

Interim Core Map Documentation for the Marsh Sandwort

Version 1

Review Completed: April 2026

Core Map Developer: Compliance Services International (CSI) on behalf of BASF Corporation

Species Summary

The marsh sandwort (*Arenaria paludicola*; Entity ID 881) is a dicotyledonous endangered plant in California. The United States Fish and Wildlife Service (FWS) has not assigned designated critical habitat for the marsh sandwort. This species inhabits freshwater marshes up to elevations of about 450 meters. Additional habitat information is provided in **Appendix 1**.

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 map and documentation and evaluated if: (1) the map and documentation are consistent with EPA's process; (2) areas included or excluded from the 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 Geographic Information System (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 given the available data and was consistent with EPA's mapping process. This documentation was not prepared by EPA, and EPA may have edited this documentation for clarity or other purposes. Some views expressed in this documentation may not necessarily be the viewpoints of EPA or its staff.

The core map developed for this species can be used to develop pesticide use limitation areas (PULAs). This core map incorporates information developed by FWS and made available to the public. This core map may be revised in the future after FWS review of the core map or to incorporate additional information that becomes available for this species.

This core map does not replace or revise any range or designated critical habitat developed by FWS.

Description of Core Map

The core map for the marsh sandwort is based on biological information, and comprises an extent determined by known observations of wild and reintroduced populations of Marsh Sandwort. The species' 5-Year Review (FWS 2020) includes a catalogue of locations of extant populations and textual descriptions of habitats where the species is known to occur. Known location information from the iNaturalist and the Global Biodiversity Information Facility (GBIF) databases, and NatureServe, provided support for using these sites as the core map extent, but were not otherwise used in core map development.

Consideration was given to using the LANDFIRE Existing Vegetation Type (EVT) layer to further refine the core map by land cover types, with selected land cover types matching descriptions of species habitat (LANDFIRE 2024). However, the three sites of extant populations were judged to be sufficiently representative of where the species could occur, and the introduction of a habitat-based refinement, while a potential refinement, was not selected by the developers. A refinement of area was applied to exclude areas of cultivated lands greater than 25 contiguous acres, based on the species not expected to be found in agricultural fields.

The core map developed in this document for the marsh sandwort spans 4,151 acres (Figure 1). A summary of acreage by National Landcover Database (NLCD 2021) land use type is provided in Table 1.

Based on the EPA’s “best professional judgment classification” system, CSI has graded this core map as “limited” (2) because relatively few assumptions were made to develop the core map, and there was no need to connect species life history and/or biological needs to any national or state-level Geographical Information System (GIS) dataset. The species’ primary habitat—low elevation freshwater marshes—is adequately represented by the site locations themselves that were found in PAD-US and/or documentation from FWS. More information about the best professional judgment classification system and its definitions can be found in the core map process document (EPA 2024).

