

Core Map Documentation for the Conservancy Fairy Shrimp

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Draft Interim Core Map Developer: Center for Biological Diversity

Species Summary

The Conservancy fairy shrimp (*Branchinecta conservatio*, Entity ID 490) is a freshwater crustacean found in the Central Valley of California. The U.S. Fish and Wildlife Service (FWS) designated critical habitat for the Conservancy fairy shrimp in 2006. As of 2024, there are 10 extant populations of the Conservancy fairy shrimp that inhabit vernal pools and other seasonal wetlands in the Valley. They spend most of their life as eggs or cysts in the dry sediment at the bottom of the vernal pools. The shrimp emerge and become active during wet periods when their vernal pools become inundated and feed mostly on detritus or other small animals in the pool. Their vernal pools historically existed throughout the Central Valley, but most have been lost to agricultural development and disruptions to natural flooding in the Valley. Additional information on the species is provided in **Appendix 1**.

EPA Review Notes

The developers created this core map using the U.S. Environmental Protection Agency's (EPA) process available at: <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas>. EPA reviewed the draft interim map and documentation and evaluated if: (1) the map and documentation are consistent with the agency's process; (2) areas included or excluded from the interim core map are consistent with the biology, habitat, and/or recovery needs of the species; (3) data sources are documented and appropriate; and (4) the GIS data and mapping process are consistent with the stated intention of the developer. EPA agrees that this map is a reasonable depiction of core areas for this species and was consistent with the agency's mapping process. This documentation was not prepared by EPA, but EPA may have edited this documentation for clarity or other purposes. Some views in this documentation may not necessarily be the views of EPA or its staff.

The core map developed for this species is considered interim and can be used to develop pesticide use limitation areas (PULAs). 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 core map does not replace or revise any range or designated critical habitat developed by FWS.

Description of Core Map

The core map is based on a combination of critical habitat and biological information of the species' known locations. There are six geographically isolated areas that are considered occupied with a total of

10 extant populations (see Figures A1-4).¹ This species relies on vernal pools in California that have a distribution that is reasonably well understood and mapped. The combination of critical habitat, areas of public lands with current populations, and generalized locations of vernal pools that are considered occupied by the Conservancy fairy shrimp constitute the basis for the core map.

Figure 1 depicts the resulting interim core map for the Conservancy fairy shrimp. The size of this core map is approximately 213,100 acres. Landcover categories within the core map area are included in **Table 1**. Landcover is predominantly grassland/herbaceous, shrub/scrub, and emergent herbaceous wetlands.

This interim core map has an “average” (3) best professional judgment classification to describe uncertainties/limitations. The map is based on the range and critical habitat described by FWS, with areas removed based on the biological needs of the species. Known locations described by FWS and CNDBB were also added. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

¹ FWS 2024 p. 25

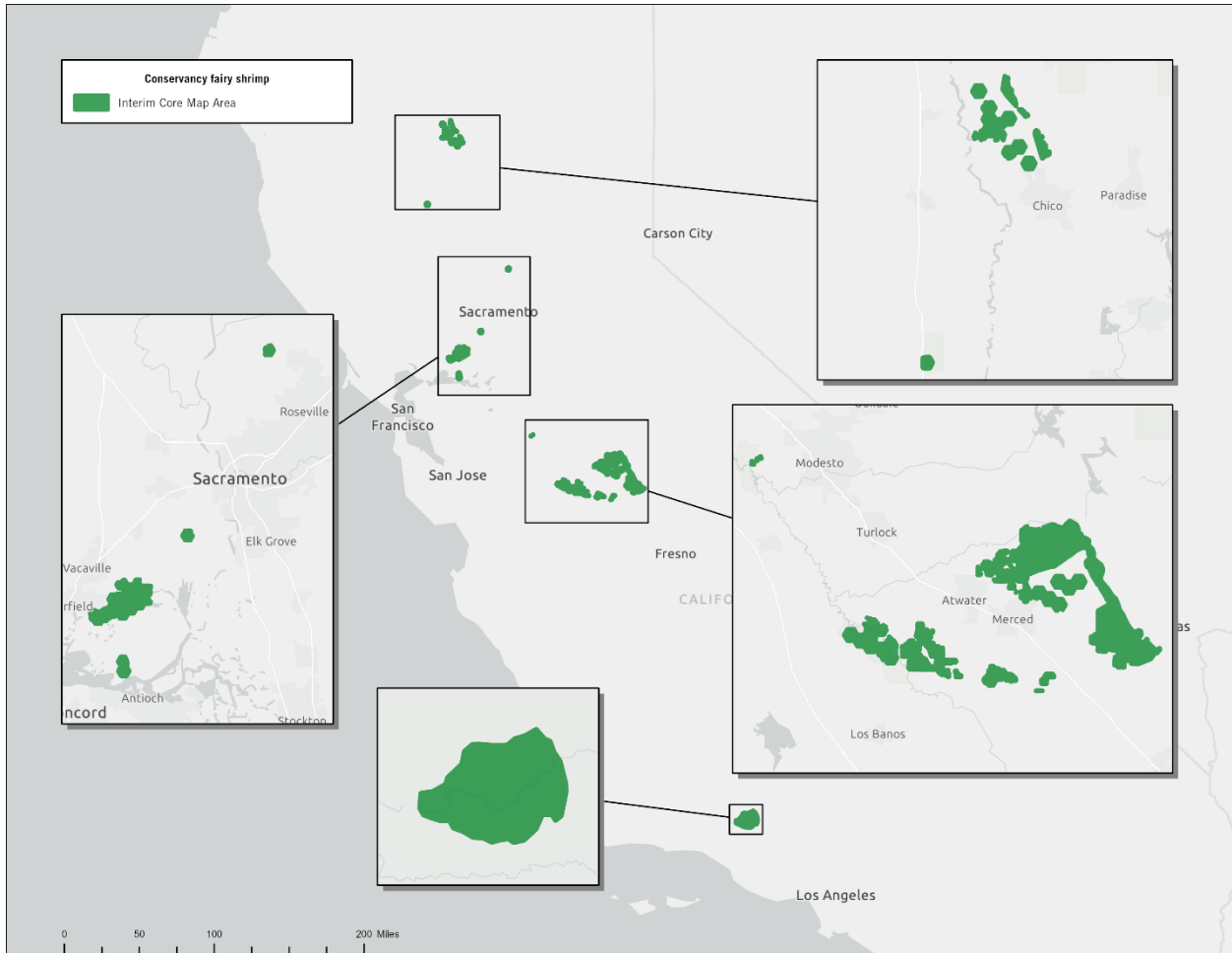


Figure 1. Conservancy fairy shrimp interim core map.

Disclaimer: California Natural Diversity Database (CNDDDB) version 07/2025. Please Note: The occurrences shown on this map represent the known locations of the species listed here as of the date of this version. There may be additional occurrences or additional species within this area which have not yet been surveyed and/or mapped. Lack of information in the CNDDDB about a species or an area can never be used as proof that no special status species occur in an area.

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 Landcover (Value)	% Area	% area for landcover type
Forestry	Deciduous Forest (41)	0	3.5
Forestry	Evergreen Forest (42)	3.5	3.5
Forestry	Mixed Forest (43)	0	3.5
Agriculture	Pasture/Hay (81)	.1	2.9
Agriculture	Cultivated Crops (82)	2.8	2.9
Mosquito adulticide, residential	Open space, developed (21)	1.1	1.6
Mosquito adulticide, residential	Developed, Low intensity (22)	.4	1.6
Mosquito adulticide, residential	Developed, Medium intensity (23)	.1	1.6
Mosquito adulticide, residential	Developed, High intensity (24)	0	1.6
Invasive species control	Woody Wetlands (90)	.3	91.7
Invasive species control	Emergent Herbaceous Wetlands (95)	6.4	91.7
Invasive species control	Open water (11)	.3	91.7
Invasive species control	Grassland/herbaceous (71)	67.7	91.7
Invasive species control	Scrub/shrub (52)	16.9	91.7
Invasive species control	Barren land (rock/sand/clay; 31)	.1	91.7
Total Acres	Interim Core Map Acres	213,100 acres	

Evaluation of Known Location Information

There are six datasets with known location information:

- Descriptions of locations provided by FWS;
- Occurrence locations in California Natural Diversity Database (CNDDDB);
- Occurrence locations in California Department of Fish and Wildlife (CDFW) vernal pools database;
- Occurrence locations in iNaturalist;
- Occurrence locations in NatureServe; and
- Occurrence locations in the Global Biodiversity Information Facility (GBIF).

Six sources of known location information were evaluated.

- General occurrence information and survey results presented in the FWS 2024 5-year review
Comment: The FWS (2024) presents general descriptions of 10 areas that are considered to have extant populations of the Conservancy fairy shrimp. The occupied areas are presented as areas of public lands or lands with a conservation agreement. The review presents location information as points (**Figures A1-4**) that are associated with the names of general areas or preserves. The general occupied areas based on named areas of public or protected lands were fully included in the core map. This location information presents the most up to date data on the species and is much more refined than the ECOS range map for the species.

- California Department of Fish and Wildlife (CDFW) vernal pools geodatabase
Comment: Vernal pools are an Area of Conservation Emphasis for the CDFW and have received special attention that has resulted in a statewide geodatabase² of the known locations of vernal pools that can be filtered for the presence of the Conservancy fairy shrimp. The geodatabase presents hexagonal regions with occupied vernal pool(s) located somewhere within the hexagonal area. This dataset was produced and verified by the CDFW and presents a reliable source of location information for the Conservancy fairy shrimp that is supplemented to or helps refine locations presented in the FWS 2024 5-year review.

- California Natural Diversity Database (CNDDDB)
Comment: CNDDDB presents 57 occurrences dated from 1981 to 2023. Of these, 32 could be considered recent (newer than 2010). This dataset presents spatial information for occupied pools at various spatial scales. This dataset contains most, but not all, of the locations that were surveyed as described in FWS (2024). This source of information is referenced in FWS documents and is considered very reliable.

- Occurrence data in iNaturalist, NatureServe, and GBIF were also searched and results presented in **Appendix 1**.

