Interim Core Map Documentation for the Santa Cruz Tarplant

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Developed by EPA, Office of Pesticide Programs

Species Summary

The Santa Cruz tarplant (Holocarpha macradenia; Entity ID #562) is a threatened annual herb (dicot) in the composite family (Asteraceae) that is geographically restricted to California. The Santa Cruz tarplant typically begins flowering in June, peaking in July or August, and may produce flowers through November depending on environmental conditions. The Santa Cruz tarplant requires pollinators to transfer pollen between plants to produce viable seed. Common floral visitors associated with species in the composite family (Asteraceae) include bees, ants, wasps, butterflies, and moths (SSA, 2023). A study of pollinator visitation and floral density in a population of *Holocarpha virgata*, a closely related species, found that the most common floral visitors were sweat bees (Halictidae) and long-horned bees (Anthophoridae) (SSA, 2023). There is a designated critical habitat for this species. Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the Santa Cruz tarplant is a biological information core map type which is based on the designated critical habitat with two additional areas and one critical habitat unit replaced with a more refined area. Some occurrences in Costa Contra County may be introduced. **Figure 1** depicts the interim core map for Santa Cruz tarplant (green areas on map). The core map represents approximately 4,991 acres.

The Santa Cruz tarplant inhabits coastal grasslands and prairies from Monterey County, north to Marin County, California which is captured in the species' designated critical habitat. Landcover categories within the core map area are included in **Table 1**. Landcover within the core map is predominantly grassland/herbaceous, mixed forest, scrub/shrub, and open space/developed, which is consistent with the habitat of this species.

The core map developed for the Santa Cruz tarplant is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Santa Cruz tarplant. This core map incorporates information developed by the 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 a "limited" best professional judgment classification because it consists of the species' critical habitat with two additions and one modification. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

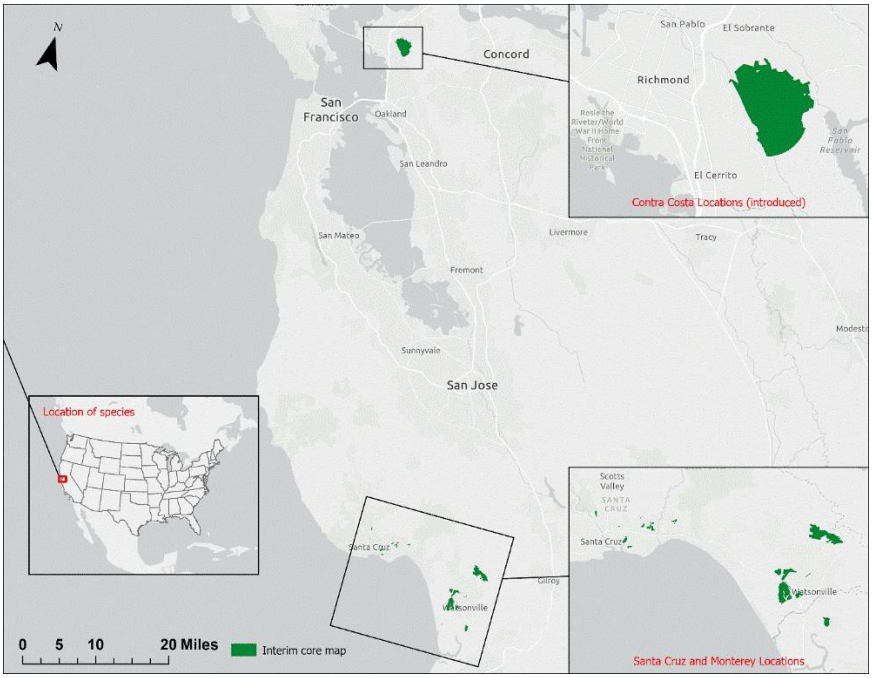

Figure 1. Interim core map for the Santa Cruz tarplant. The total acreage of the core map is approximately 4,991 acres.

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 Landcover (Value)	% of core map represented by landcover	% of core map represented by example pesticide use
Forestry	Deciduous Forest (41)	0	29
Forestry	Evergreen Forest (42)	2	29
Forestry	Mixed Forest (43)	27	29
Agriculture	Pasture/Hay (81)	2	4
Agriculture	Cultivated Crops (82)	2	4
Mosquito adulticide, residential	Open space, developed (21)	10	17
Mosquito adulticide, residential	Developed, Low intensity (22)	3	17
Mosquito adulticide, residential	Developed, Medium intensity (23)	3	17
Mosquito adulticide, residential	Developed, High intensity (24)	1	17
Invasive species control	Woody Wetlands (90)	1	49
Invasive species control	Emergent Herbaceous Wetlands (95)	0	49
Invasive species control	Open water (11)	0	49

[1] Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, https://www.usgs.gov/data/national-land-cover-database-nlcd-2021-products

Example pesticide use sites/types	NLCD Landcover (Value)	% of core map represented by landcover	% of core map represented by example pesticide use
Invasive species control	Grassland/herbaceous (71)	28	49
Invasive species control	Scrub/shrub (52)	20	49
Invasive species control	Barren land (rock/sand/clay; 31)	0	49
Total Acres	**Interim Core Map Acres**	**4991**	

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 iNaturalist;
- Occurrence locations in the Global Biodiversity Information Facility (GBIF); and
- Occurrence locations in NatureServe.

