

Interim Core Map Documentation for the Gambel's Watercress

Date Posted to EPA's GeoPlatform: November 2025

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

Species Summary

The Gambel's watercress (*Rorippa gambellii*; Entity ID 1145) is a dicotyledonous endangered plant in California. The U.S. Fish and Wildlife Service (FWS) has not assigned designated critical habitat for the Gambel's watercress. This species inhabits marshes and swamps, and other coastal wetland habitats, including streambanks, and on the margins of lakes and ponds. Additional habitat information 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, and 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 for the Gambel's watercress is biological information type comprising an extent determined by the only two extant populations of the Gambel's watercress. The species' 5-Year Review (FWS 2022) includes a catalogue of locations of extirpated and extant populations, and textual descriptions of habitats where the species is known to occur.

The two sites of extant populations were judged to be sufficiently representative of where the species could occur, so no habitat-based refinement was done in the development of this core map. However, 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 within agricultural fields.

The core map developed in this document for the Gambel's watercress spans 1,619 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 the use of national or state-level Geographical Information System (GIS) datasets was relatively straightforward. The species' primary habitat—marshes, swamps, and other coastal wetland habitats—is adequately represented by the site locations themselves that were found in the Protected Areas Database of the United States (PAD-US), the National Hydrography Dataset (NHD Plus v. 2) 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).



Figure 1. Interim core map for Gambel's Watercress (*Rorippa gambellii*; Entity ID 1145). The core map spans 1,619 acres, while the range is 2,825,435 acres.

Table 1. Acres by National Land cover Database (NLCD 2021) class within the core map of the Gambel's watercress. The total core map area (based on NLCD pixel count) is 1,618 acres¹.

NLCD_Land_Cover_Class	Acres	%
Shrub/Scrub	710	37.5
Woody Wetlands	393	20.8
Emergent Herbaceous Wetland	261	13.8
Herbaceous	86	4.5
Developed, Open Space	60	3.2
Open Water	39	2.1
Evergreen Forest	28	1.5
Mixed Forest	18	1
Developed, Low Intensity	11	0.6
Barren Land	6	0.3
Developed, Medium Intensity	3	0.2
Cultivated Crops	2	0.1
Hay/Pasture	1	0.1
Developed, High Intensity	-	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 the Global Biodiversity Information Facility (GBIF)
- Occurrence locations in NatureServe

Compliance Services International evaluated these four datasets before developing the core map. Overall, there was one usable research-grade observation found in iNaturalist.² The GBIF or NatureServe datasets did not support further expanding the core map.

FWS location information included both extant population sites, which both occur on at least partially protected lands.

¹ This acreage is slightly different from the core map acreage (1,619) 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->).

Approach Used to Create Core Map

The core map was developed using EPA's process for developing core maps for species listed by the 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 Gambel's watercress from FWS, as well as observation information available from various publicly available sources including iNaturalist, GBIF, and NatureServe. The information compiled for the Gambel's watercress is included in **Appendix 1**. Influential information that impacted the development of the core map includes a description of the species habitat from the most recent 5-Year Review:

The Gambel's watercress occurs in marshes and swamps, and other coastal wetland habitats, including streambanks, and on the margins of lakes and ponds... there are currently two confirmed, extant element occurrences of Gambel's watercress. These include CNDDDB³ number 1 (Oso Flaco Lake), located on Parks and private lands, in southwestern San Luis Obispo County and number 12, located in a stream tributary to San Antonio Creek on [Vandenberg Space Force Base] in Santa Barbara County (FWS 2022).

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 and NHD) were usable as a refinement for the core map. Other known location data from GBIF, iNaturalist, and NatureServe were not used to develop the core map given the precision, scale, and number of observations in these public datasets.

Review of the available data suggested that the core map was refined enough that it was deemed unnecessary to exclude landcover types inconsistent with Gambel's watercress 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 Gambel's watercress 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.