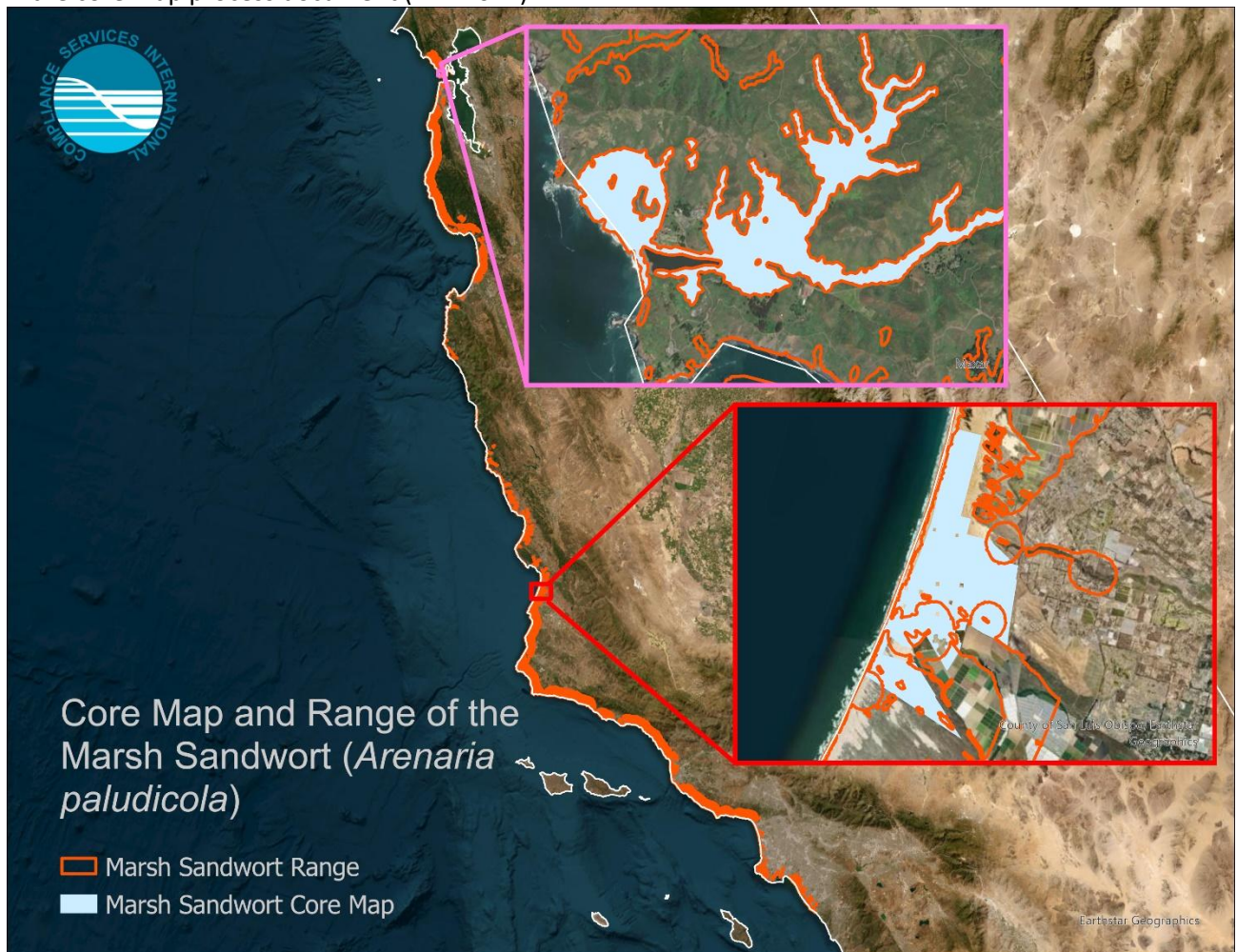


Table 1. Acres by National Land cover Database (NLCD 2021) class within the core map of Marsh Sandwort. Total core map area (based on NLCD pixel count): 4,154 acres¹.

NLCD_Land_Cover_Class	Acres	%
Shrub/Scrub	1,903	45.8
Herbaceous	1,441	34.7
Emergent Herbaceous Wetland	275	6.6
Woody Wetlands	222	5.3
Open Water	62	1.5
Barren Land	63	1.5
Cultivated Crops	60	1.4
Developed, Open Space	44	1.1
Developed, Low Intensity	28	0.7
Mixed Forest	20	0.5
Hay/Pasture	16	0.4
Developed, Medium Intensity	14	0.3
Evergreen Forest	5	0.1
Developed, High Intensity	1	0
Deciduous Forest	1	0

Evaluation of Known Location Information

There were four evaluated datasets with known location information:

- Descriptions of locations provided by FWS
- Occurrence locations in iNaturalist
- Occurrence locations in GBIF
- Occurrence locations in NatureServe

Compliance Services International evaluated these four datasets before developing the core map. Overall, there were 45 usable research-grade observations found in iNaturalist.² The GBIF dataset comprised 134 georeferenced observations, 18 of which were considered usable based on the criteria described below. Both datasets were useful to identify extant population sites for the marsh sandwort, but not precise enough to be used in core map development. These datasets were largely redundant because the iNaturalist observations comprised all the GBIF observations. NatureServe public element occurrence (EO) data were also evaluated and used for comparison purposes.

¹ This acreage is slightly different from the core map acreage (4,151) due to the pixelation of NLCD land cover. The core map is not developed from raster data.

² According to iNaturalist, an observation is designated as “research grade” if it 1) is verifiable with date, coordinates, photos/sounds, and not captive; 2) achieves community agreement defined as “more than 2/3 of identifiers needs to agree on the species level ID or lower;” and 3) “must pass a data quality assessment, which includes checks for accurate date and location, evidence of a wild organism, and clear evidence of the organism itself”

(<https://help.inaturalist.org/en/support/solutions/articles/151000169936-what-is-the-data-quality-assessment-and-how-do-observations-qualify-to-become-research-grade->).

TFWS location information comprised of all three extant population sites, all of which occur on protected lands; this provided a refinement of species range, reducing the area of extent by about 96.2%, or 106,299 acres.

Approach Used to Create Core Map

The core map was developed using EPA’s process for developing core maps for species listed by FWS and their designated critical habitat (referred to as “the process”). This core map was developed by CSI using the four steps described in the process document:

1. Compile available information for a species
2. Identify core map type from among the following defined types: critical habitat, range, and biological information. From EPA, summaries of each core map type are provided below (EPA 2024).
3. Develop the core map for the species
4. Document the core map

For step 1, CSI compiled available information for the marsh sandwort from FWS, as well as observation information available from various publicly available sources including iNaturalist, GBIF, and NatureServe. The information compiled for the marsh sandwort is included in **Appendix 1**. Influential information that impacted the development of the core map includes a description of the species habitat from the Recovery Plan:

- [*Arenaria paludicola* is] found in freshwater marshes... The extant populations in California are in areas of Mediterranean climate, with cool wet winters and drier warmer summers; coastal fog is very common. The elevational range ... is from sea level to about 450 meters (1,480 feet). Soils in their marshy habitats are saturated acidic bog soils, predominantly sandy with a high organic content’ (FWS 1998).

For step 2, CSI used the compiled information including the species range, known locations, and habitat location information to determine the core map type. Compliance Services International compared the known location data to the range and found that known locations from FWS (extant populations identifiable in PAD-US, with a modest refinement using part of the species range) were usable as a refinement of range in determining the core map extent.

Review of the available data suggested that the core map was refined enough that it need not exclude landcover types inconsistent with the marsh sandwort habitat. However, the core map shape had contiguous cultivated areas > 25 acres (EPA 2024) removed to develop the core map because this species’ habitat is not consistent with cultivated areas.

For step 3, CSI used the best-available data sources to generate the core map. Data sources are discussed in EPA’s core map process document. For this interim core map, CSI followed EPA’s decision framework to arrive at a core map type of biological information within an extent defined by known location data. Designated critical habitat was eliminated as a core map type because the marsh sandwort does not have critical habitat. The range core map type was not selected because the species range is neither refined nor endemic in comparison to known occurrence areas. **Appendix 2** provides more details on the GIS analysis and data used to generate the core map.

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

Known Observation Datasets

Datasets such as iNaturalist, GBIF, and NatureServe were considered but not used to define the core map. A different refinement based directly on known observation locations described in FWS documentation and identifiable in PAD-US was selected as the outer extent of the core map.