² <https://gis.data.ca.gov/search?q=vernal%20pool>

Approach Used to Create Core Map

The core map for the Conservancy fairy shrimp was based on critical habitat, as well as known occupied areas identified by CNDDDB, and occupied hexagonal areas identified by the CDFW in their vernal pool geodatabase.

Evaluation of available data from CNDDDB and CDFW identified named areas of public or conserved lands and occupied hexagonal areas from the vernal pool dataset were both necessary to capture all currently occupied areas for the Conservancy fairy shrimp.

Critical habitat areas are all considered currently occupied and were added to the core map.

The core map was further expanded to include hexagonal areas from the CDFW vernal pool data layer. The vernal pool data layer was filtered to only include hexagonal areas with current known locations based on a query of the CNDDDB. If a hexagonal area had an occurrence of the Conservancy fairy shrimp, then the entire hexagonal area was included.

Using EPA's cultivated lands layer, we removed areas that were considered cultivated. Neither the Recovery Plan (FWS 2005) nor the 5-year review (FWS 2024) indicate that the Conservancy fairy shrimp can survive in cultivated fields once they are established.

Considering the available location information includes critical habitat and other occupied areas of varying precisions we judge the uncertainty score of this core map to be 3. Substantial additional areas were added to the core map outside of the critical habitat to expand the core map. Locations of occupied pools were available through the CDFW's vernal pool geodatabase, but with limited precision. No habitat modeling was required.

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

Range Map Approach for Core Map

- A core map based on the species range was rejected because the ECOS range map is overly broad and contains large areas of unoccupied habitat. The FWS 2024 5-year review shows that the extant range does not include any areas of the coast range and a much smaller area of the Central Valley.

Critical Habitat Approach for Core Map

- A core map based on critical habitat was rejected because, of the known populations, only a subset is in the designated critical habitat.

Habitat Modeling Approach for Core Map

- A core map based on modeled habitat was rejected because sufficient location information was available to describe the known locations. There is no preexisting habitat model for the Conservancy fairy shrimp.

Other sources of information reviewed but not included

- Location information from the CNDDDB was evaluated, but these locations were not included in the core map. The CNDDDB data included only a subset of currently occupied areas and 32 could be considered as recent observations. The Center has also made a conscious effort to not rely on CNDDDB data to create core maps when other data is available. Sharing CNDDDB data on Bulletins Live Two has not been cleared under the terms of use of CNDDDB data. The vernal pool dataset was judged to be of adequate resolution to form the basis of the core map.

Appendix 1. Information compiled for species during Step 1

1. Recent FWS documents

[2005 Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon](#)

[2006 Critical Habitat Designation](#)

[2024 Vernal Pool Shrimps 5-Year Review](#)

2012 Conservancy fairy shrimp (*Branchinecta conservatio*) [5-year Review](#)

2007 Conservancy fairy shrimp (*Branchinecta conservatio*) [5-year Review](#)

Background information

- **Status:** Federally listed as endangered in 1994
- **Taxonomy:** freshwater invertebrate
The Conservancy fairy shrimp (*Branchinecta conservatio*) is classified as a crustacean in the Branchinectidae family (Order:Anostraca). The type locality is at Olcott Lake, in Solano County California. The species name refers to The Nature Conservancy, the organization that is responsible for protecting and managing this and other vernal pool species.³

Taxonomic Hierarchy

Kingdom	Animalia – Animal, animaux, animals
Subkingdom	Bilateria – triploblasts
Infrakingdom	Protostomia
Superphylum	Ecdysozoa
Phylum	Arthropoda – artrópode, arthropods, arthropods
Subphylum	Crustacea Brunnich, 1772 – crustacés, crutáceo, crustaceans
Superclass	Altocrustacea
Order	Anostraca G.O. Sars, 1867 – brine shrimp, fairy shrimp
Suborder	Anostracina
Family	Branchinectidae Daday, 1910
Genus	Branchinecta
Species	Neonympha mitchelly French, 1889 – Mitchell’s Satyr

Figure A1-1. Taxonomy from ITIS.

- **Resiliency, redundancy, and representation (the 3Rs):**
FWS has not formally assessed resiliency, redundancy, or representation in the 2005 Recovery Plan or 2024 5-year review. However, all three can be inferred as low.

“The Conservancy fairy shrimp’s abundance can be considered low based on the number of inhabited pools. The playa pools that support the Conservancy fairy shrimp’s longer lifecycle are rarer than typical vernal pools. The Mariner Ranch, Yolo Bypass, and Los Padres populations of the species are all comprised of only a single pool. Due to the small size and isolated nature of existing populations, the risk of local extinctions is high and opportunities for re-colonization are low.” (2024 5-year review, 27)

- **Habitat, Life History, and Ecology**
 - **Habitat:**
The Conservancy fairy shrimp lives in ephemeral freshwater wetlands such as vernal pools. Conservancy fairy shrimp tend to be found in larger and more turbid vernal pools

³ FWS 2005 p. II-181

called playas that remain flooded for longer periods. The vernal pool habitats are part of complex, ephemeral drainage systems that develop and change during times of heavy precipitation in the winter and spring. The vernal pools are dynamic and harsh ecosystems with highly variable amounts of water followed by drying and long periods of desiccation. The Conservancy fairy shrimp is adapted to this harsh environment by being active and reproduces when water levels are high and lay eggs, or cysts, that remain dormant in the soil at the bottom of the pool or wetland until wet conditions return.⁴

- **Life History:**

“Conservancy fairy shrimp hatch out of tiny cysts within the soil during the first winter rains, and complete their entire life cycle by early summer.” (2012 5-year review, 7)

- **Ecology**

The Conservancy fairy shrimp is a prey species for the vernal pool tadpole shrimp, as well as a variety of insect and vertebrate predator species. (2005 Recovery plan, 240)

- **Diet:**

When active, their diet consists mostly of detritus, but they will opportunistically consume algae, bacteria, protozoa, rotifers, aquatic earthworms, aquatic insects, other fairy shrimp, frog eggs, and tadpoles.⁵

- **Relevant Pesticide Use Sites:**

" Little is known about the relative sensitivity of vernal pool invertebrates to commonly used agricultural pesticides and chemical concentrations. However, research has shown that many commonly used pesticides may result in adverse effects to aquatic invertebrate species." (2012 5-year review, 19)

“We [FWS] believe it is likely that vernal pools containing Conservancy fairy shrimp have been exposed to harmful pesticides to some degree. The current effects of contaminants on this species are not known at this time. Further research and monitoring are necessary to determine the degree that the Conservancy fairy shrimp is threatened by contaminants such as pesticides.” (2012 5-year review, 19)

2. Description of Species Range:

The Conservancy fairy shrimp is endemic to the Central Valley of California. Its habitat is vernal pools, also known as playas. The species is extant in vernal pools from near Chico in the northern part to Merced in the southern part of the Central Valley.

⁴ FWS 2024 p. 12

⁵ Helm BP, Vollmar JE. 2002. Large branchiopods. Wildlife and Rare Plant Ecology of Eastern Merced County's Vernal Pool Grasslands. University of California at Merced:151–190. Page 168.

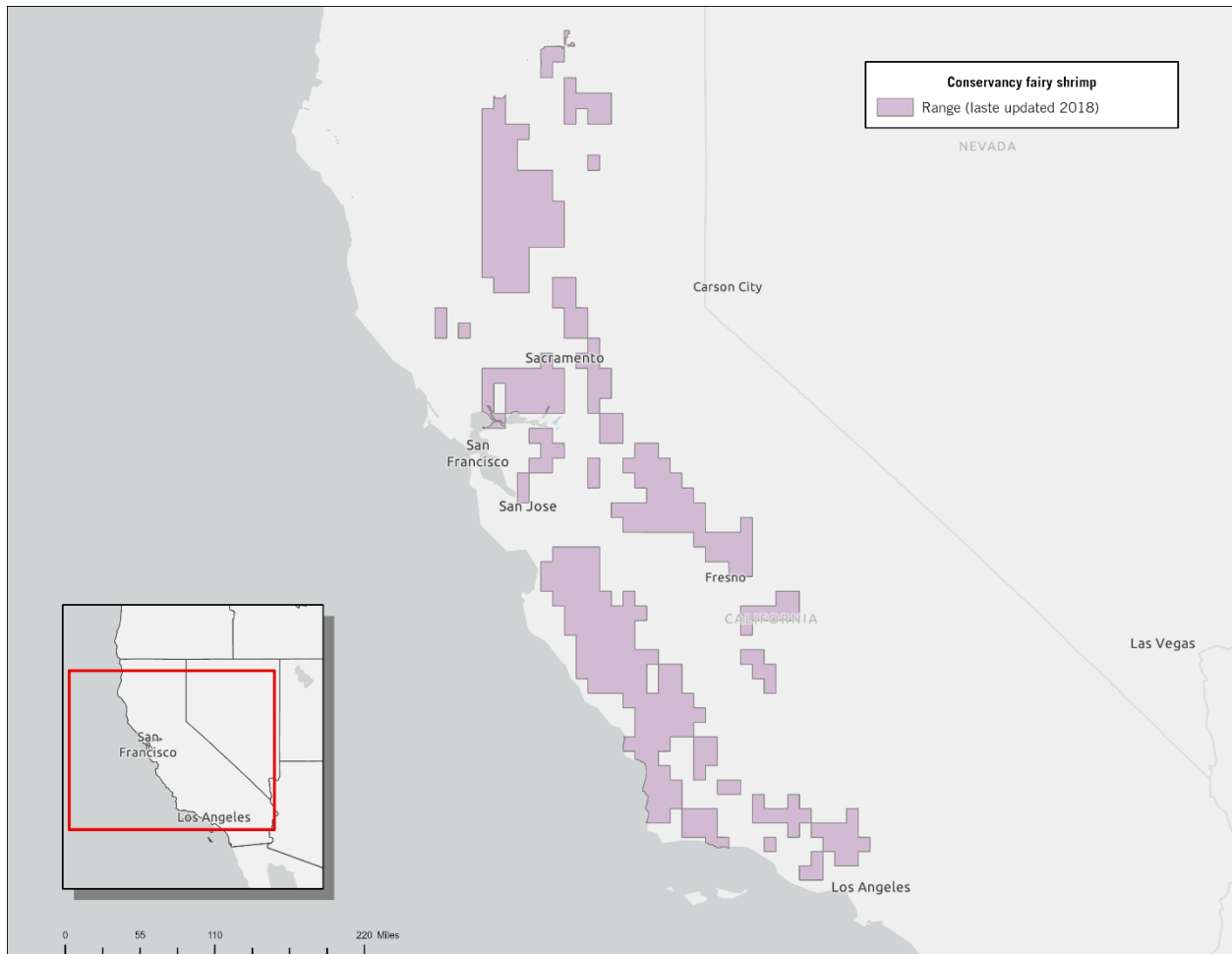


Figure A1-2. FWS range for the Conservancy fairy shrimp from last updated on 03/29/2018 (11,656,017 acres).