³ California Natural Diversity Database.

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. Known observation locations described in FWS documentation and identifiable in PAD-US and NHD Plus was selected as the outer extent of the core map given the authoritative source of the FWS data.

Appendix 1. Information compiled for Gambel's Watercress

1. Recent FWS documents

- 5-Year Review (2011): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1884.pdf
- 5-Year Review (2022): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3673.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) (FWS 2019)
 - Resiliency: 'The species has the potential of having high resiliency, based on its ability to propagate vegetatively, both in the greenhouse and in the wild. However, this is tempered by the fact that, due to the ubiquitousness of common watercress (*Nasturtium officinale*), the genetic purity of the wild population has already been partially compromised by the presence of common watercress, and any efforts to outplant *N. gambelii* in other locations may face the same challenge.'
 - Redundancy: 'The species is currently represented by only one small population in the wild.'
 - Representation: 'The species is currently represented by only one small population in the wild.'
- Habitat, Life History, and Ecology
 - 'Gambel's watercress occurs in marshes and swamps, and other coastal wetland habitats, including streambanks, and on the margins of lakes and ponds. While the species was once wide ranging, we now consider it likely reduced to a single pure, extant population located along the banks of an unnamed perennial stream, tributary to San Antonio Creek on Vandenberg Space Force Base (VSFB), in Santa Barbara County, California' (FWS 2022).
 - 'In 2020, the [USFWS] funded a project designed to evaluate the hybridization potential of Gambel's watercress and learn more about its reproductive biology and breeding strategy in an *ex-situ*, greenhouse setting. Santa Barbara Botanic Garden (SBBG) staff made three bulk Gambel's watercress seed collections from the two extant patches at VSFB to start this work in August of 2021. They collected a total of 3,371 seeds from the eastern patch and 1,888 seeds from the western patch. SBBG will bank any seeds not used in direct support of the project (Schneider 2021, pers comm). These banked seeds are of use for additional seed bulking efforts, outplanting recovery projects, and can serve as backup in the event of catastrophic loss of the species' (FWS 2022).
 - 'Since the time of listing, there has been a loss and degradation of habitat due to development and urbanization and a conversion of marsh habitat due to the collateral, but indirect, effects from development and urbanization. Some of this habitat loss has occurred in watersheds that are classified as impaired by the Regional Water Quality Control Board due to excessive amounts of nitrogen and other nutrients' (FWS, 2011).
- Taxonomy
 - '*Nasturtium gambelii* was originally described as *Cardamine gambellii* in 1876 based on a specimen collected by William Gambel in 1844 in the vicinity of Santa Barbara (Watson 1876). *Nasturtium*

gambelii, the currently recognized name, was originally listed by the Service as endangered under the name *Rorippa gambellii* (Service 1993). While the circumscription of the species (the limits of the species characters and range) has remained constant since its original description, it has been recognized under several different names (some of the names have similar spelling, but because they were recorded with slightly different names they are listed separately), including *Cardamine gambellii* (Watson 1876, Abrams 1944), *Cardamine gambelii* (Jepson 1923; Munz 1959, 1968, 1970, 1974; Hoover 1970; Roberts 1989), *Rorippa gambellii* (Smith 1976, 1998; Roberts 1998; Service 1998, CNPS 2001), *Rorippa gambellii* (Al-Shehbaz and Rollins 1988, Rollins 1993, Service 1993, Skinner and Pavlik 1994), *Nasturtium gambellii* (Al-Shehbaz and Price 1998), and *Nasturtium gambelii* (Index of California Plant Names 2009)' (FWS 2011).

- Relevant Potential Pesticide Use Sites
 - Pesticides are not listed as a threat to this species.