Appendix 1. Information compiled for Marsh Sandwort

1. Recent FWS documents

- 5-Year Review (2008): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3591.pdf
- 5-Year Review (2020): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3448.pdf
- Recovery Plan (1998): https://ecos.fws.gov/docs/recovery_plan/Service_1998%20recovery%20plan.pdf
- Recovery Plan Amendment (2019): https://ecos.fws.gov/docs/recovery_plan/Recovery%20Plan%20Amendment_NAGA%20ROGA.pdf

2. Background information

- Status: Federally listed as endangered in 1993
- Resiliency, redundancy, and representation (the 3Rs) (USFWS 2019)
 - Resiliency: ‘With respect to resiliency, propagation and outplanting efforts over the last decade have shown that this species has a potential to propagate vegetatively, though with the caveat that much of the vegetatively-propagated material represents a small genetic stock.’
 - Redundancy: ‘Redundancy has been somewhat increased, as the species is now extant in two of the four geographic areas it used to occur. On the other hand, one outplanted population in the central coastal region was recently extirpated due to a stochastic event.’
 - Representation: While representation has been increased somewhat on a regional scale, this is tempered by the fact that, on a microhabitat scale, this species has a very narrow tolerance for soil moisture and salinity conditions, as elucidated by the outplanting trials; therefore, there are a limited number of locations where those habitat conditions can be met for future outplanting efforts.
- Habitat, Life History, and Ecology
 - ‘Both *Arenaria paludicola* and *Rorippa gambelii* are found in freshwater marshes, and *Rorippa gambelii* additionally may occur in brackish marshes. The extant populations in California are in areas of Mediterranean climate, with cool wet winters and drier warmer summers; coastal fog is very common. The elevational range of both species is from sea level to about 450 meters (1,480 feet). Soils in their marshy habitats are saturated acidic bog soils, predominantly sandy with a high organic content. When the species were found in 1992, they occupied an area with some shallow standing water, about 5 centimeters (2 inches) deep, on level ground in the bottom of Black Lake Canyon (M. McLeod, pers. comm. 1994). Vegetation surrounding the plants at Black Lake Canyon includes emergent freshwater marsh species and some riparian woodland or wetland tree species, mainly arroyo willow (*Salix lasiolepis*) and California wax myrtle (*Myrica californica*). Eucalyptus (*Eucalyptus globulus*) trees planted in and around the canyon in the late 1800s form a dense canopy around the edges of the marshes, and some are invading the lower margins of the canyon. Shady or filtered light conditions in the canyon bottom may be inhibiting the growth of species such as *Arenaria paludicola* and *Rorippa gambelii*, but light requirements for their germination and survival are unknown’ (FWS 1998).
 - ‘*Arenaria paludicola* is an herbaceous perennial in the Caryophyllaceae (pink family). It has trailing stems that can be up to 39 inches (in) (1 meter (m)) long and are often supported

by surrounding vegetation. *Arenaria paludicola* has small, white flowers that are borne singly on long stalks arising from the leaf axils (point of leaf attachment to the stem). This plant can also reproduce asexually. It can produce adventitious roots on the trailing stems that come in contact with suitable conditions. It generally blooms from May to August' (FWS 2008).

- 'As a whole, marsh habitat along the Pacific coast continues to decrease both in quantity and quality. These changes are attributed primarily to increased development, erosion and sedimentation, and non-native plants' (FWS 2008).
- Our understanding of marsh sandwort's ecological tolerances has grown considerably since the 2008 5-year review. Bontrager et al. (2014) found that marsh sandwort has an ability to tolerate a wider range of salinities than expected (p. 474). Soil samples were collected across a salinity gradient in five distinct vegetation zones starting from the ocean and moving inward, as well as from soil used for a greenhouse experiment. Marsh sandwort survival was reduced in the most saline soils, with a non-linear threshold trend, suggesting that potential habitats for reintroduction are not necessarily restricted to entirely freshwater, like the three extant populations (FWS 2020).
- Pollination: 'Self-pollination appears to occur in this species, based on the lack of pollinators seen in the field, as well as results of pollinator exclusion experiments' (FWS 1998).
- Taxonomy
 - 'Marsh sandwort (*Arenaria paludicola*) is a dicotyledonous plant belonging to the pink family (Caryophyllaceae). Pertinent synonyms for the scientific name are *Minuartia paludicola* House; *Alsinopsis paludicola* A. Heller; *Arenaria palustris* S. Watson not of Gay 1845; and *Alsine palustre* Kellogg. The species first was described as *Alsine palustre* by Albert Kellogg in 1863, from specimens collected by Bolander near Fort Point (now within Golden Gate National Recreation Area), San Francisco, California. The plant was then "very abundant in swamps" in the area (Kellogg 1863). In 1876, Sereno Watson reassigned the species to the genus *Arenaria*. The resulting name, *Arenaria palustris*, inadvertently duplicated the name that Gay had published earlier, in 1845, for another species. This duplication of names was corrected by B.L. Robinson (1894), who substituted the currently used scientific name, *Arenaria paludicola*' (FWS 1998).
- Relevant Potential Pesticide Use Sites
 - 'The upper canyon's rising or stable aquifer may be recharging through agricultural and golf course runoff, which may include pesticides and fertilizers. Agriculture is the major land use in the Dune Lakes region, particularly the area surrounding Little Oso Flaco Lake' (FWS 1998).
- Relevant Recovery Criteria and Actions (FWS 2019)
 - Preliminary Criteria for Downlisting
 1. New plants of each species are established so that there are at least 5 populations of at least 500 individuals each.
 2. These populations occur in permanently protected habitats within the species' historical ranges.
 3. The populations remain viable (self-sustaining through natural reproduction and stable or increasing in size) for at least 5 years.
 - Criteria for Delisting (When the downlisting criteria have been met for a species, the species can be considered for delisting if:)
 1. threats are reduced or eliminated so that protected populations are capable of

persisting without significant human intervention or perpetual endowments are secured for management necessary to maintain the continued existence of the species. The most outstanding management needs currently are a) controlling competition with nonnative species and hybridization with common watercress, and b) managing water conditions, particularly flow and nutrient loads, that the species depends on.