3. Critical Habitat:

FWS designated critical habitat for the species in 2006.

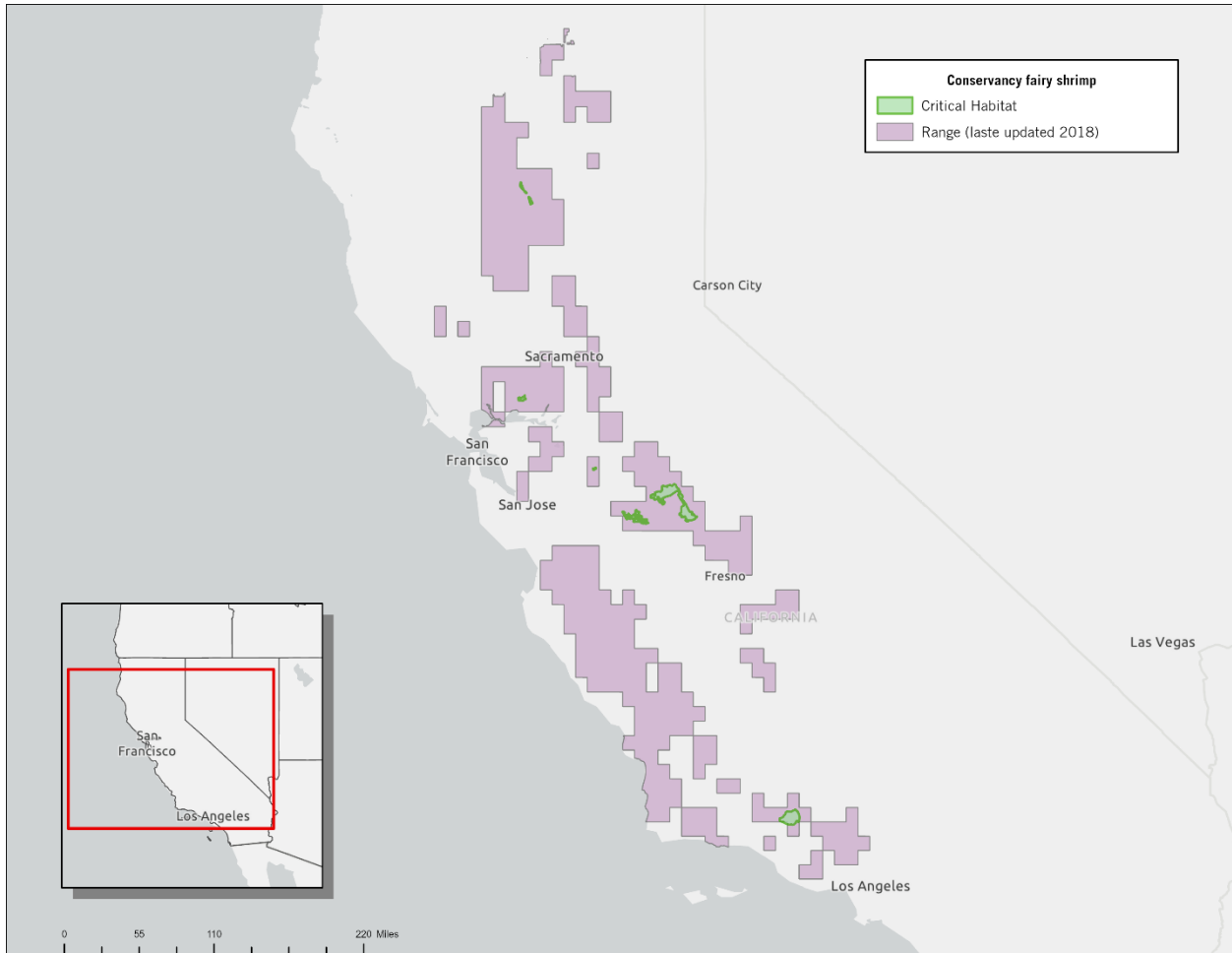


Figure A1-3. Critical Habitat for the Conservancy fairy shrimp. Total acreage of Critical Habitat is approximately 161,786 acres.

4. Known Locations

- **Occurrences Described in FWS Documents**

- As of the 2024 5-Year Review, the FWS identifies Conservancy fairy shrimp as extant in 10 populations across six vernal pool regions (Table A1-1).⁶ Some populations are considered overlapping. The 10 extant populations are depicted in Figure A1-4 are from the 2024 5-year review.

Table A1-1. Extant locations of the Conservancy fairy shrimp. Note that there are more than 10 sites as four were described at listing and now are presumably extirpated.

Place Name	County	Landowner(s) and status of protection ¹	Notes	Extant in 2025
Vina Plains	Southern Tahoma and Northern Butte Counties	The Nature Conservancy; 4 of 6 localities protected at the Vina Plains Preserve	Described in 2002, noted in 2007 5YR, 2012 5YR, and 2024 5YR	Yes
Jepson Prairie	Solano County	The Nature Conservancy; 11 localities protected; 3	Described in 2002, noted in 2007 5YR,	Yes

⁶ FWS 2024 p. 24

Place Name	County	Landowner(s) and status of protection ¹	Notes	Extant in 2025
		additional are restored but not under easements	2012 5YR, and 2024 5YR	
Suisun Slough	Solano County	Extirpated	Described in 2002	No
Sacramento National Wildlife Refuge	Glenn County	FWS; protected – federal lands	Described in 2002, noted in 2007 5YR, 2012 5YR, and 2024 5YR	Yes
Caswell Memorial State Park	Stanislaus County	Extirpated	Described in 2002	No
Haystack Mountain Area	Merced County	Extirpated	Described in 2002	No
San Luis National Wildlife Refuge Complex	Merced County	Extirpated	Described in 2002	No
Mutau Flat area in the Los Padres National Forest	Ventura County	U.S. Forest Service; protected – federal lands	Described in 2002, noted in 2007 5YR, 2012 5YR, and 2024 5YR	Yes
Mariner Ranch	Placer County	Private; protected – conservation easement	Noted in 2012 5YR, 2012 5YR, and 2024 5YR	Yes
Yolo Bypass Wildlife Area	Yolo County	California Department of Fish and Game; protected – state lands	Noted in 2007 5YR, noted in 2012 5YR and in 2024 5YR	Yes
Mapes Ranch	Stanislaus County	Private; not protected	Noted in 2007 5YR, 2012 5YR, and 2024 5YR	Yes
Highway 165 area (San Luis NWR, Merced NWR, and California Department of Parks and Recreation’s Great Valley Grasslands State Park)	Merced County	FWS, California Department of Parks and Recreation, and private; protected – state and federal lands and conservation easement	Noted in 2007 5YR, 2012 5YR, and 2024 5YR	Yes
UC Merced (includes Roen Ranch occurrence mentioned in 2024 5YR)	Merced County	Private; 1 of 4 localities is protected under a conservation easement while 3 are not. Roen Ranch not protected.	Noted in 2007 5YR, 2012 5YR, and 2024 5YR	Yes
Sandy Mush Road	Merced County	Private; protected by conservation easements	Noted in 2012 5YR and 2024 5YR	Yes
Beale Air Force Base	Yuba County	Extirpated	Noted in 2012 5YR	No

¹ Landowner(s) and status of population protection are from the 2012 5-year review, p. 23 and 2024 5-year review, p. 111.