- Relevant Recovery Criteria and Actions
 - Criteria for Downlisting (FWS 2022)
 1. New plants of each species (Gambel's watercress and marsh sandwort) are established so there are at least five populations of at least 500 individuals each.
 2. Some of these populations occur in permanently protected habitats in Black Lake Canyon and the Dune Lakes area.
 3. Some of the populations must be in other areas of suitable habitat within the species' historical ranges in the United States.
 4. The populations remain viable for at least five years.
 - Criteria for downlisting are not considered currently (FWS 2022)
 - Recommendations for Future Actions (FWS 2022)
 1. 'Conduct annual monitoring of both the VSFB and Oso Flaco Lake Gambel's watercress populations. Include counting and reporting the number of above ground vertical stems and global positioning system (GPS) mapping of occupied spatial area, co-occurring and co-dominant vegetation, presence of natives versus nonnative species, percent canopy cover, hydrological conditions, timing of phenology, and presence of potential insect pollinators. Consistent data collection and reporting will allow for meaningful comparisons and analyses of trends.
 2. Implement threats management activities at each population, including vegetation management such as trimming and removal, invasive weed abatement, and sediment removal and erosion controls.
 3. Document the presence and extent of common watercress within the San Antonio Creek and Oso Flaco Lake watersheds. Improve assessment of morphological traits of pure versus hybrid Gambel's watercress to better facilitate rapid visual assessments of introgression in the field. Conduct control and eradication of common watercress where appropriate.
 4. Develop an effective rapid method for sequencing and genotyping to characterize Gambel's watercress genetic population structure and accurately evaluate abundance.
 5. Determine if the seed bank harbors additional Gambel's watercress genetic diversity. If so, introduction/reintroduction projects may utilize such grown out plants and potentially restore lost genetic integrity to the species.
 6. Determine how vegetative succession and other hydrological changes associated with eutrophication and biostimulation are affecting the species and employ remedial measures to restore occupied habitats to optimal conditions for recovery.
 7. Research the species reproductive biology to evaluate and quantify hybridization with common

watercress, including self-compatibility, breeding system, seed viability, and morphology of pure and hybrid lineages. Work to better understand the species pollinators, fruiting and seed production, and optimal ecological factors that favor Gambel's watercress growth and population expansion.

8. Conduct genetic studies and other controlled experiments to evaluate the hypothesis that hybrid individuals have reduced viability and that when we remove common watercress, selective forces may act over successive generations to return genotypes back to pure Gambel's watercress forms.'

3. Range

'*Rorippa gambelii* was reported in the early 1900s from several wetland locations in southern California, from Los Angeles and San Bernardino counties southward. There was a disjunct population in the Valley of Mexico near Mexico City (Wickenheiser 1989). In 1947, a population was observed by R.F. Hoover in San Luis Obispo County near Small Twin Lake and Oceano Beach (California Natural Diversity Data Base 1994). These historical populations of *Rorippa gambelii* are extirpated. A population reported from San Diego County by Oberbauer (date unknown) may have been misidentified — the plants were possibly *Rorippa nasturtium-aquaticum* (Price 1989). Plants reported in Santa Barbara County occurred in a marsh dominated by sawgrass (*Cladium californicum*) in Barka Slough at Vandenberg AirForce Base (Dial 1980). They were not observed by Price in 1989 surveys, when he noted that the area had converted to willow woodland; additionally, Price reports that the 1980 record was not supported by an herbarium voucher. In California floras by Hoover (1970), Munz (1974), and Rollins (1993), the distribution of *Rorippa gambelii* was termed, respectively, "locally common," "occasional becoming scarcer," and finally, "rare" (FWS 1998).