EPA evaluated these four sets of data before selecting the type of and developing the core map. FWS' 2023 Species Status Assessment (SSA) and most recent 5-year review (2022) detailed known locations of this species. FWS described 19 documented occurrences that are extant and extirpated. iNaturalist had eight research grade observations. NatureServe provided three documented locations. GBIF contained no additional data that were not already included in iNaturalist or NatureServe. The iNaturalist and NatureServe data had a coarse resolution, and EPA could not determine conclusively if these data fell within the critical habitat; however, they generally appear to be consistent with the locations of the range and critical habitat given the data resolution. **Appendix 1** includes more information on the available known location information.

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 Habitats"[2] (referred to as "the process"). This core map was developed by EPA and was developed 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.

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

EPA compiled available information for the Santa Cruz tarplant from FWS as well as observational information available from various publicly available sources (discussed in previous section). The information compiled for the Santa Cruz tarplant is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- Current existing populations occur in locations consistent with the critical habitat;
- The species' critical habitat is highly refined;
- Two locations from the California Natural Diversity Database (Atkinson Lane and Santa Cruz Gardens/Winkle were not represented by the critical habitat;
- Wildcat Canyon Regional Park had sub-populations that were not fully contained within the critical habitat.

EPA used the compiled information to identify the core map type, including the species range, critical habitat, and known location information. The species range follows geopolitical boundaries (i.e., counties) and is not likely limited to the areas containing habitat of the species. The range is also much larger than the areas where known locations occur. EPA compared known location data to the range and critical habitat and found that the FWS known locations of currently existing (extant) populations are mostly consistent with the location of the designated critical habitat, which serves as the base of the interim core map. Two locations from the California Natural Diversity Database (Atkinson Lane and Santa Cruz Gardens/Winkle, **Table A1-1**) were not represented by the critical habitat and one (Wildcat Canyon Regional Park) had sub-populations that were not fully contained within the critical habitat. To capture additional populations in the Contra Costa County region that were outside of the critical habitat, the Mezue critical habitat unit was expanded to include a one-mile buffer, which was clipped to within the boundaries of Wildcat Canyon Regional Park (**Figure A1-4**). Two new core map areas were created by adding Atkinson Lane (including a 100 ft. buffer surrounding the street) and Santa Cruz Gardens (**Figure A1-5**).

EPA used the designated critical habitat provided by FWS for the Santa Cruz tarplant. EPA downloaded the critical habitat from FWS's ECOS (https://ecos.fws.gov/ecp/).

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

Alternative approaches and data not described in this document were not explored in the development of this interim core map.

Appendix 1. Information Compiled for the Species During Step 1

1. **Recent FWS Documents/Links**
   - Species Status Assessment (SSA) for the Santa Cruz Tarplant (11/1/2023)
   - Final Designation of Critical Habitat for Holocarpha macradenia (Santa Cruz Tarplant) (10/16/2002)
   - Santa Cruz Tarplant 5-Year Review (7/19/2022)

2. **Background information**
   - **Status**: Federally listed as threatened in 2000
   - **Resiliency, redundancy, and representation (the 3Rs)**
     - "Under current conditions there are four populations of Santa Cruz tarplant that have high resiliency, seven with moderate resiliency, and four with low resiliency. The remaining four populations had unknown resiliency due to a lack of information." (SSA, 2023)
     - "Representation was moderate with populations existing throughout the range of the species under a variety of conditions." (SSA, 2023)
     - "Redundancy was low in the northern part of the range where the four populations all occur close to one another and moderate in the southern portion of the range where populations are spread out and less likely to be universally affected by a single catastrophic event." (SSA, 2023)

   - ***Habitat, Life History, and Ecology (Source: 2021 Recovery Plan)***
     - **Habitat**:
       - "Within its current distribution, Santa Cruz tarplant exists under a variety of conditions ranging from highly invaded grasslands dominated by nonnative annual grasses and forbs to relatively intact coastal prairie. Typical terrace soils are a mix of sand and loam with a clay component. The clay component of these soils holds moisture longer into the growing season compared to the surrounding sandy soils. Soil series associated with Santa Cruz tarplant habitat include Watsonville, Tierra, Elkhorn, Santa Inez, and Pinto. Populations near the City of Santa Cruz occur on gently sloping terrace platforms that are separated by steep-sided ''gulches,'' whereas in the Watsonville (Santa Cruz County) and Monterey areas, and on the east side of San Francisco Bay, the terraces are more extensively dissected." (SSA, 2023)

     - **Reproduction/pollinators**:
       - Flowers June to November
       - Self-incompatible.
       - Common pollinators for species in the composite family include bees, ants, wasps, butterflies, and moths (SSA, 2023).