2. Populations are established across the species ecological settings (in addition to Black Lake Canyon and the Dune Lakes area in San Luis Obispo County), including suitable site(s) in the Santa Barbara County and Ventura County region (e.g.; the San Antonio Creek drainage on Vandenberg Air Force Base or comparable sites); and coastal wetlands in Los Angeles, Orange, or San Bernardino Counties; and
 3. The populations remain viable for at least 10 years. Because this species has narrow microhabitat conditions that it will tolerate, particularly with respect to water flow and nutrient loads, and in light of fluctuations that can occur with climatic conditions and local water availability and nutrient loading, the persistence of populations with these varying conditions over time needs to be confirmed.
- Recovery Actions/Recommendations for Future Actions
 1. Implement annual monitoring programs and develop comprehensive management plans to ameliorate the threats at extant populations.
 2. Conduct surveys within suitable marsh habitats throughout the historic range and in extirpated sites previously known to have supported the species.
 3. Conduct introductions at suitable sites that include long-term management strategies to ensure success and persistence of the species at introduced locations.
 4. Continue to collect seed to expand the *ex-situ* conservation seed bank collection.
 5. Conduct research to evaluate site-specific effects of climate change, the role of sexual reproduction, the seed bank, and genetics of the species to inform management and introduction efforts.

3. Range

'Marsh sandwort was historically known from 16 California Natural Diversity Database (CNDDDB) occurrences found in Los Angeles, Riverside, San Bernardino, San Francisco, San Luis Obispo, and Santa Cruz counties (CNDDDB 2020, website). The Consortium of California Herbaria Portal (CCH2) contains 34 specimen records of the species collected from San Bernardino, San Luis Obispo, Mendocino, and Santa Cruz counties, as well as Mexico (CCH2 2020, website). It was also historically known from Pierce County, Washington and southcentral Mexico (Service 2008, p. 5-6). Currently, the species is considered extirpated from Washington State and may no longer occur in Mexico (Service 2008, p. 5-6). All of the CNDDDB occurrences are confirmed or presumed to be extirpated, except for occurrence numbers nine and 14, which are both in San Luis Obispo County (Figure 1 of the 5-Year Review, Figure 3 of this document). Marsh sandwort also occurs at two locations within the Golden Gate National Recreation Area (GGNRA), in Marin County, where it was successfully introduced in 2011 (Figure 1 of the 5-Year Review, Figure 3 of this document). However, there are no CNDDDB occurrence records for these two GGNRA locations' (FWS 2020; Figure 2).



Range of the Marsh Sandwort (August 2025)

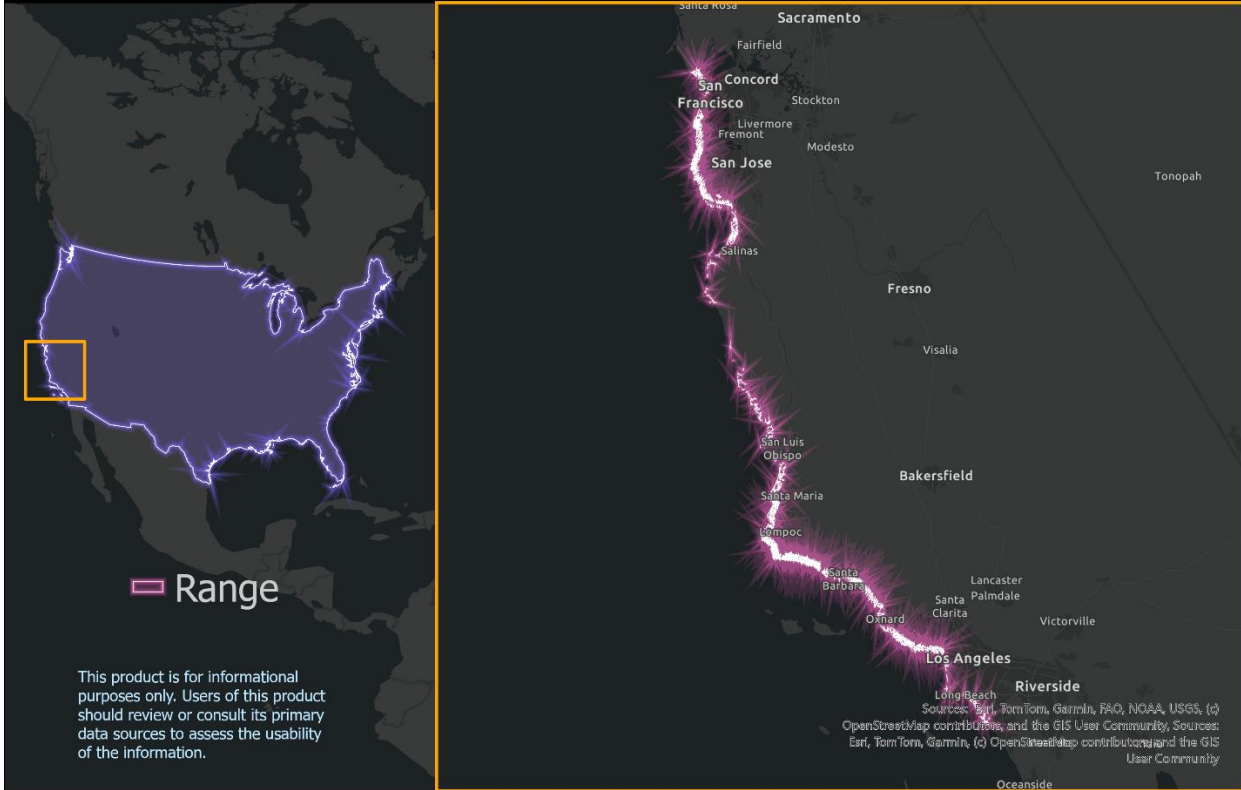


Figure 2. Range of Marsh Sandwort (FWS 2025).