Range of the Gambel's Watercress (August 2025)

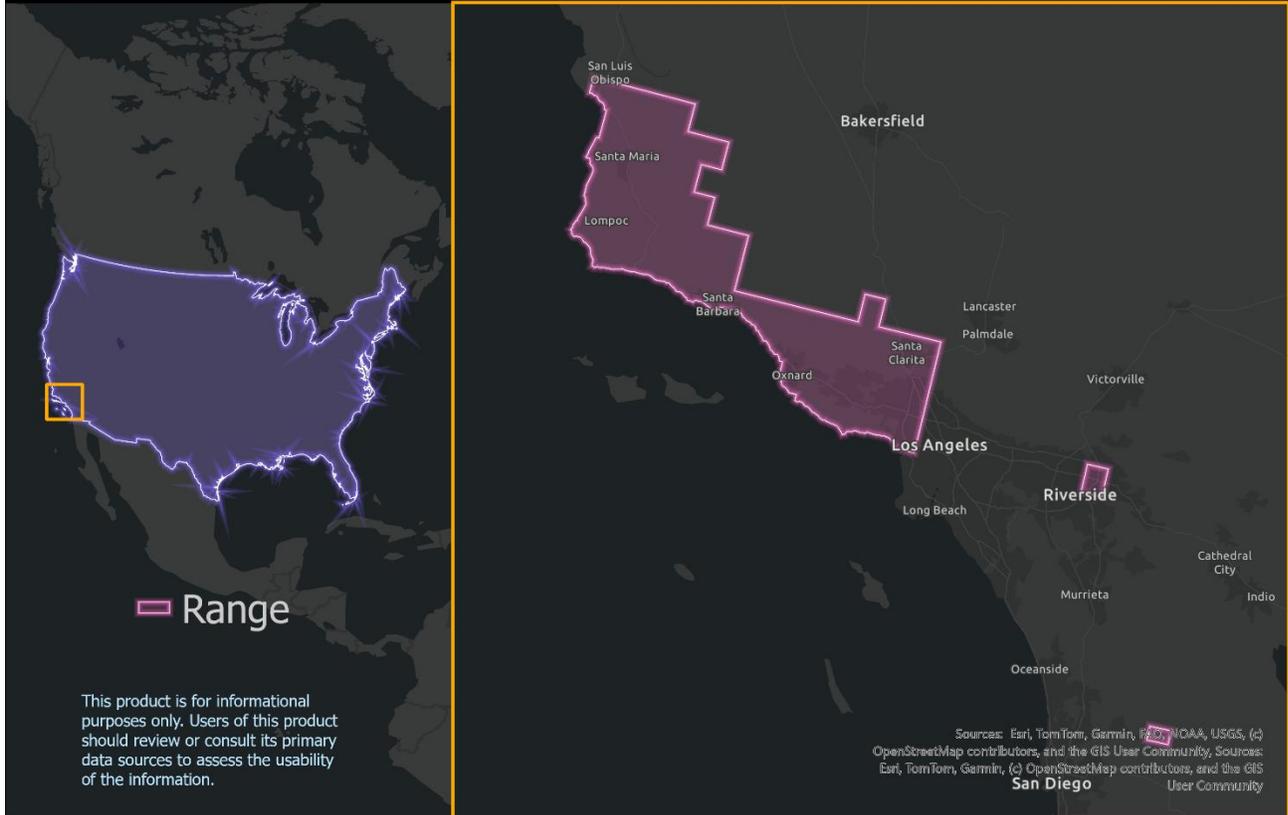


Figure 2. Range of the Gambel's watercress (FWS 2025).

4. Description of Critical Habitat

Critical habitat has not been designated for this species.

5. Known Locations

'There are currently two confirmed, extant element occurrences of Gambel's watercress. These include CNDDDB number 1 (Oso Flaco Lake), located on Parks and private lands, in southwestern San Luis Obispo County and number 12, located in a stream tributary to San Antonio Creek on VSFB in Santa Barbara County'. The Oso Flaco Lake population is a hybrid population (FWS 2022). See Figure 3 for the extant populations.