     - **Dispersal**:
       - "The disc achenes usually fall from the receptacle to the ground below the parent plant, while the ray achenes are enclosed in a sticky glandular phyllary (leaf-like structure) which aides dispersal by attaching to animals. Those animals likely to assist in seed dispersal include, but are not limited to, mule deer (*Odocoileus hemionus*), gray foxes (*Urocyon cinereoargenteus*), coyotes (*Canis latrans*), black-

tailed jackrabbits (*Lepus californicus*), bobcats (*Felis rufus*), striped skunks (*Mephitis mephitis*), opossums (*Didelphis virginiana*), racoons (*Procyon lotor*), and other small mammals and small birds." (Final Designation, 2002)

- **Taxonomy**
  - FWS Category: Flowering dicot plants with biotic pollination vectors (group 11)
  - Aromatic herb in the composite family (Asteraceae).

- **Essential Physical Biological Features (PBFs) for Designated Critical Habitat:**
  - Soils associated with coastal terrace prairies, including the Watsonville, Tierra, Elkhorn, Santa Inez, and Pinto series.
  - Plant communities that support associated species, including native grasses such as needlegrass (*Stipa* [=*Nassella*] sp.) and California oatgrass (*Danthonia californica*); native herbaceous species such as members of the genus *Hemizonia* (other tarplants), Gairdner's yampah (*Perideridia gairdneri*), San Francisco popcorn flower (*Plagiobothrys diffusus*), and Santa Cruz clover (*Trifolium buckwestiorum*).
  - Physical processes, particularly soils and hydrologic processes, that maintain the soil structure and hydrology that produce the seasonally saturated soils characteristic of *Holocarpha macradenia* habitat.

- **Relevant Pesticide Use Sites in FWS Documents**
  - No mention of pesticides in the SSA (2023), however it is possible that the highly introduced plant matrix of the coastal prairie habitat could eventually see management with herbicides.

- **Relevant Recovery Criteria and Actions (Source: 5-Year Review, 2022)**
  - "A recovery plan for Santa Cruz tarplant has not been completed, and therefore recovery criteria have not been established."

3. Description of the species range

- "Santa Cruz tarplant historically occurred within coastal grasslands and prairies from Monterey County, north to Marin County. The statewide loss and degradation of coastal grasslands and prairies resulted in extirpation of historical populations within Alameda and Marin Counties, and fragmentation of the remaining populations. Santa Cruz tarplant is currently known to occur within Monterey, Santa Cruz, and Contra Costa Counties. Fifteen populations are located within Santa Cruz and Monterey Counties and four populations are located within Contra Costa County. Santa Cruz and Monterey Counties are considered together because the single population in Monterey County is very close to the Santa Cruz County border and there is no biological or political reason to differentiate. The populations in Santa Cruz and Monterey Counties represent the remaining natural, although often managed, populations. The populations in Contra Costa County were introduced between 1982 and 1986 in an attempt to prevent extirpation of the species from its historical northern limit. The last natural population within Contra Costa County was extirpated in 1993." (ASA, 2023)
- **Figure A1-1** depicts the current range.