Conservancy Fairy Shrimp Occurrences

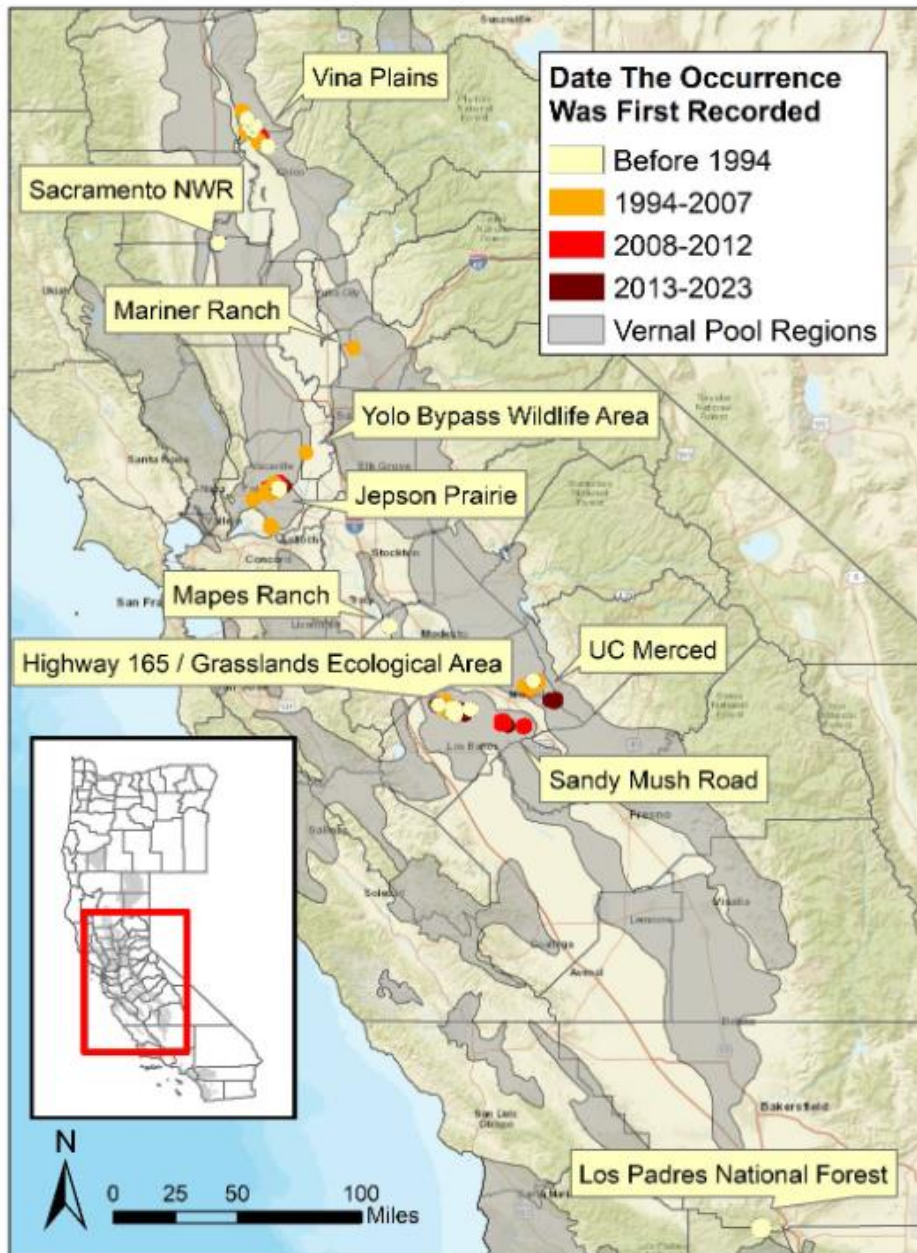


Figure A1-4. Map of Conservancy fairy shrimp occurrences as presented in Figure 4 of the 2024 5-year review.

- Occurrences in California Natural Diversity Database (CNDDDB)
 - The CNDDDB had additional, more precise species location information. As of March 2025, the CNDDDB presents 57 occurrences records dated from 1981 to 2023. Of these, 32 could be considered recent (newer than 2010). These occurrences use polygons or points to represent occupied areas. FWS (2024) review of CNDDDB data indicates that there are 53 total occurrences.⁷

⁷ FWS 2024 p. 19

- Occurrences in iNaturalist
 - Searched on 6/9/2025
 - https://www.inaturalist.org/observations?quality_grade=research&subview=map&taxon_id=96013&verifiable=any
 - There are 51 research grade observations available from 2015 to 2025.
 - **Figure A1-5** depicts the locations of these observations.
 - The northern CA observation is consistent with the Vina Plains population while the southern occurrences are consistent with the Jepson Prairie/Yolo Bypass Wildlife Area populations.



Figure A1-5. Occurrences available in iNaturalist (n=51).

- Occurrences in NatureServe
 - Searched on 6/9/2025
 - <https://explorer.natureserve.org/pro/Map>
 - There were 17 hexagons representing documented distribution available for this species as of 2025.
 - The hexagons align with locations of the 10 known populations of this species.

- **Occurrences in GBIF**

- Searched on 6/9/2025
- https://www.gbif.org/occurrence/search?has_coordinate=true&has_geospatial_issue=false&taxon_key=2235369
- As shown below in **Figure A1-6**, there are 65 observations for this species, most of which were observations from iNaturalist, with the remaining 19 observations being preserved specimens from 1981-2013.
- The southern CA occurrences appear to align with the Sandy Mush Road population while the central CA occurrences appear to align with the Jepson Prairie/Yolo Bypass Wildlife Area, and the northern CA occurrences appear to align with the Vina Plains population.

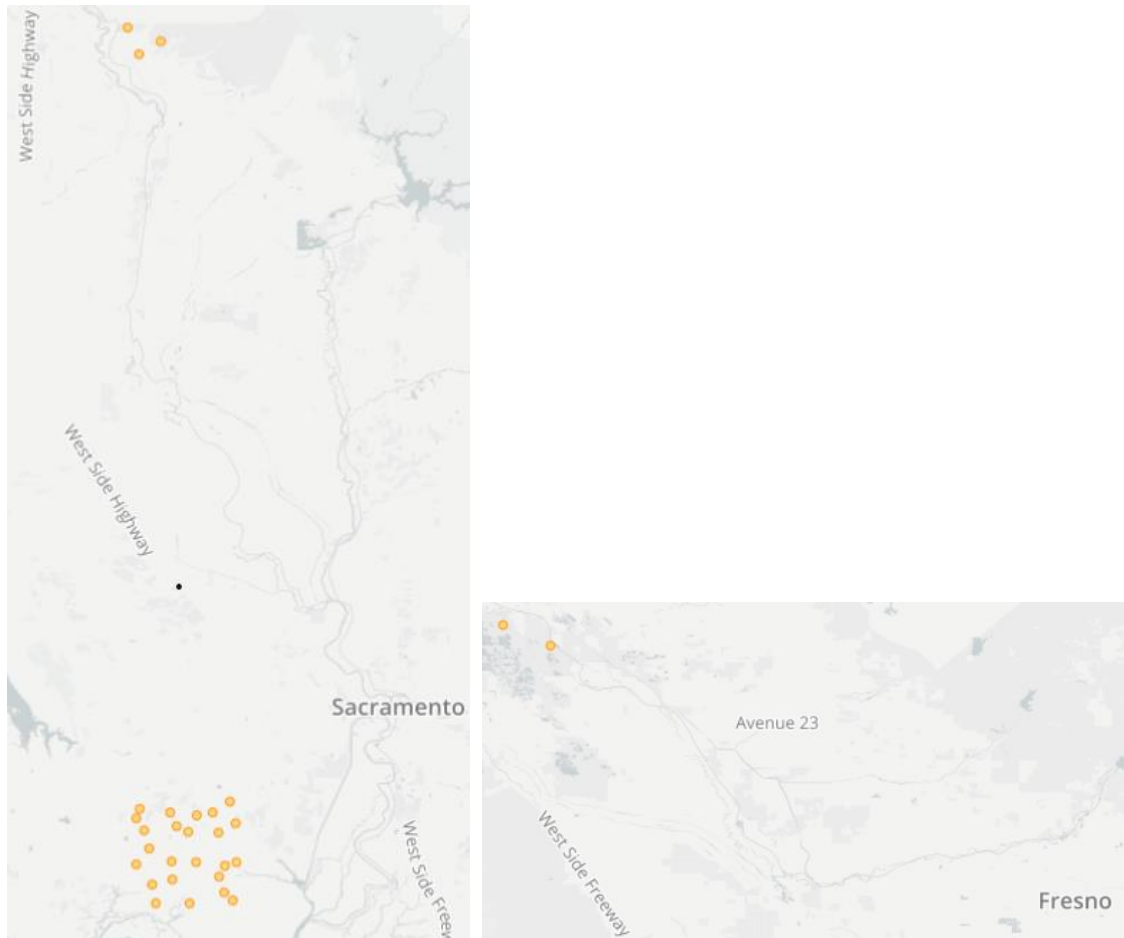


Figure A1-6. Occurrences available in GBIF.

Appendix 2. GIS Data and Method to Develop Core Map (Step 3)

The core map type for this species is based on known locations from the CNDDDB locations and the critical habitat for this species.

CBD developed the interim core map by refining the species critical habitat based on where vernal pools with known occurrences of the Conservancy fairy shrimp occur. Any CNDDDB polygons not already covered by either the critical habitat, yet spatially coincident with vernal pool hexagons were added to the core map. Some CNDDDB polygons that extend outside the critical habitat polygon less than 100 meters were not included in the core map, as these areas will be covered by any PULAs which utilize this core map. CNDDDB polygons that extend greater than 100 meters from a vernal pool were used in the core map.

The cultivated layer was used to remove any areas within the core map that are cultivated agriculture. The map was then buffered and smoothed using EPA's QA/QC process.

This section details the data and steps used to create the core map for the Conservancy fair shrimp based on this biological information.

1. References and Software

- World UTM Grid:
https://services.arcgis.com/P3ePLMYs2RVChkJx/arcgis/rest/services/World_UTM_Grid/FeatureServer
- Modified Cultivated Layer (Downloaded 01/27/2025)
<https://cdn.arcgis.com/home/item.html?id=159e70ce4c284f5b972c687037f8a668>
- BIOS California Natural Diversity Database (CNDDDB) Government [ds45]
cnddb.shp
- BIOS Vernal Pools - ACE [ds2732]
ds2732.shp
- FWS Species critical habitat:
https://ecos.fws.gov/docs/crithab/zip/FCH_Branchinecta_conservatio_20060210.zip
- FWS Species range:
https://ecos.fws.gov/docs/species/shapefiles/usfws_K03D_I01_Branchinecta_conservatio_current_range.zip
- Software used: ArcGIS Pro version 3.2

2. Datasets and Procedures Used in Core Map Development

2.1. Create copy of template EPA polygon and project FWS Critical Habitat shapefile

1. In ArcPro, create a copy of the template EPA polygon shapefile for Conservancy fairy shrimp, named "Conservancy_fairy_shrimp_Poly" (core map shapefile).
2. Select all the records from the "FCH_Branchinecta_conservatio_20060210" (Critical Habitat) shapefile. Copy and paste them into the newly created Conservancy fairy shrimp shapefile from step 1. **(Figure A2-1)**