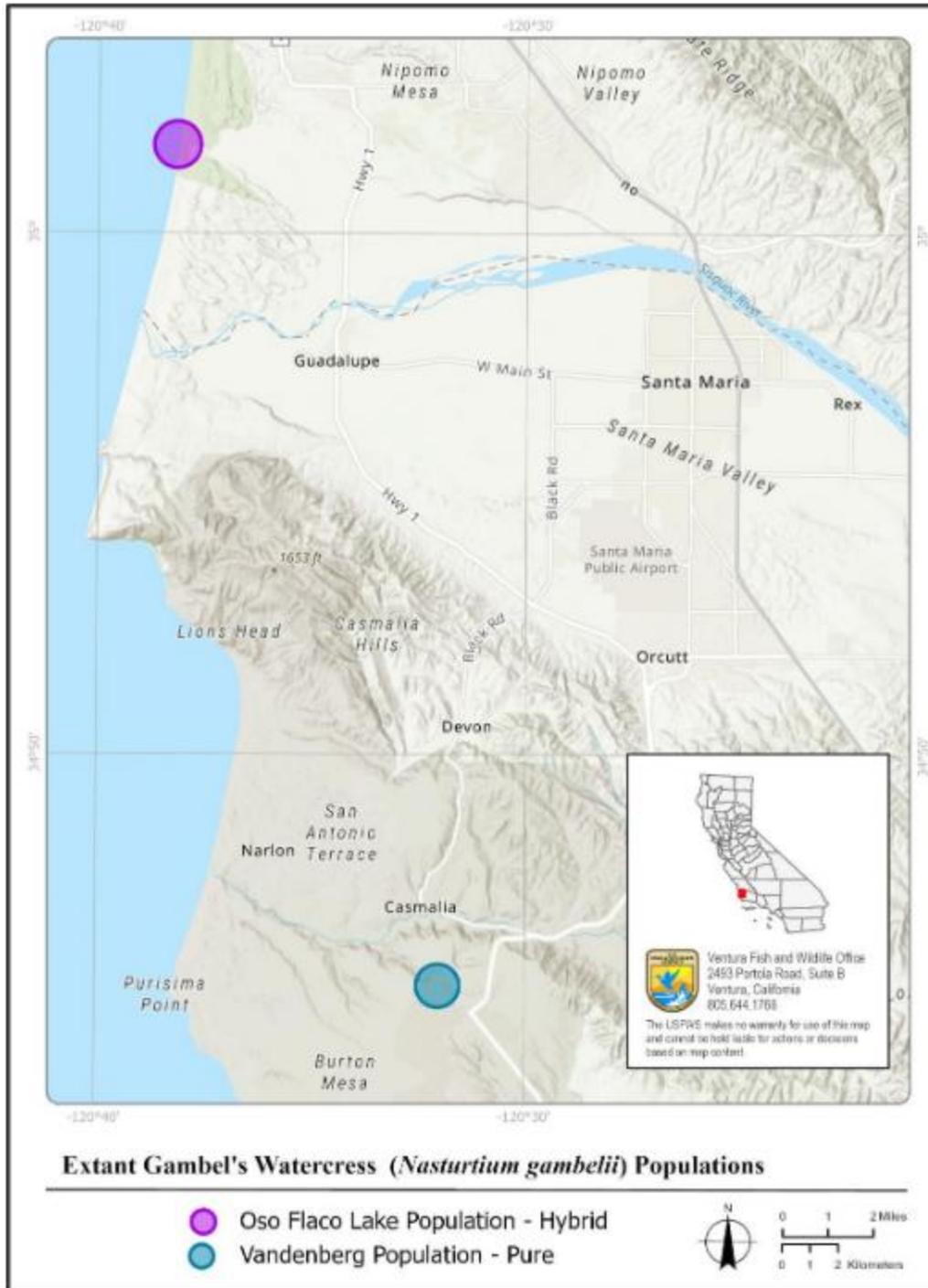


Figure 3. Extant Gambel's watercress (*Rorippa gambelii*, also known as *Nasturtium gambelii*) populations. Copied from Figure 1 of the most recent 5-Year Review (FWS 2022).