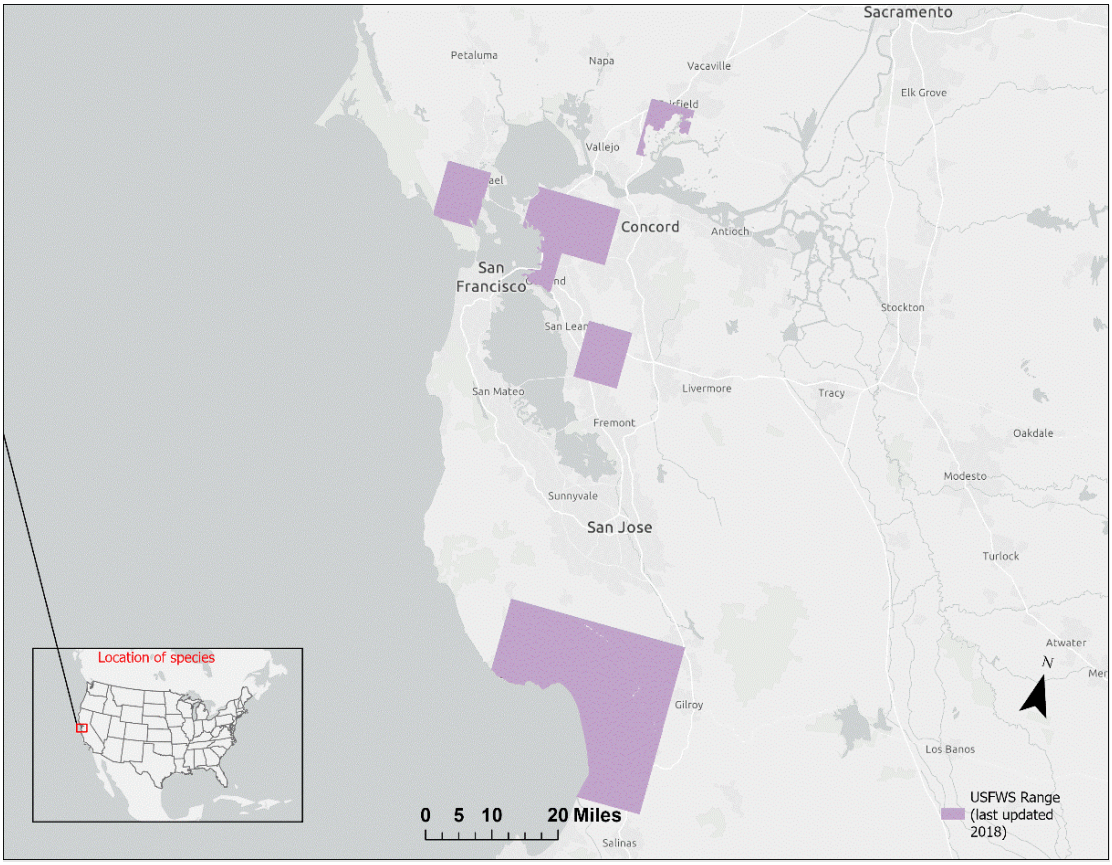

Figure A1-1. FWS range of the Santa Cruz tarplant (745,592 acres).

4. **Critical Habitat (Source: 5-Year Review, 2022)**
   - Soils associated with coastal terrace prairies, including the Watsonville, Tierra, Elkhorn, Santa Inez, and Pinto series.
   - Plant communities that support associated species, including native grasses, such as needlegrass (Stipa [=Nassella] sp.) and California oatgrass (Danthonia californica); native herbaceous species, such as members of the genus Hemizonia (other tarplants), Gairdner's yampah (Perideridia gairdneri), San Francisco popcorn flower (Plagiobothrys diffusus), and Santa Cruz clover (Trifolium buckwestiorum).
   - Physical processes, particularly soils and hydrologic processes, that maintain the soil structure and hydrology that produce the seasonally saturated soils characteristic of Holocarpha macradenia habitat.
   - **Figure A1-2** depicts the current critical habitat.