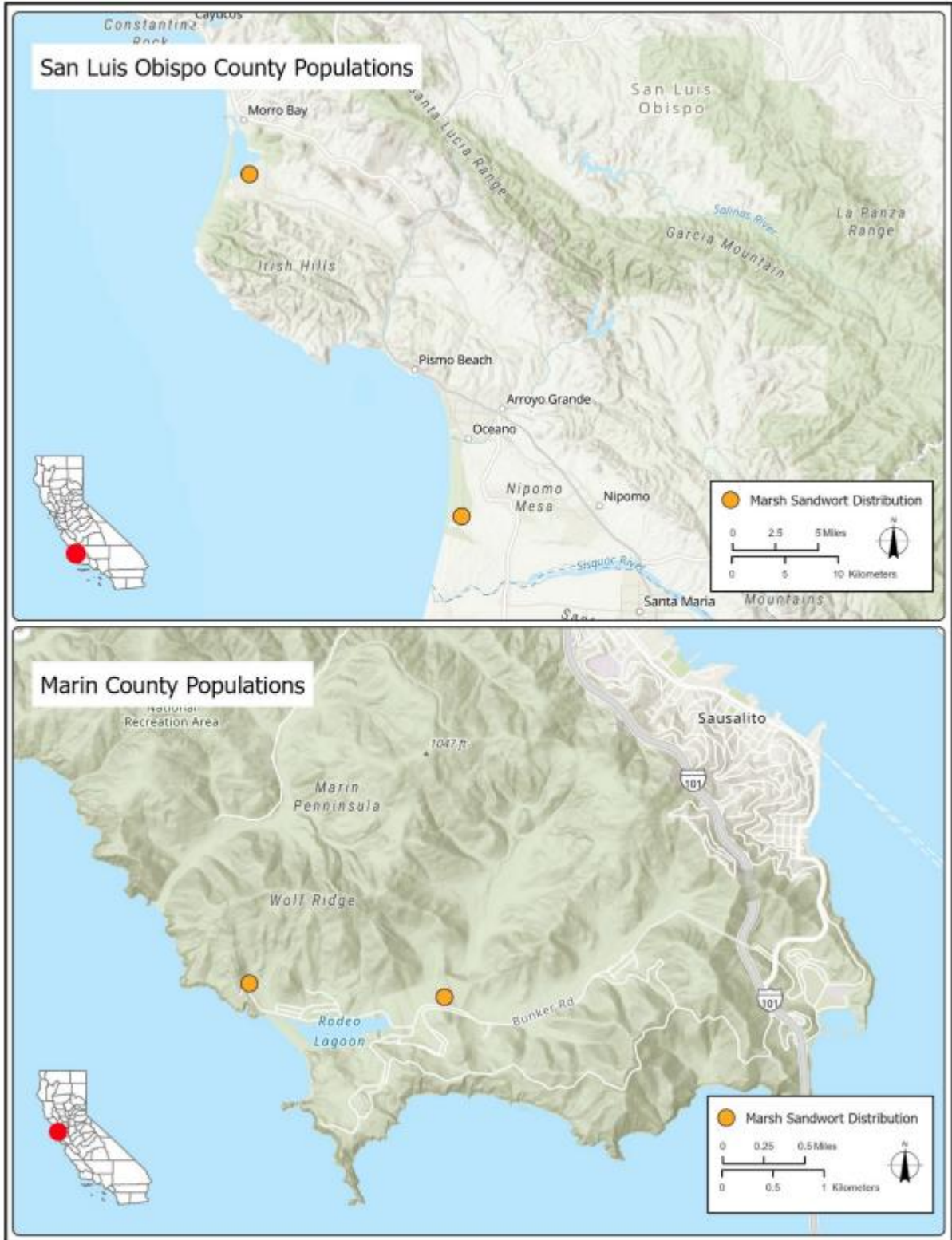


Figure 3. Approximate locations of extant marsh sandwort occurrences in San Luis Obispo County (top) and Marin County (bottom) based on CNDDDB data and additional information from GGNRA (CNDDDB 2020; Acierto et al. 2012, p. 3). Copied from Figure 1 of the most recent 5-Year Review (FWS 2020).

4. Description of Critical Habitat

- Critical habitat has not been designated for this species.