- GBIF: <https://www.gbif.org/species/5384479>
 GBIF includes 193 occurrence records; 71 of which are georeferenced (Figure 4). None 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.”
- Since there were no usable observations for the Gambel’s watercress, the GBIF dataset was not used for core map development.

71 GEOREFERENCED RECORDS



Figure 4. GBIF occurrences for the Gambel’s watercress (GBIF 2025).

- iNaturalist: https://www.inaturalist.org/observations?taxon_id=78173
- iNaturalist includes one observation (Figure 5) which is 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 km⁴
 - This did not result in the exclusion of any records.
 - The observation intersects the range when accounting for the PPA uncertainty value (Figure 6).
 - The iNaturalist is consistent with one of two areas where the species still has extant populations. These observations do not support expanding the core map.

⁴ 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.](#)

Observations

Gambel's Watercress

The World **1 OBSERVATION** 1 SPECIES 1 IDENTIFIER 1 OBSERVER

Map Grid List Places of Interest Redo search in map

Gambel's Watercress
(*Nasturtium gambelii*)
California, US June 2018
Research Grade 2 10 4 Aug '23

Figure 5. iNaturalist occurrences for the Gambel's watercress (iNaturalist 2025).

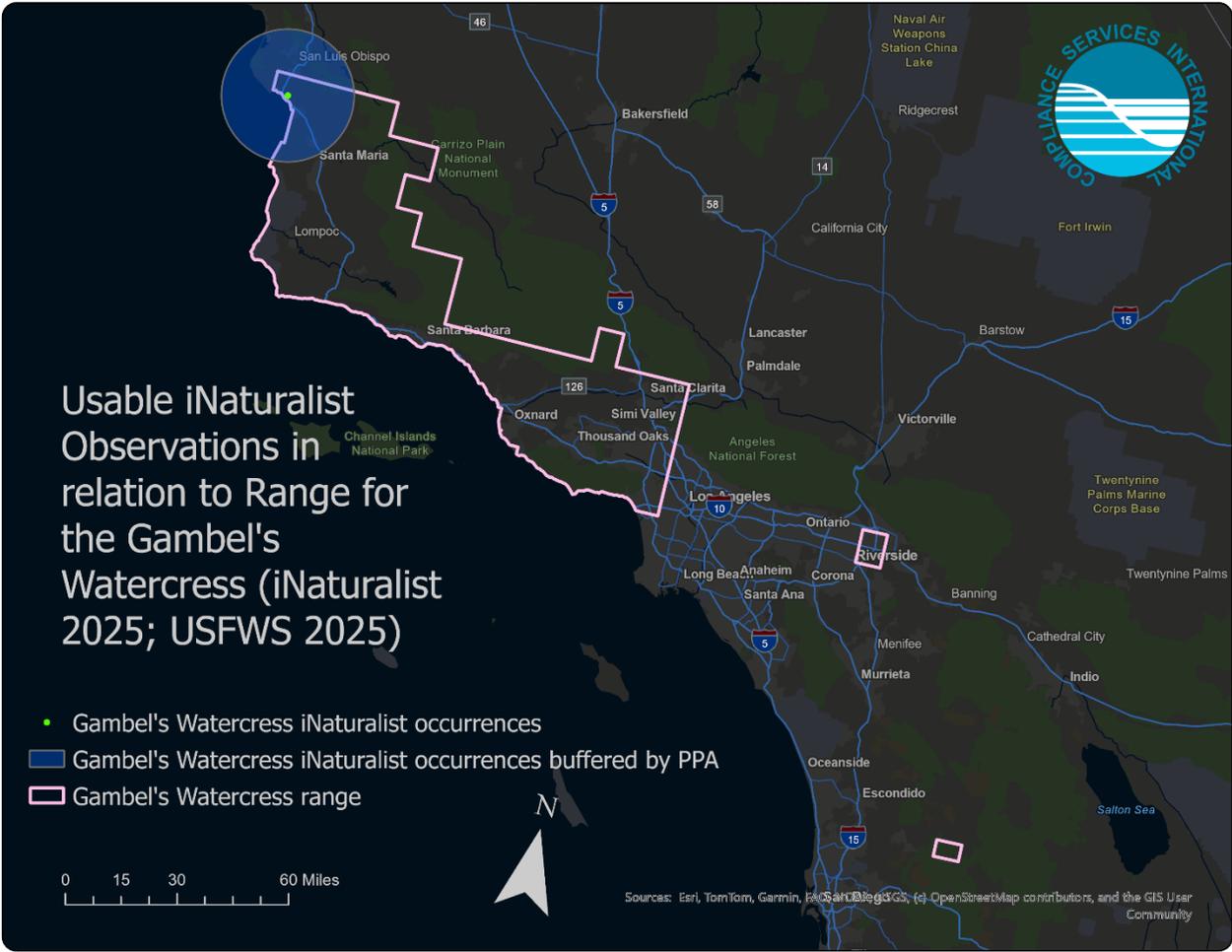


Figure 6. Usable iNaturalist observations, buffered by PPA, for the Gambel's watercress in relation to species range (iNaturalist 2025; FWS 2025).

- NatureServe Explorer: <https://explorer.natureserve.org/>
 - Available public occurrence information from NatureServe Explorer aligns with the information from iNaturalist and FWS.
 - EOs were generally consistent with other known observation datasets and do not support further expanding or refining the core map.

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

The core map for this species is based on biological information, which comprises 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/4201>.
- Software used: ArcGIS Pro version 3.5.2.