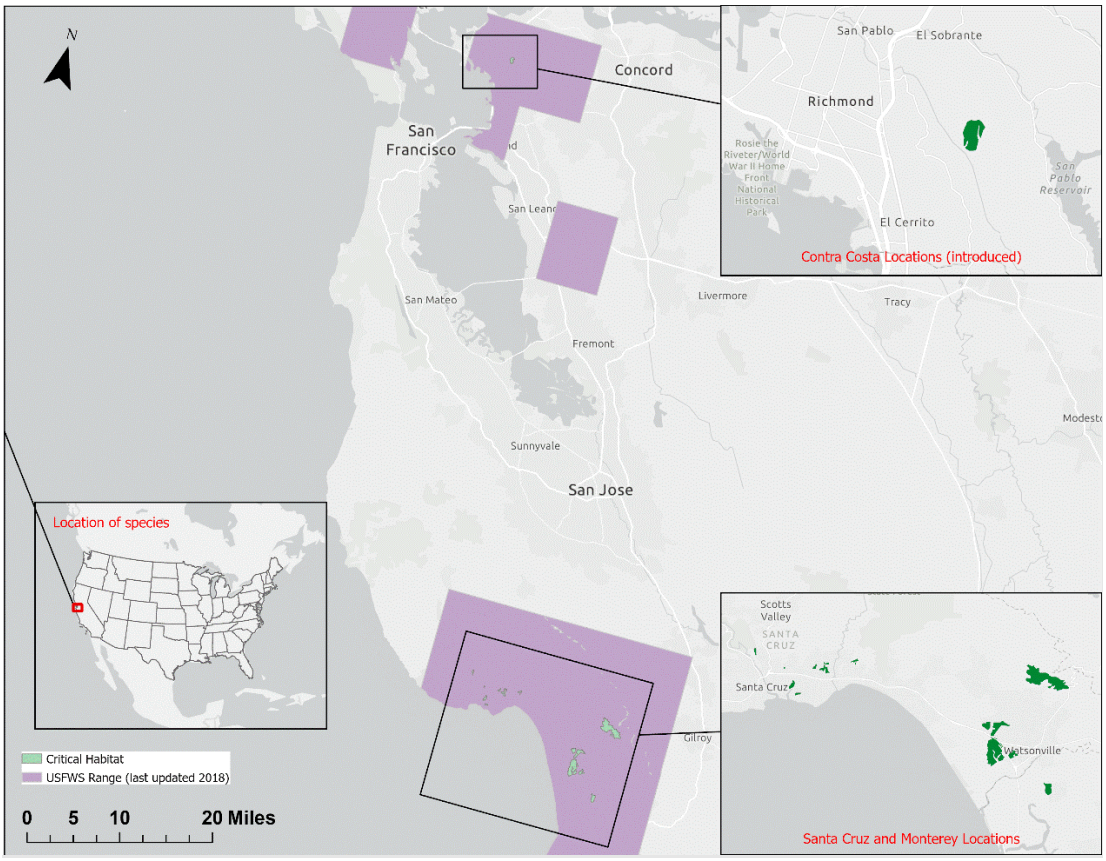

Figure A1-2. FWS critical habitat of the Santa Cruz tarplant. The range is also included for reference.

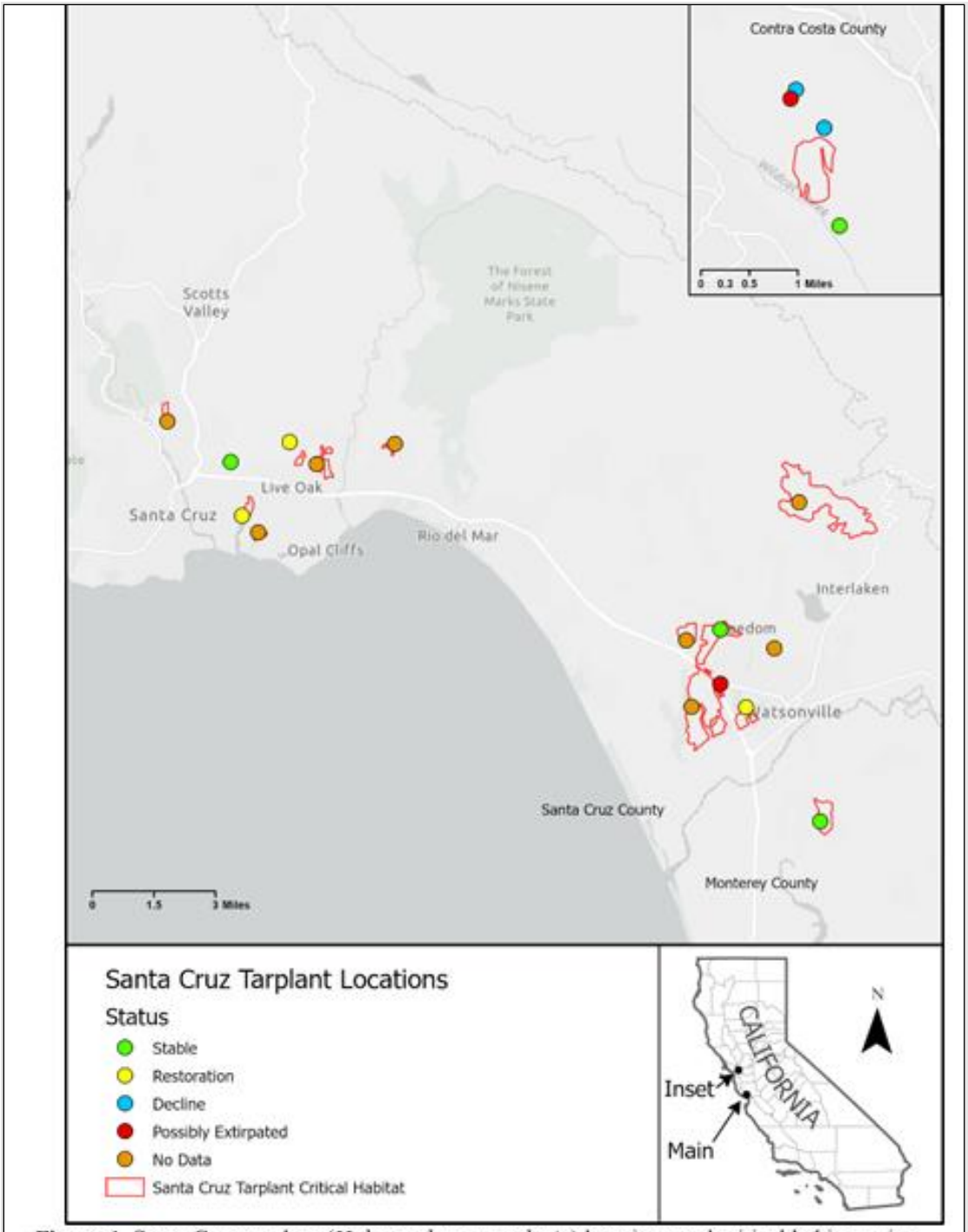

Figure 1. Santa Cruz tarplant (*Holocarpha macradenia*) locations and critical habitat units (Service 2002, data).