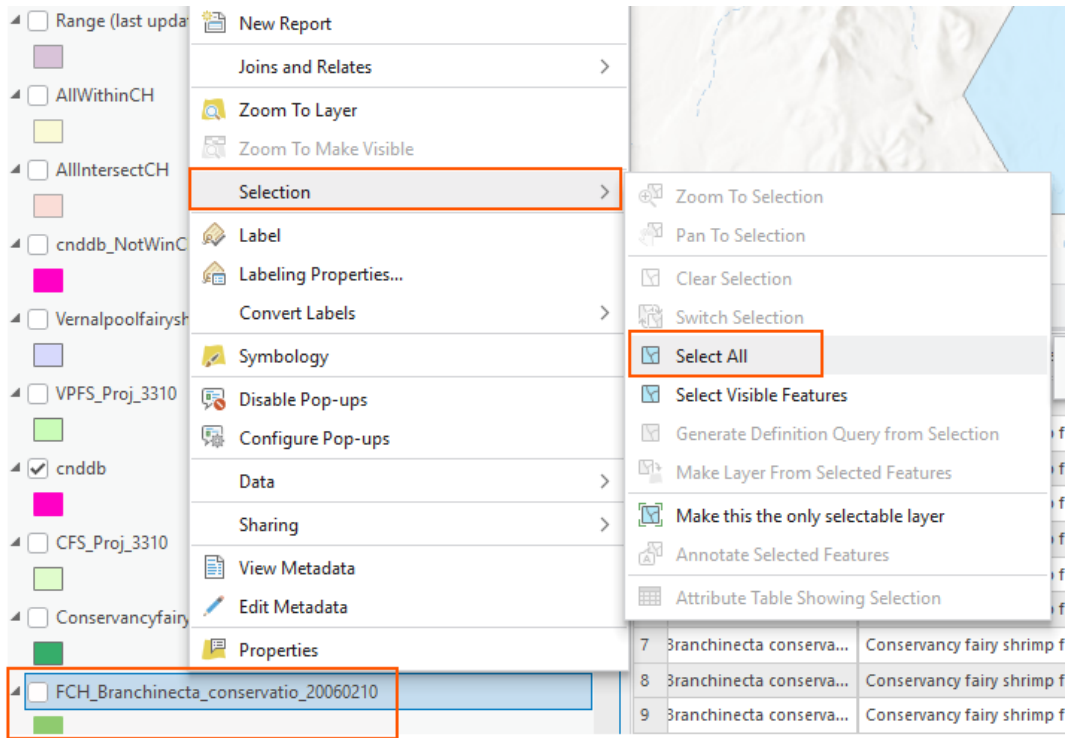


Figure A2-1. Screenshot of steps to select all records in a shapefile

3. Set the definition query in the BIOS CNDDDB Government [ds45] shapefile where “SNAME” = “Branchinecta conservatio”. This filter will show only polygons for Conservancy fairy shrimp and can be used to identify known locations. (Figure A2-2)

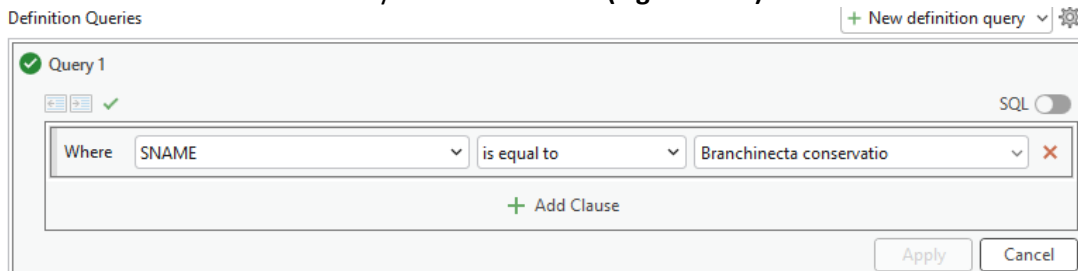


Figure A2-2. Screenshot of definition query

4. A definition query was assigned in the BIOS Vernal Pools - ACE [ds2732] shapefile to show only hexagons that are assigned to contain a vernal pool. (Figure A2-3)

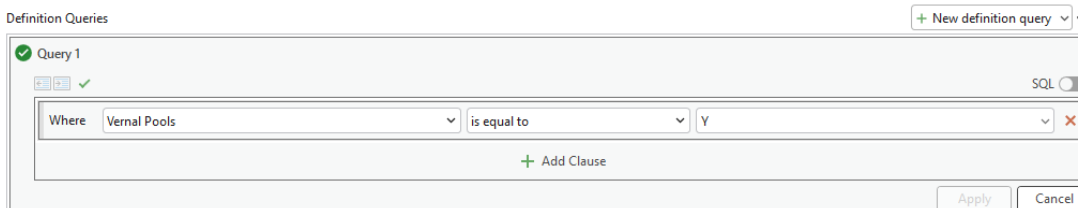


Figure A2-3. Screenshot of definition query

5. Pan and zoomed to remaining delta CNDDDB polygons (CNDDDB polygons minus any areas where they do not intersect with vernal pools). Because there are sources that indicate

presence and suitable habitat for the Conservancy fairy shrimp, the vernal pools were copied and pasted into the core map shapefile.

6. For CNDDDB polygons that were partially inside and outside critical habitat, the “Measure” tool was used to determine how far the polygon existed outside these areas. If the measurement was 100 meters or greater and a vernal pool existed in the area, then that vernal pool was added to the core map. If it was less than 100 meters, the core map was left as is.
7. To confirm that all CNDDDB polygons have core map polygon that at least intersects them, use the “Select by Location” tool, with CNDDDB as the input feature, “Intersect” as the relationship, “Conservancy_fairy_shrimp_Poly” and the selecting feature, search distance is blank, and the “Invert Spatial Relationship” box is checked. If no CNDDDB polygons are selected, then all CNDDDB polygons have a “Conservancy_fairy_shrimp_Poly” that covers it.

(Figure A2-4) (Figure A2-5)

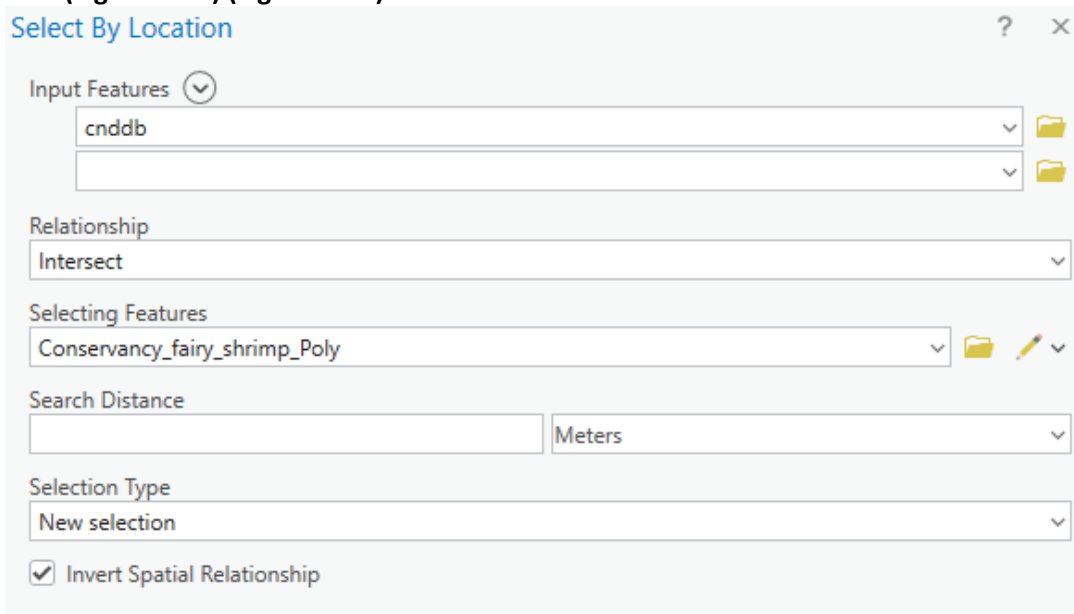


Figure A2-4. Screenshot of “Select by Location” tool

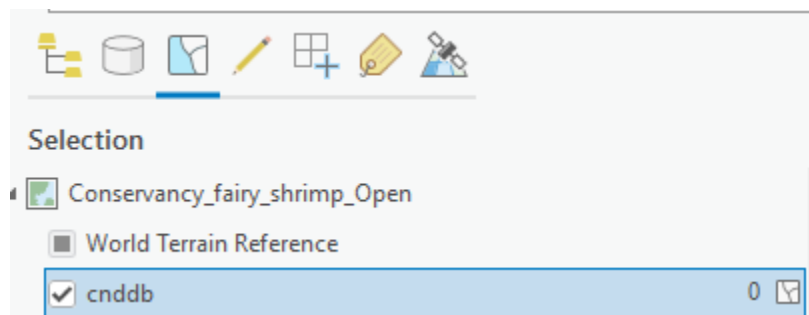


Figure A2-5. Screenshot of Result and “Select by Location” tool is applied

2.2. Use EPA’s “CultivatedAreas_Over25acres” to “Pairwise Erase” Conservancy_fairy_shrimp_Poly

1. As an effort to refine the core map boundaries, use “Pairwise Erase” to erase the core map “Conservancy_fairy_shrimp_Poly” by “CultivatedAreas_Over25acres”. The resulting layer is named, “Conservancy_fairy_shrimp_NoCultLand”. **(Figure A2-6)**

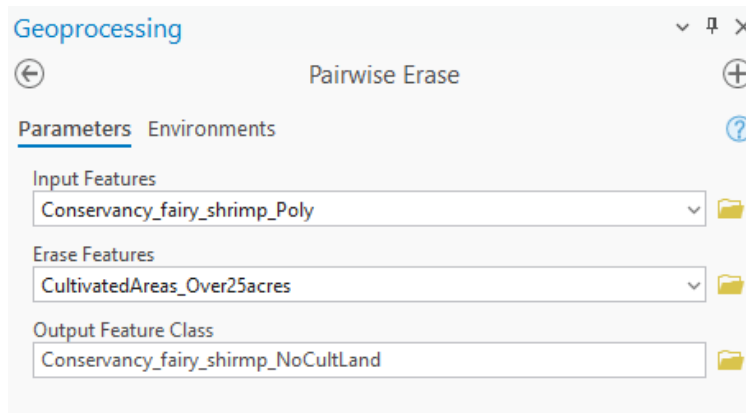


Figure A2-6. Screenshot of “Pairwise Erase” tool

2. Checked to see if any CNDDDB polygons were now not covered after the “Pairwise Erase” tool. To do this, used the “Select by Location” tool with the “Invert Spatial Relationship” . No CNDDDB polygons were selected, which is good. **(Figure A2-7) (Figure A2-8)**