- FWS 2022 5-Year Review: https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3673.pdf.
- National Hydrography Dataset (Version 2.1): https://nhdplus.com/NHDPlus/NHDPlusV2_tools.php.
- 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 October 30, 2023. A shapefile including species range for all listed species was downloaded from the FWS ECOS website on August 7, 2025, and the species profile for this species was checked on September 1, 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”).

- Using an ArcGIS Web Map the species was queried based on the ECOS listed “Entity ID” of 1145 and exported as a feature class to a temporary file geodatabase as a standalone Entity ID-specific layer.
- 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 for comparison purposes only and did not otherwise contribute to core map extent of the Gambel’s watercress. There is some core map area extending beyond the range in the vicinity of Oso Flaco Lake.

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

The individual populations of the Gambel’s watercress are catalogued in the species’ 5-Year Review document (FWS 2022). The species inhabits marshes, swamps, and other coastal wetland habitats that are sometimes identifiable by name in the USGS PAD-US dataset. Table 2 lists the single population that was found this way, the Vandenberg Space Force Base (VFSB), including the query that was used to find it. The query identified multiple polygons, all of which were included in the core map extent (Figure 7).

Table 2. Gambel's watercress population site 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	Vandenberg Space Force Base	Unit_Nm LIKE '%Vandenberg%' And State_Nm = 'CA'	VSFB

The core map shape for the VSFB was not derived exclusively from PAD-US; the most recent 5-Year Review specifies that the extant population is “located along the banks of an unnamed perennial stream, tributary to San Antonio Creek” (FWS 2022). As a result, further refinement was done using the NHD Plus v. 2 dataset to incorporate relevant tributaries within the VSFB shape.

