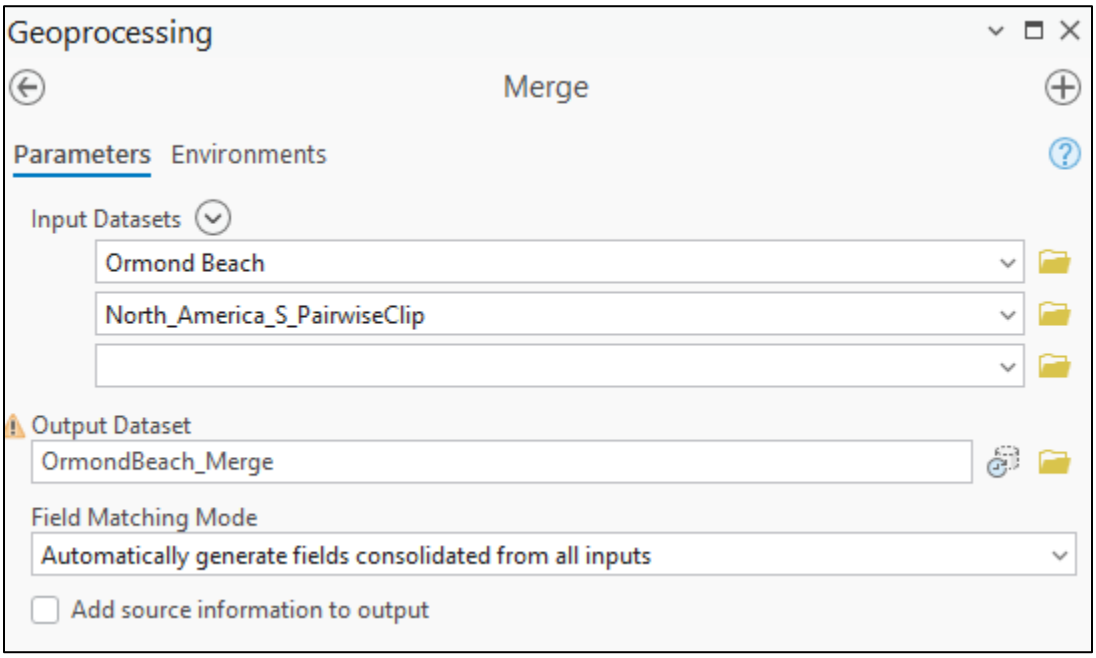

Figure 10. Setup of the *Merge* tool used to combine the clipped North American Salt Marsh layer with Ormond Beach.

With this addition, all known locations and suitable habitats within the four counties where the salt marsh bird's-beak occurs is included in the coremap.

References

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