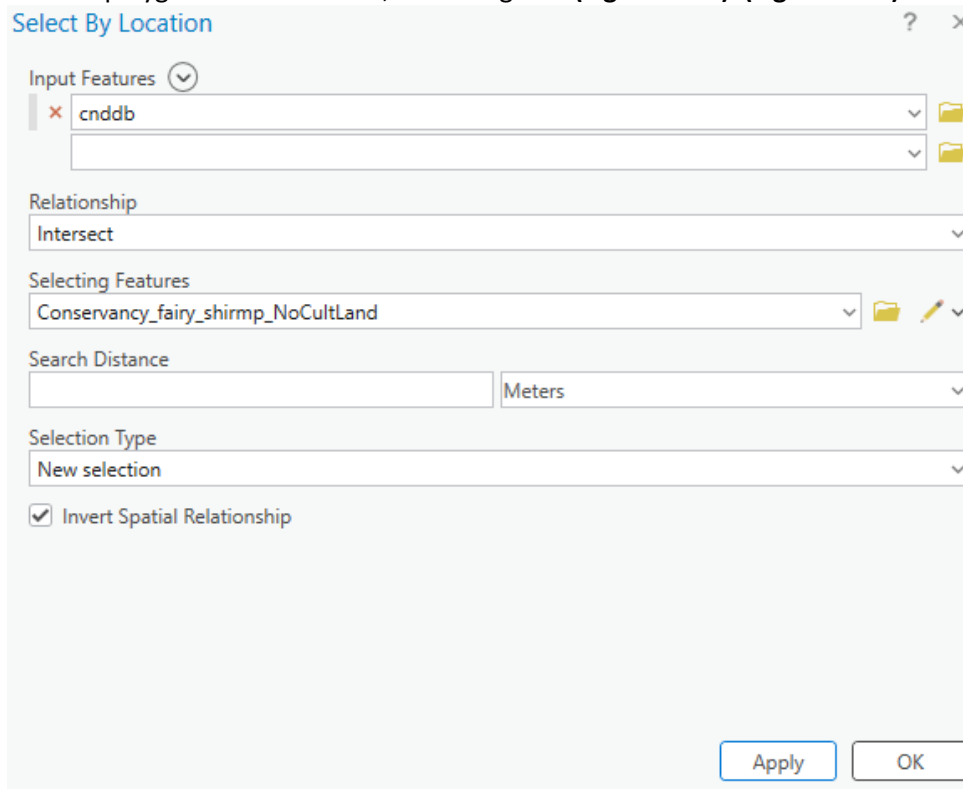


Figure A2-7. Screenshot of “Select by Location” tool

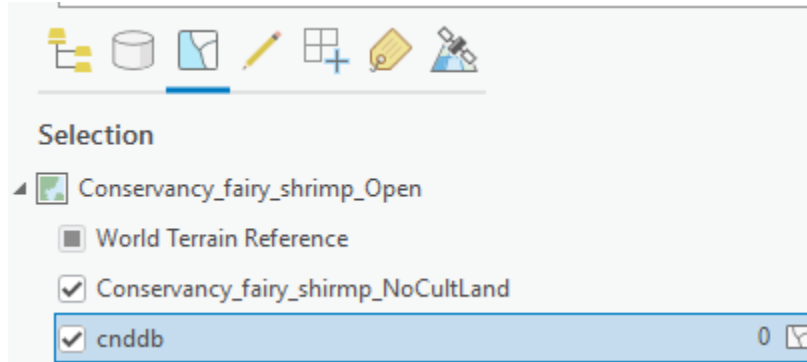


Figure A2-8. Screenshot of Results from “Select by Location” tool

1.1. Use EPA’s QA/QC process to remove small, disconnected patches less than 2 acres

1. Buffer “Conservancy_fairy_shrimp_NoCultLand” by 1,000 US survey feet, with the option “Dissolve all output features into a single feature” choice. The output feature class is named, “Conservancy_fairy_shrimp_NoCultLand_Buffer”. **(Figure A2-9)**

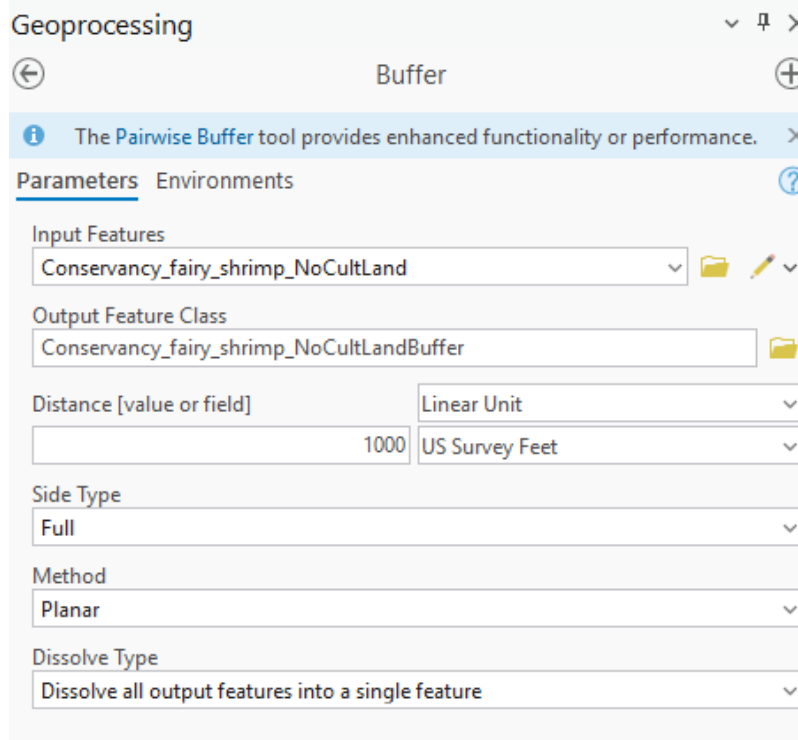


Figure A2-9. Screenshot of “Buffer” tool

2. Use the “Eliminate Polygon Part” tool to eliminate polygon parts that are less than 2 acres and more than 1,000 feet away from another polygon. The resulting output is named, “Conservancy_fairy_shrimp_No2Acre”. **(Figure A2-10)**

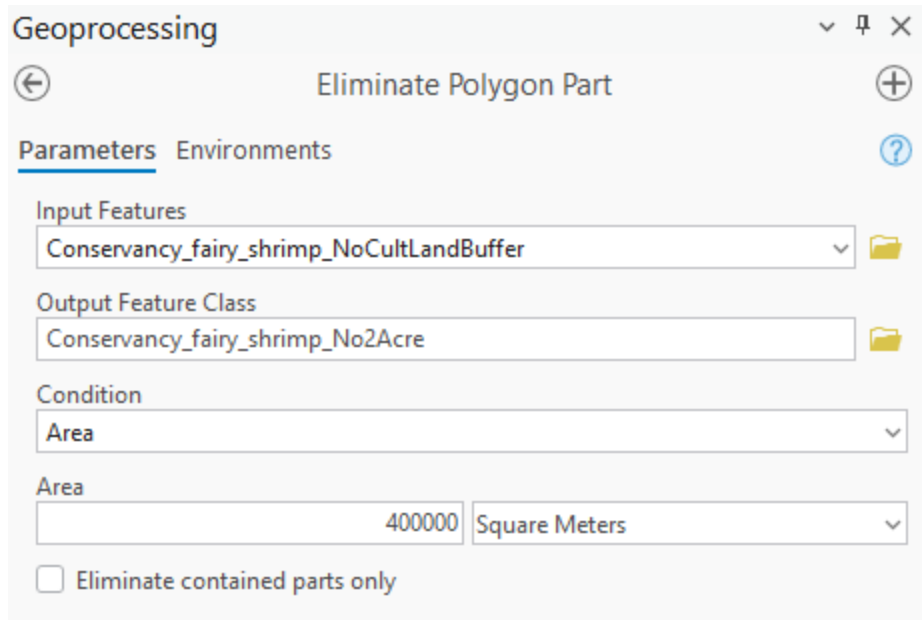


Figure A2-10. Screenshot of “Eliminate Polygon Part” tool

3. Use “Pairwise Clip” tool to remove any polygon parts that are less than 2 acres and more than 1,000 feet away from another polygon. The resulting output is named, “Conservancy_fairy_shrimp_Poly_Clip”. (Figure A2-11)

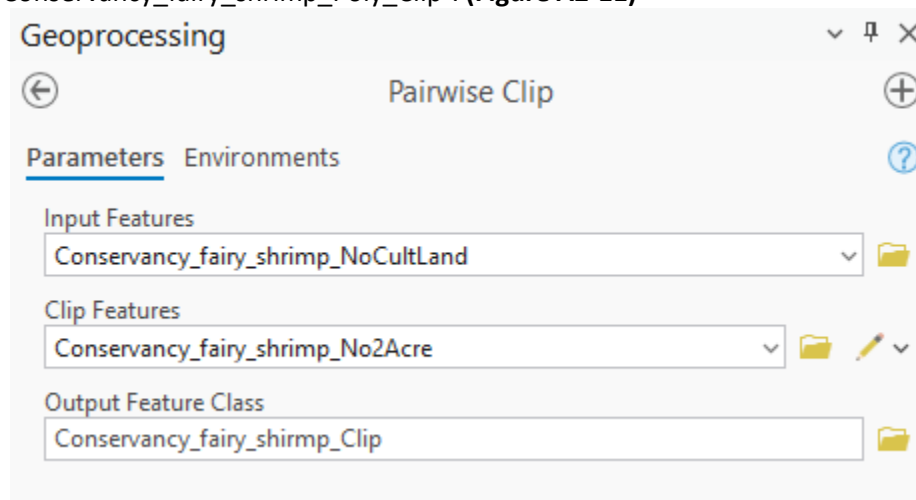


Figure A2-11. Screenshot of “Pairwise Clip” tool

1.2. Use EPA’s QA/QC process to “smooth” by filling in gaps or holes and update attributes

1. Use the “Dissolve” tool to merge polygons from “Conservancy_fairy_shrimp_Poly_Clip” into one polygon. The resulting output is named, “Conservancy_fairy_shrimp_Poly_Dissolve” (Figure A2-12)