5. Known Locations

- ‘The species distribution is now reduced to three isolated occurrences, with two populations at GGNRA in Marin County and two populations in San Luis Obispo County; at the Sweet Springs Nature Preserve on Morro Bay and Oso Flaco Lake on ODSVRA’ (USFWS 2020).
- GBIF: <https://www.gbif.org/species/5384479>
 - GBIF includes 281 occurrence records; 134 of which are georeferenced. Eighteen of these had usable coordinate data based on these criteria:
 - U.S. only (excludes Mexico)
 - Latitude and longitude precision were both 3+ decimal places.
 - Coordinate uncertainty values no greater than 30 km.
 - Relative recency (2010-present)
 - Must include date information.
 - No “preserved specimen” observations; only “human observation.”
 - The eighteen usable coordinates were mapped against the species range to evaluate their utility in representing species extent. It was observed that all the usable GBIF coordinates were originally sourced from iNaturalist, which also had more records. Therefore, the GBIF dataset was not used for core map development.
- iNaturalist: https://www.inaturalist.org/observations?taxon_id=75552
 - iNaturalist includes seventy total observations, 45 of which are research-grade with usable coordinate data based on these criteria:
 - U.S. only (excludes Canada)
 - Latitude and longitude precision were both 3+ decimal places.
 - Relative recency (2010-present)
 - Observation description did not include the text “intentionally incorrect.”
 - Public positional accuracy (PPA) value no greater than 30 km³
 - This did not result in the exclusion of any records.
 - Locations are consistent with GBIF, which is expected because all the GBIF observations are imported from iNaturalist.
 - The iNaturalist data are neither comprehensive nor precise enough to be used in core map development. However, these data may provide insight into where the species is more commonly found. There are high concentrations of observations in the San Francisco Bay and Morro Bay areas.
- NatureServe Explorer: <https://explorer.natureserve.org/>
 - Available public occurrence information from NatureServe Explorer aligns with the information from iNaturalist and GBIF.
 - Element occurrences were generally consistent with other known observation datasets.

³ For “obscured” observations, public positional accuracy (PPA) represents the diagonal of a 0.2 x 0.2 arc cell. See the iNaturalist geoprivacy page for more details on this and related terms [What is geoprivacy? What does it mean for an observation to be obscured? : iNaturalist Help](#).

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

The core map for this species is based on biological information, which comprised of population locations identified in the most recent 5-Year Review document from FWS and in PAD-US. Additionally, the core map was further refined to exclude areas of contiguous cultivated land > 25 acres according to a spatial layer developed by EPA.

1. References and Software

- FWS Species Range: <https://ecos.fws.gov/ecp/species/2229>.
- Software used: ArcGIS Pro version 3.5.2.
- USFWS 2020 5-Year Review: https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3448.pdf.
- PAD-US v. 4.1 (USGS 2024): <https://www.sciencebase.gov/catalog/item/652d4fc5d34e44db0e2ee45e>.

2. Datasets Used in Core Map Development

2.1. Range

The range for this species was last updated by FWS on September 4, 2024. A shapefile including species range for all listed species was downloaded from the USFWS ECOS website on August 7, 2025, and the species profile for this species was checked on August 28, 2025, for any updates. The shapefile was converted to a feature class stored in a file geodatabase and reprojected to WKID #102008 (“North America Albers Equal Area Conic”).

1. Using an ArcGIS Web Map the species was queried based on the ECOS listed “Entity ID” of 881 and exported as a feature class to a temporary file geodatabase as a standalone Entity ID-specific layer.
2. The area of the range was calculated automatically by loading it into the software (ArcGIS Pro version 3.2) and reading its area from the attribute table (“Shape_Area”), then converting its units (square meters) into acres with a conversion factor of 0.000247105.

This shapefile was added to an ArcGIS Pro map and compared against the known observation datasets. The range was used to limit the extent of one PAD-US site contributing to core map extent within the Golden Gate National Recreation Area.

2.2. U.S. Geological Survey (USGS) Protected Areas Database of the United States (PAD-US Version 4.1)

The individual populations of Marsh Sandwort are catalogued in the species’ 5-Year Review document (FWS 2020). The species inhabits nature preserves and similar types of public lands that are identifiable by name in the USGS PAD-US dataset. Table 2 lists all three populations that were found this way, including the queries that were used to find them. The queries identified multiple polygons or linear features, all of which were included in the core map extent. However, the shapes comprising Golden Gate National Recreation Area (GGNRA) were not adopted because they spanned an area much larger than the actual locations where the species has been observed.

Table 2. Marsh Sandwort population sites obtained from PAD-US version 4.1 and the queries used to find corresponding shapes (USGS 2024).

State	County	Site	Query	FC_Name
CA	San Luis Obispo	Sweet Springs Nature Preserve	Unit_Nm LIKE '%Sweet Springs Nature Preserve%' And State_Nm = 'CA'	Sweet_Springs_NP
CA	San Luis Obispo	Oceano Dunes State Vehicular Recreation Area (ODSVRA)	Unit_Nm LIKE '%Oceano Dunes%' And State_Nm = 'CA'	ODSVRA
CA	Marin	Golden Gate National Recreation Area	Unit_Nm LIKE '%Golden Gate National Recreation Area%' And State_Nm = 'CA'	[n/a]

The core map shape for the GGNRA was not obtained from PAD-US; unlike the other two extant population sites, the GGNRA is a location that extends well beyond the site locations given in FWS documentation: Rodeo Beach and Miwok trail. A comparison of the GGNRA shape in PAD-US vs. the site locations from a georeferenced image is provided in Figure 4.