Figure A1-3. Locations and critical habitat of the Santa Cruz tarplant (FWS 5-Year Review, 2022).

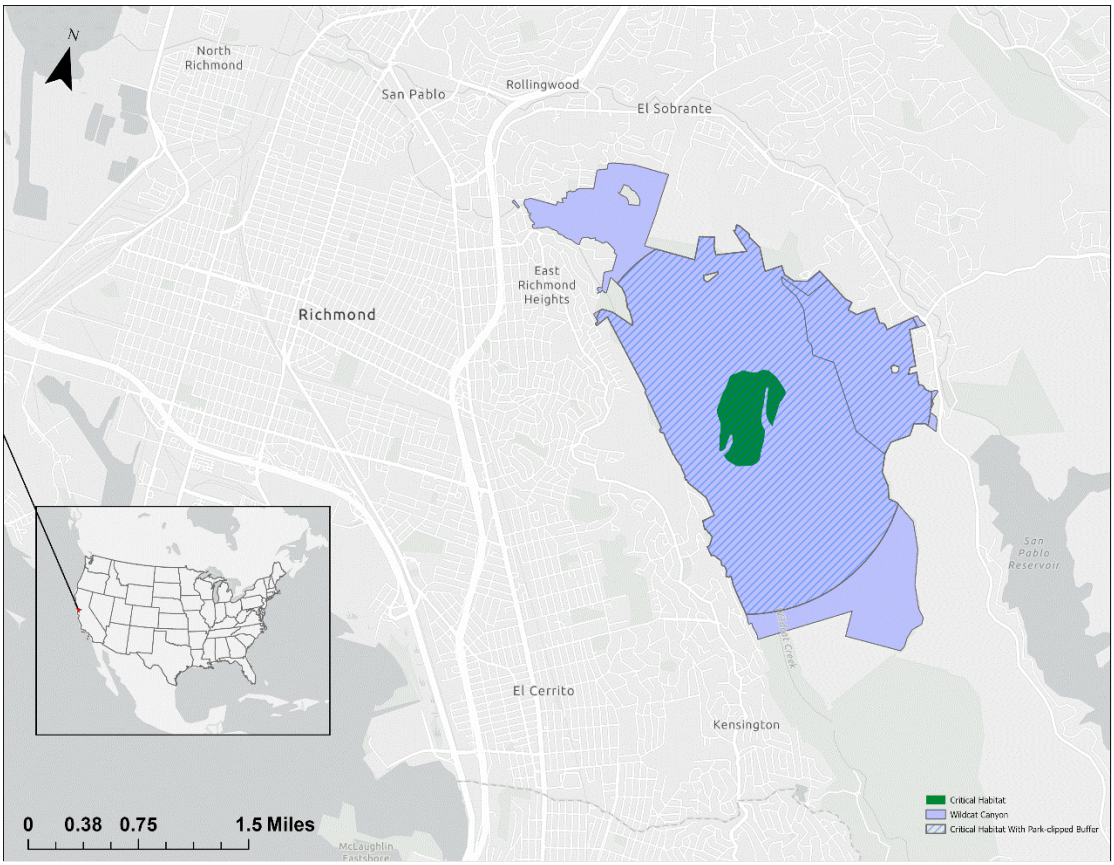

Figure A1-4. Contra Costa County area with FWS critical habitat (Mezue unit, green), Wildcat Canyon Park (violet) and the suggested core map region of critical habitat with 1 mile buffer limited to within Wildcat Canyon Park borders (hatched blue).