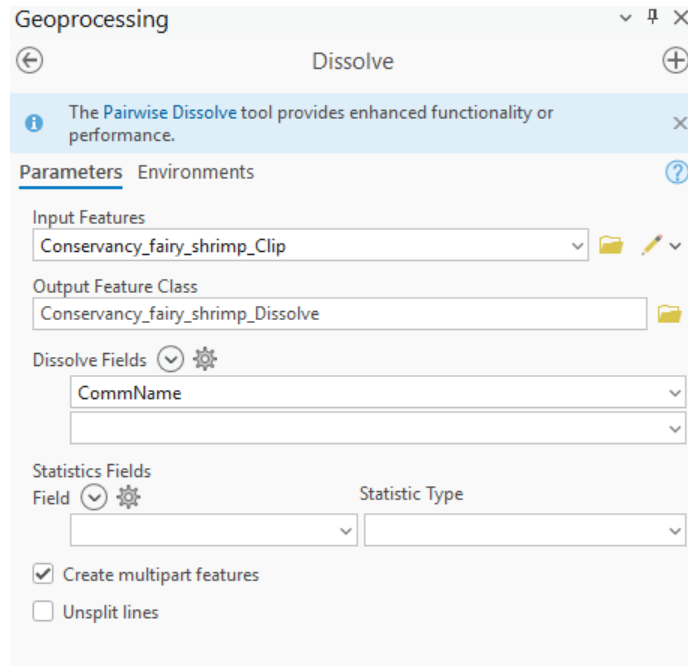


Figure A2-12. Screenshot of “Dissolve” tool

2. Use the “Eliminate Polygon Part” tool to fill in gaps and holes less than 25 acres. Resulting output is named, “Conservancy_fairy_shrimp_Poly_smooth”. **(Figure A2-13)**

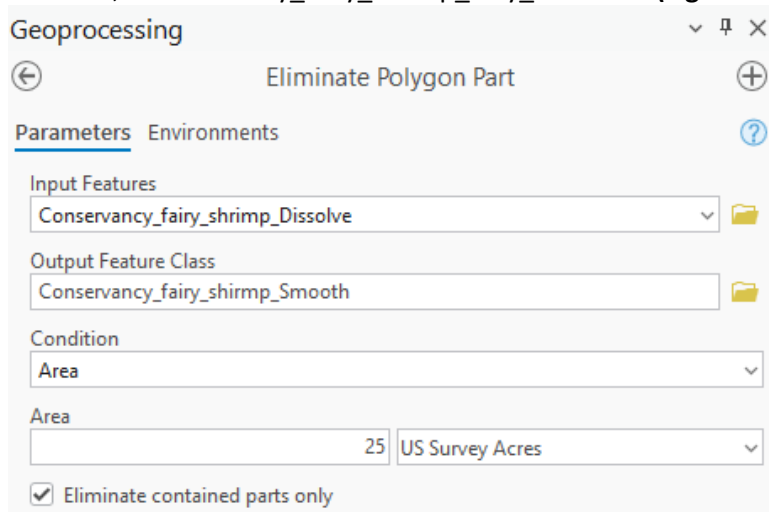


Figure A2-13. Screenshot of “Eliminate Polygon Part” tool

4. Although the “Eliminate Polygon Part” tool did remove internal gaps and holes less than 25 acres, there were narrow strips that are less than 2 meters wide that can be removed by deleting vertices manually. **(Figure A2-13) (Figure A2-14)**

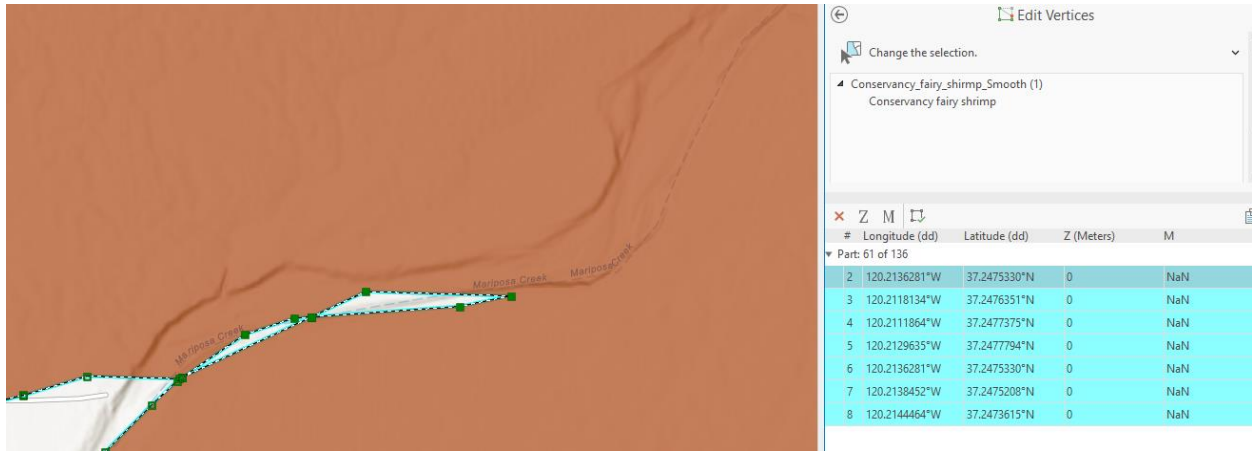


Figure A2-13. Screenshot Example of Selected Vertices to be deleted

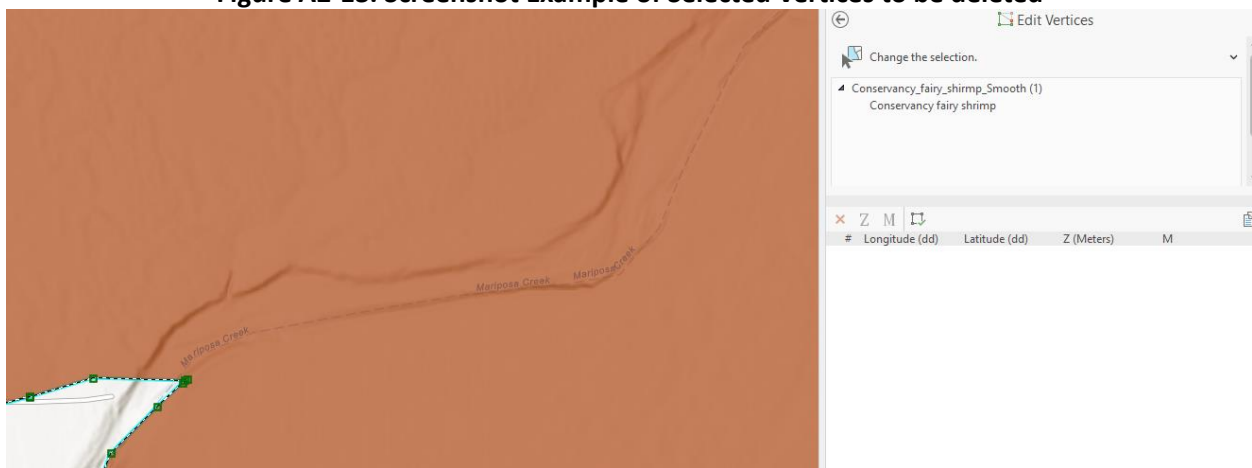


Figure A2-14. Screenshot Example of Selected Vertices after they were deleted

1.3. Update Attributes and “Calculate Geometry”

1. Create a copy of the template EPA polygon shapefile for Conservancy fairy shrimp, named “Conservancy_fairy_shrimp_Poly_Final” (core map shapefile). Copy and paste from “Conservancy_fairy_shrimp_Poly_smooth” to “Conservancy_fairy_shrimp_Poly_Final”.
2. Since there is only one record in “Conservancy fairy shrimp”, update each field manually with:
 - a. CommName = " Conservancy fairy shrimp"
 - b. SciName = “Branchinecta conservatio”
 - c. Description = “Area of USFWS Conservancy fairy shrimp (CFS) critical habitat and CDFW Vernal pool hexagons overlapping CNDDB occurrences outside of critical habitat. All clipped by EPA Cultivated Land.”
 - d. Category = “Area of occupancy”
 - e. EPA_Code = “490”
 - f. FWS_Code = " K03D”
 - g. CBD_Code = " 1916”
 - h. Heritage = “0”
 - i. ECOS_WebPg = <https://ecos.fws.gov/ecp/species/8246>
2. Turned on the “World UTM Grid” layer and identified the UTM zone as “10”. Right-clicked on the “Acres” fieldàleft-clicked on “CalculateGeometry”. “Calculate Geometry” dialog box

appears. Selected “Area” under “Property”, “US Survey Acres” in “Area Unit” and “NAD_1983_UTM_Zone_10N” in the Coordinate System” boxes. Click Apply. Click OK. (Figure A2-15)

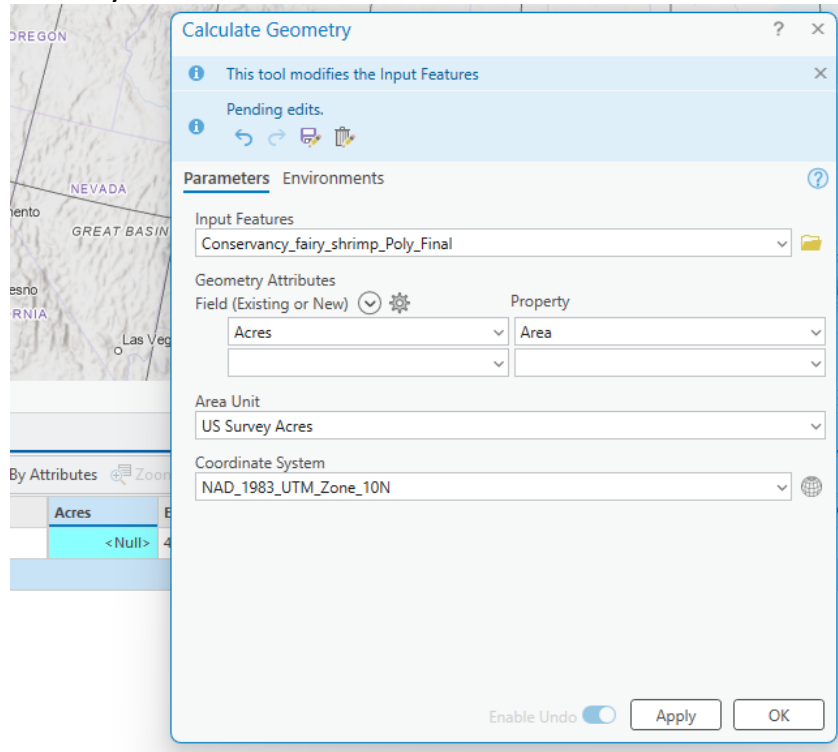


Figure A2-15. Screenshot “Calculate Geometry”

1.4. Use Download USA NLCD Land Cover raster process to determine Percentage of Interim Core Map Represented by NLCD Land Covers

1. Using the MRLC viewer (<https://www.mrlc.gov/viewer/>) and uploaded a shapefile of area to use as an extent to download the NLCD that covers all the “Conservancy_fairy_shrimp_Poly” records. (Figure A2-13) The file was downloaded and added to ArcPro and renamed, “NLCD_CFS_Area.tiff”.