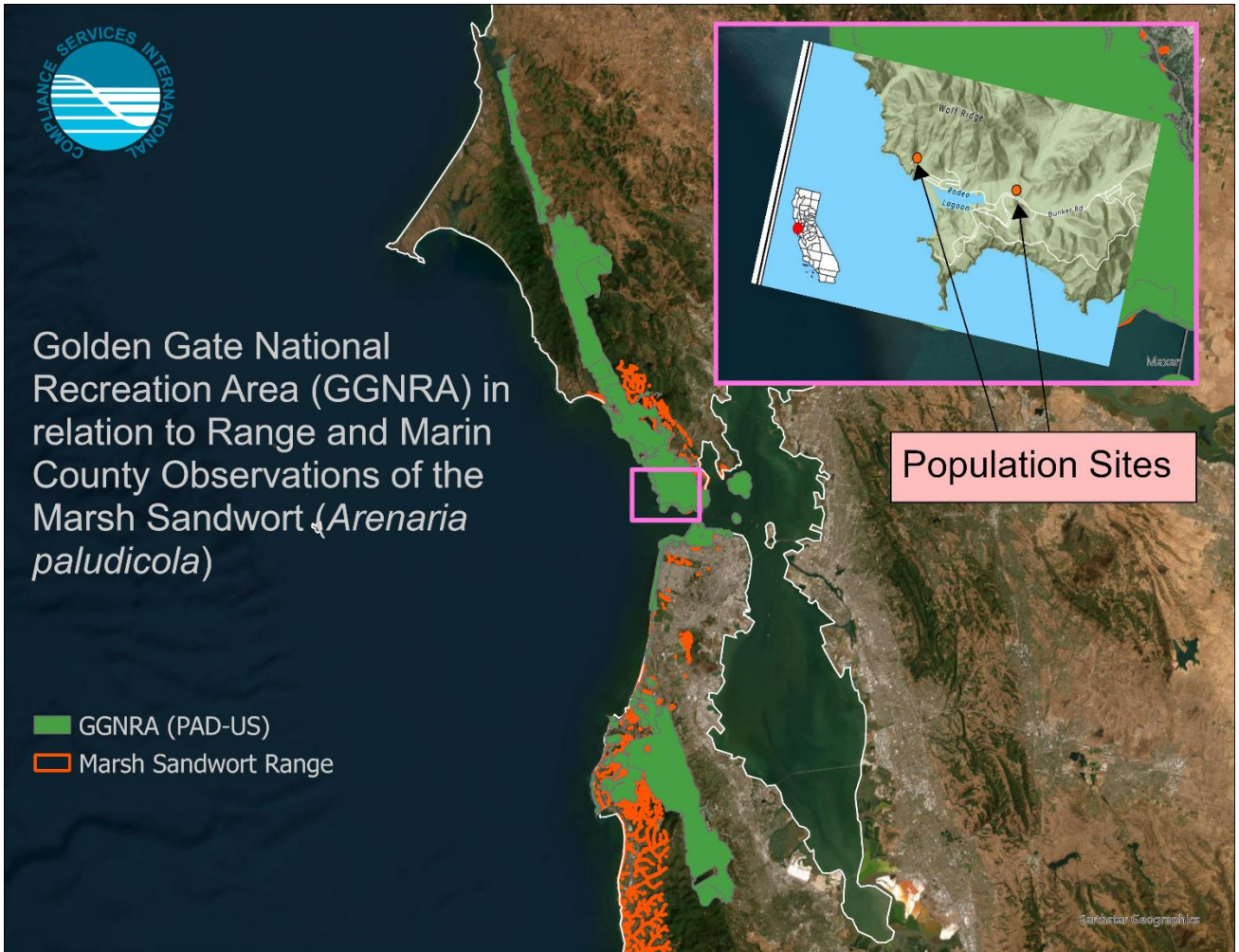


Figure 4. Golden Gate National Recreation Area (GGNRA) in relation to range and Marin County observations of the marsh sandwort (*Arenaria paludicola*).

Instead, Marin County observations within the GGNRA were represented by a piece of the range overlapping with observation sites at Rodeo Drive and Miwok trail. This was accomplished by creating a polygon surrounding the vicinity of these sites and clipping the species range to that county, as shown in Figure 5.