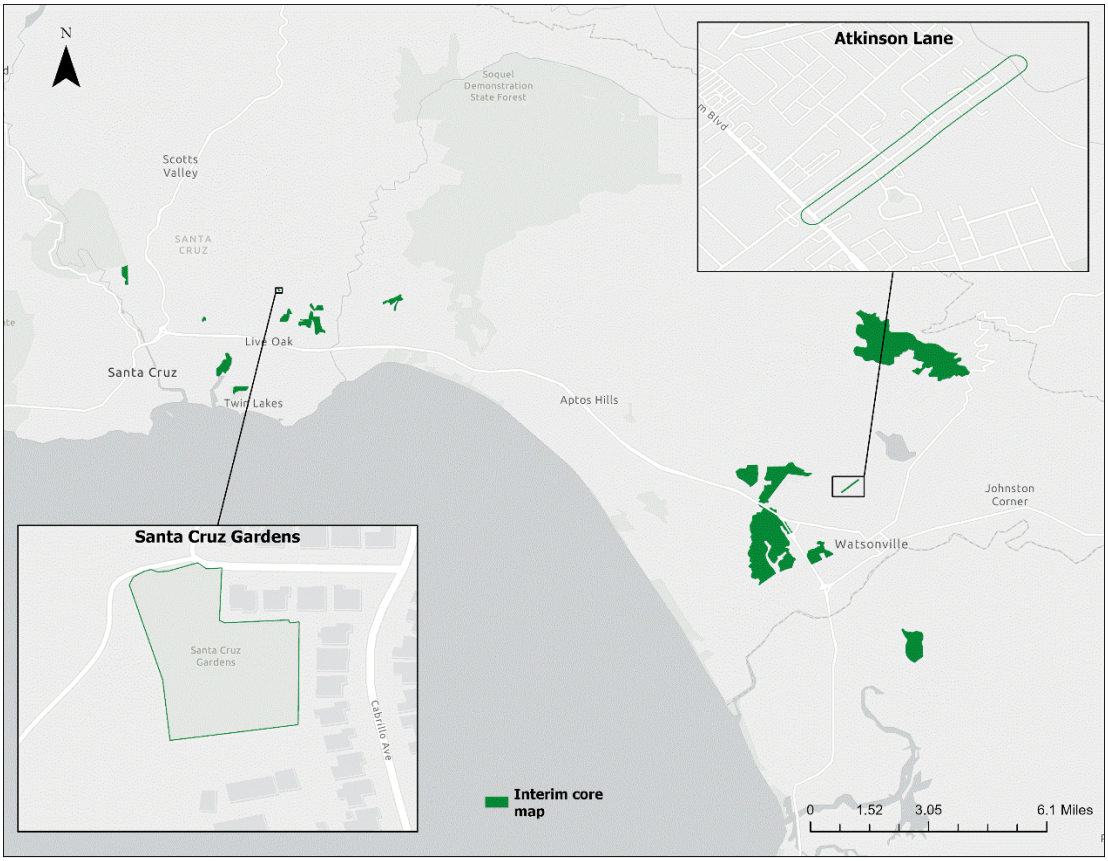

Figure A1-5. Santa Cruz-Monterey area with suggested additions of Santa Cruz Gardens (inset lower left) and Atkinson Lane (inset upper right) to core map.

5. Known Locations

Locations Described in FWS Recovery Documents

- "There are currently 19 known populations of Santa Cruz tarplant (**Figure A1-3**). Populations are either consistently occupied with individuals or are often lacking individuals but are presumed to have a viable seedbank and suitable habitat (**Table A1-1**). Eleven of the known populations have regular or periodic monitoring that includes estimates of annual abundance of individuals and also have active management and/or reintroduction efforts. The remaining eight populations have no monitoring and management efforts, or monitoring and management ceased since 2017." (SSA, 2023)
- To account for the stable population found just outside the critical habitat in the Contra Costa County (**Figure A1-3**), EPA expanded the Mezue critical habitat unit by adding a 1-mile buffer around the original critical habitat and clipping it to reside completely within the Wildcat Canyon Regional Park (https://www.ebparks.org/parks/wildcat-canyon) (**Figure A1-4**). This replaced the existing Mezue critical habitat unit. The Wildcat Canyon boundaries were extracted from a database of lands owned, operated by or leased to the East Bay Regional Park District (https://m.arcgis.com/home/item.html?id=0bf240b928e44f9aa7b0d95f703d67b1).

- To account for the stable populations not contained within the current critical habitat in the Santa Cruz-Monterey region, two new areas were proposed for the core map (**Figure A1-5**),

Table A1-1. Location names, California Natural Diversity Database (CNDDB) occurrence number, management, and ownership of Santa Cruz tarplant locations (CNDDB 2023, data). Hyphens (-) represent areas with no known management of Santa Cruz tarplant. Locations modified from original critical habitat in red font.

Location Name	Occurrence Number	Management	Ownership
Apple Hill	5	-	Caltrans
Arana Gulch	6	Experimental including grazing, mowing, scraping, reintroduction	City of Santa Cruz
Atkinson Lane	NA	-	Private/PG&E easement
Buena Vista Drive	46	-	Private
De Laveaga (Santa Cruz Amory)	47	Monitoring, mowing, grazing	California Army National Guard
Fairway Drive	33	-	Private
Graham Hill	21	Ended 2017	Private/conservation easement
Harkins Slough	40	grazing	Private/conservation easement
O'Neil/Tan/Anna Jean Cummings	11	-	County of Santa Cruz/Private
Porter Ranch	19	Monitoring, grazing	Elkhorn Slough Foundation
Santa Cruz Gardens/Winkle	11	Monitoring, restoration, experimental management, reintroduction	Private/conservation easement[3]
Spring Hills Golf Course	41	-	Private
Struve Slough/ Tarplant Hill	34	Monitoring, mowing	Watsonville Wetlands Watch
Twin Lakes State Beach	2	-	California Department of Parks and Recreation
Watsonville Airport	9	Mowing, monitoring	City of Watsonville
Wildcat Canyon Regional Park (4 occurrences)	28, 29, 30	Grazing, monitoring (introduced)	East Bay Regional Park District