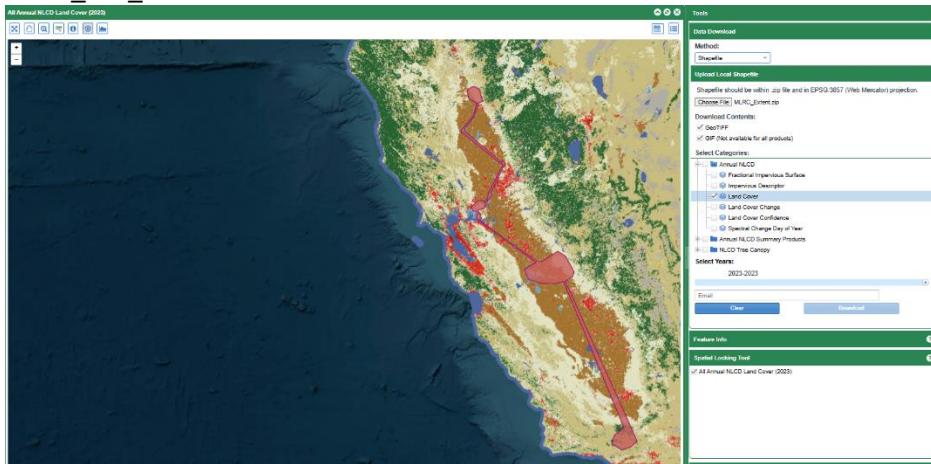


Figure A2-16. Screenshot MRLC Viewer with Shapefile extent

- The “Extract by Mask” tool was used with “NLCD_CFS_Area.tiff” filtered by the same area within “Conservancy_fairy_shrimp_Poly” as the extent. (Figure A2-61) In the “Environments” tab, changed the output coordinate system to match “Conservancy_fairy_shrimp_Poly”, which in this case is “USA_Contiguous_Albers_Equals_Area_Conic_USGS_version”. The output was named, “NLCD_MaskArea1”. (Figure A2-17) (Figure A2-18)

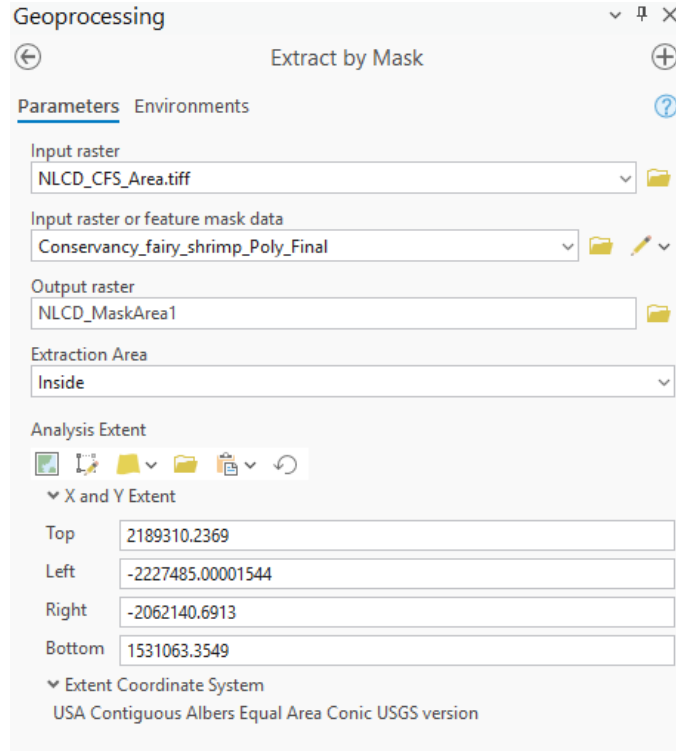


Figure A2-17. Screenshot “Extract by Mask” tool Parameters

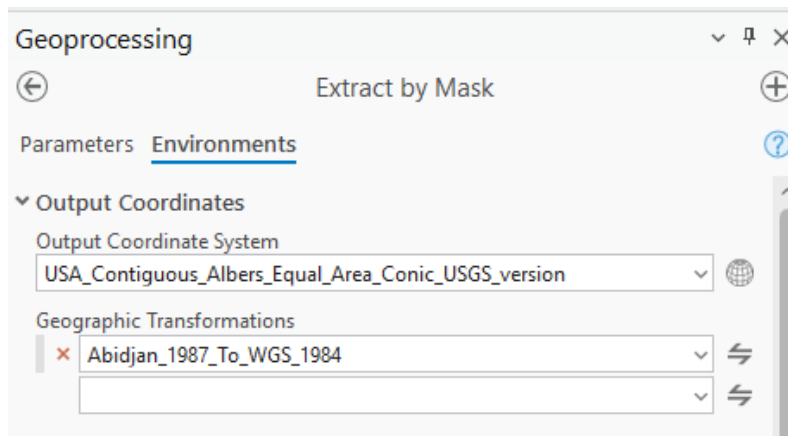


Figure A2-18. Screenshot “Extract by Mask” tool Environment

- Used the “Tabulate Area” tool to determine the count of area for each NLCD code. (Figure A2-19)

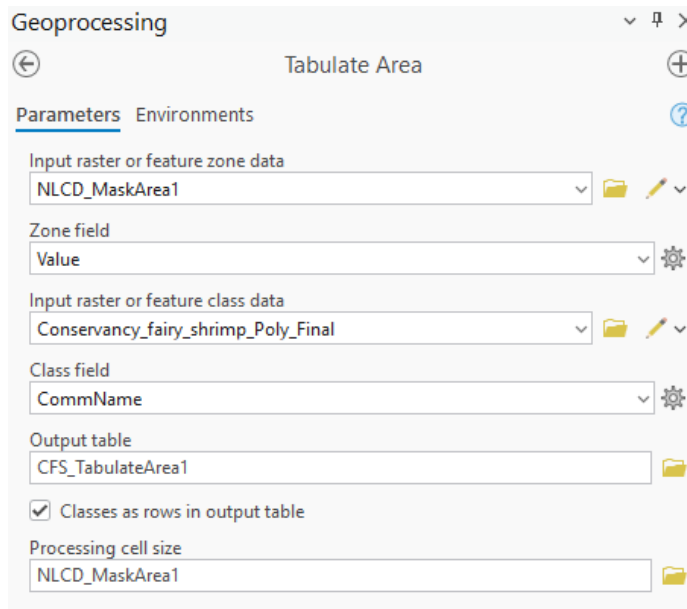


Figure A2-19. Screenshot “Tabulate” tool

4. Add a double field named, “Per” to the “CFS_TabulateArea1” table. Right clicked on field and selected “Calculate Field”. Entered the formula “(!Count!/ 957621)*100”. This calculated the percentage of NLCD within the core map area. (Figure A2-20) Review results and input into (Table 1. Percentage of Interim Core Map Represented by NLCD Land Covers and Associated Example Pesticide Use Sites/Types.)

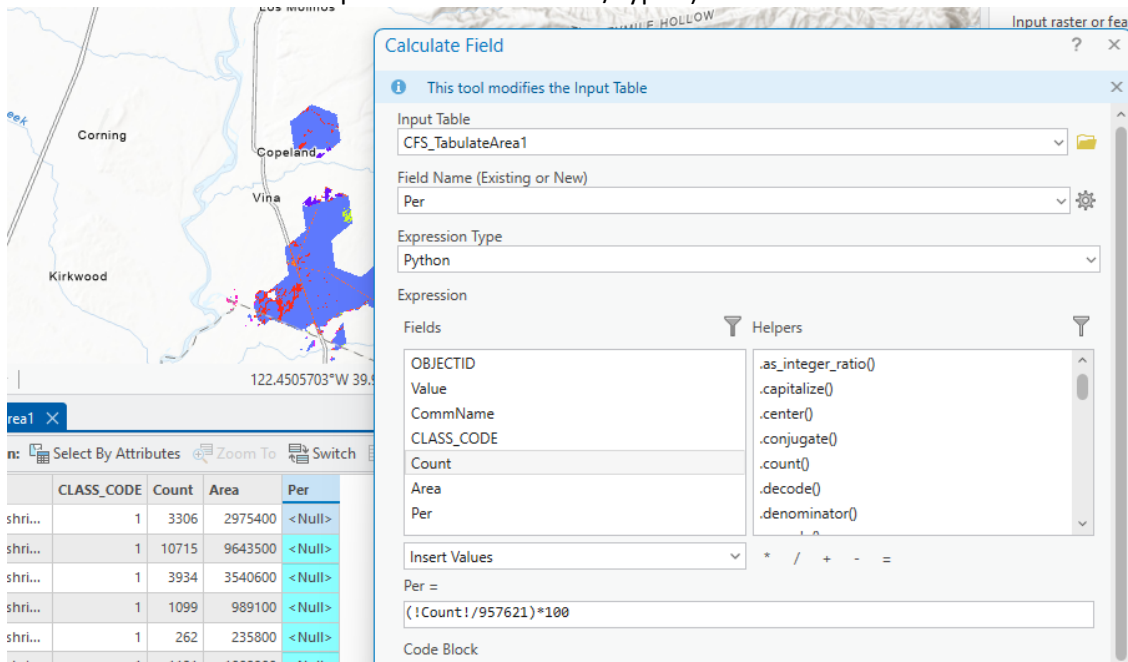


Figure A2-20. Screenshot “Tabulate” tool