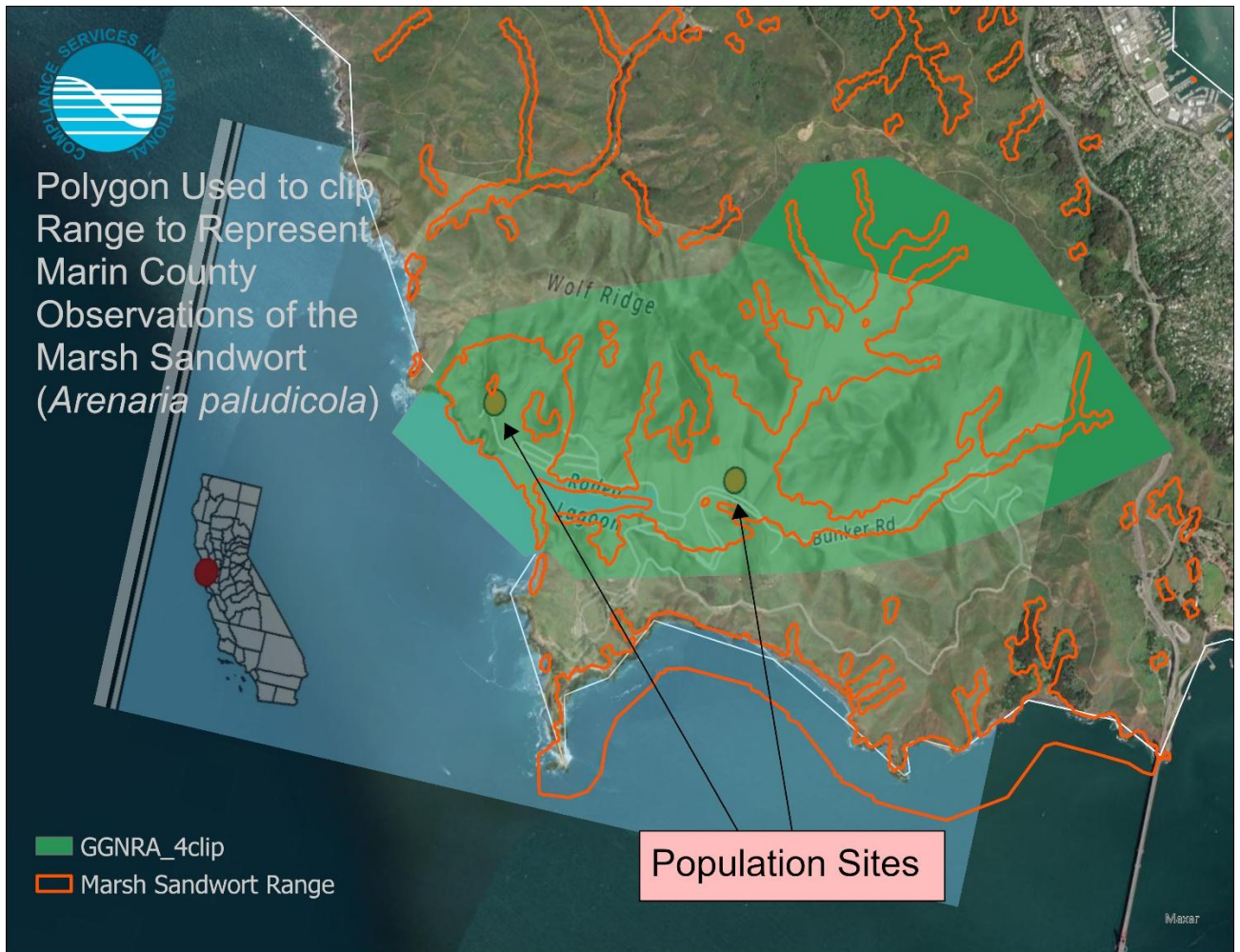


Figure 5. Polygon (green) used to clip range (orange) to represent Marin County observations of the marsh sandwort (*Arenaria paludicola*).

2.3. EPA Cultivated Lands Layer

EPA has developed and published its own cultivated layer for use in core map development as a potential refinement of extent. For the marsh sandwort, extent was refined by this layer using the Pairwise Erase tool to remove significant areas of agriculture because the species habitat is not consistent with cultivated land and is therefore considered by CSI to be an “off-field” species. This decision was based on an overall interpretation of the following statements from a recent EPA Biological Evaluation (BE) of bicyclopyrone:

- “[Marsh Sandwort] is unlikely to establish on agricultural fields as it inhabits freshwater marshes with shallow standing water and is sensitive to disturbance” (EPA 2025).

This removed only 1.15% of area (48 acres) but is considered a reasonable refinement for core map development for off-field species.

3. Creating the Core Map

3.1. Defining Extent

The core map extent for the marsh sandwort was developed from multiple sources including the PAD-US and FWS documentation. The species occurs only on federally protected public lands at three extant locations; the most recent 5-Year Review document includes information about populations on protected lands and in total. These areas were developed for the core map as follows:

1. Save an image of the map displayed in Figure 1 of the most recent 5-Year Review document (**Figure 3** of this document) to a local folder. Use the Raster To Geodatabase tool to import this image to a working geodatabase, saved as “GGNRA_sites”. Add to a map with species range (“MS_range”).
2. Render the image partially transparent. 70% transparent was used in this analysis.
3. Initiate a georeferencing session and fit the previous layer (“GGNRA_sites”) to the display. Use control points to orient the image to match the underlying state and boundary counties.
4. Create an empty polygon feature class. This layer will be used to facilitate a Pairwise Clip in a subsequent step. Name the new polygon feature class “GGNRA_4clip”.
5. In an Edit session, use the Create Features tool to create a single polygon feature for the “GGNRA_4clip” layer that encompasses the species range in the vicinity of Marin County observations.
6. Use the Pairwise Clip tool to clip the species range (“MS_range”) by the manually created polygon (“GGNRA_4clip”) and save as a new layer representing the Golden Gate National Recreation Area observations, “GGNRA”.
7. Load the PAD-US layer to the name. Use the Select by Attributes tool to query for the Sweet Springs Natural Preserve and Oceano Dunes State Vehicular Recreation Area using the following queries. Export selected features as new layers, “Sweet_Springs_NP” and “ODSVRA”, respectively.
 - Unit_Nm LIKE '%Sweet Springs Nature Preserve%' And State_Nm = 'CA'
 - Unit_Nm LIKE '%Oceano Dunes%' And State_Nm = 'CA'
8. Use the Merge tool to merge the three layers below to represent the full extent of the core map of Marsh Sandwort. Save as a new layer, “MS_extent”.
 - GGNRA
 - Sweet_Springs_NP
 - OSDVRA
9. Use the Pairwise Dissolve tool to dissolve the previous shape (“MS_extent”) into a feature class with a single feature, saved as “MS_extent_pd”.

3.2. Cultivated Lands-based Refinement

The marsh sandwort is not expected to be found in agricultural areas, so a refinement to exclude areas of agriculture was applied. This was determined according to a recent BE for bicycloprrone, where the following was said about the marsh sandwort: “The species occurs in multiple habitat types but is not expected to establish on agricultural fields” (EPA 2025). Here agricultural areas are represented by EPA’s modified cultivated layer, which includes areas spanning at least 25 acres. This was done as follows:

1. Use the Pairwise Erase tool to exclude cultivated areas > 25 acres from the previous layer (“MS_extent_pd”) according to a layer developed by USEPA (“CultivatedAreas_Over25acres”). Save as a new layer (“MS_extent_pd_peCultivated25ac”).
2. (Optional) Export features from the previous layer (“MS_extent_pd_peCultivated25ac”) into a new layer

recognizable as Marsh Sandwort core map, "Marsh_sandwort_CoreMap".

4. Datasets Considered but Not Used in Core Map Development

4.1. Known Observation Datasets

Datasets such as iNaturalist, GBIF, and NatureServe were considered but not used. NatureServe public EOs are viewable in their mapper as hexagons corresponding to locations where the species may have been observed. A different refinement from range based directly on known observation locations described in FWS documentation and identifiable in PAD-US was selected as the outer extent of the core map.

References

Documents

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