[3] https://www.cnlm.org/portfolio_page/santa-cruz-gardens/

Figure 1. Location of Santa Cruz tarplant (Holocarpha macradenia) populations. Location data is based off California Natural Diversity Database data as well as the 2022 5-year review (CNDDB 2023, data; Service 2022, pp. 4-8).

Figure A1-6. Locations of the Santa Cruz tarplant in the Santa Cruz-Monterey area (SSA, 2023).

Occurrences in iNaturalist

- Searched on April 8, 2024.
- 50 research grade observations available from 2008-2024 (**Table A1-2**).
- https://www.inaturalist.org/observations/export?quality_grade=research&identifications=any&taxon_id=62573&verifiable=true&spam=false
- The observations are clustered around the FWS range polygons in the Santa Cruz/Monterey and Contra Costa regions. The Contra Costa observations generally fall within the local range boundaries. However, over half of the observations centered around the Santa Cruz/Monterey cluster occur outside of the local range and many appear to be erroneously situated in the ocean.
- Since the iNaturalist locations are generally consistent with the vicinity of the range and critical habitats yet appear to be randomly scattered around the range polygons, these observations do not support expanding the core map beyond the established critical habitat areas.

Occurrences in NatureServe

- NatureServe was searched on April 8, 2025.
- https://www.inaturalist.org/observations/export?quality_grade=research&identifications=any&taxon_id=62573&verifiable=true&spam=false
- NatureServe has 51 documented locations. The observations are clustered around the FWS range polygons in the Santa Cruz/Monterey and Contra Costa regions. The Contra Costa observations generally fall within the local range boundaries. However, over half of the observations centered around the Santa Cruz/Monterey cluster occur outside of the local range and many appear to be erroneously situated in the ocean.
    - Since the NatureServe list locations are generally consistent with the vicinity of the range and critical habitats yet appear to be randomly scattered around the range polygons, these observations do not support expanding the core map beyond the established critical habitat areas.

Occurrences in GBIF

- Searched on April 14, 2025.
- Spatial datasets (https://www.gbif.org/occurrence/download/0022474-250402121839773) are empty.

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

This core map was created based on biological information, including a modified critical habitat and two locations containing Santa Cruz tarplant outside of the designated critical habitat.

1. **Dataset References and Software**
   - FWS Species Range – last updated on 3/21/2018
   - FWS Critical Habitat – last updated in 2002
   - National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release (Dewitz, J., 2023), https://www.usgs.gov/data/national-land-cover-database-nlcd-2021-products
   - Wildcat Canyon boundaries selected from a database of lands within East Bay Regional Park District (https://m.arcgis.com/home/item.html?id=0bf240b928e44f9aa7b0d95f703d67b1).
   - Atkinson Lane isolated from a hosted ArcGIS shapefile "California Roads 2017", which is from U.S. Census Bureau's Master Address File / Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) Database (MTDB) (https://epa.maps.arcgis.com/home/item.html?id=e11e20bccaff4b8dad54f37453e8634d).
   - Software used: ArcGIS Pro 3.4

2. **Datasets Used in Core Map Development**
   All datasets used in core map development are described in EPA's process document.

3. **Core Map Development**
   EPA started with the FWS critical habitat to set the outer extent of the core map. Two locations from the California Natural Diversity Database (Atkinson Lane and Santa Cruz Gardens/Winkle) were not represented by the critical habitat and one (Wildcat Canyon Regional Park) had sub-populations that were not fully contained within the critical habitat (**Table A1-1**).

   To capture the populations in the Contra Costa County region, the northernmost critical habitat unit (the Mezue unit) was selected and a 1-mile buffer zone expanding the boundaries was added with ArcGIS. This enlarged area was then clipped with ArcGIS to be contained within the boundaries of Wildcat Canyon Regional Park (**Figure A1-4**). Boundaries for Wildcat Canyon Regional Park were obtained from an ArcGIS database held by the East Bay Regional Park District.

   To capture the Atkinson Lane population described in the California Natural Diversity Database, Atkinson Lane was selected from the California Roads 2017 database and a 100 ft. buffer surrounding the street was added with ArcGIS (**Figure A1-5**).

   To capture the Santa Cruz Gardens population, the borders of Santa Cruz Gardens were traced manually with ArcGIS then added as a new unit to the core map (**Figure A1-5**).