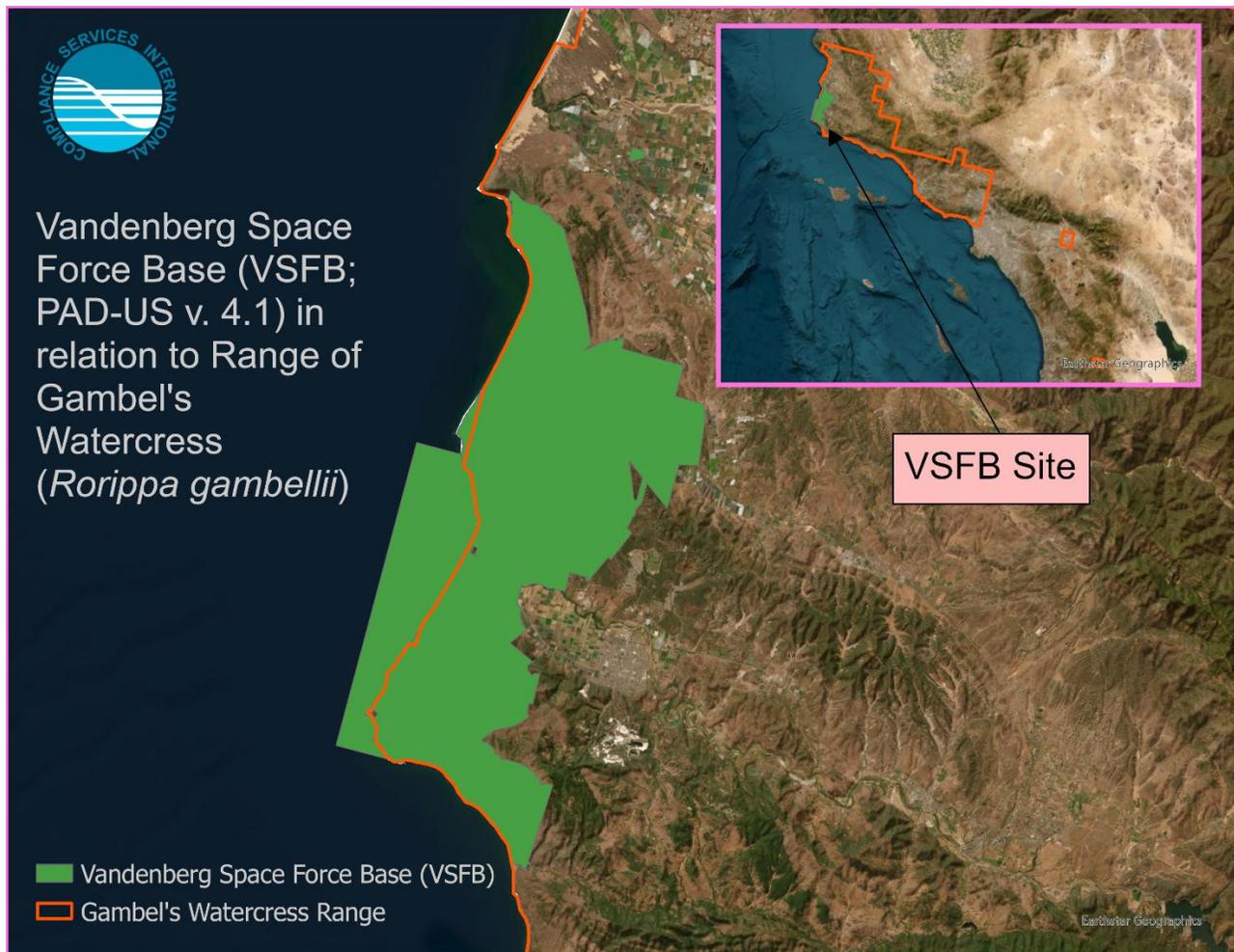


Figure 7. Vandenberg Space Force Base (VSFB) in relation to range of the Gambel's watercress (*Rorippa gambellii*).

2.3. U.S. Geological Survey National Hydrography Dataset (NHD Plus v. 2)

The NHD Plus v. 2 dataset was used to identify water bodies relevant to the core map of the Gambel's watercress. Within the VSFB shape identified in PAD-US, the network flowline layer was queried to

identify the San Antonio Creek and its tributaries, as these waters are where the extant population resides.

The second extant population residing in Oso Flaco Lake in San Luis Obispo County was represented by the water body itself; therefore, the NHD Waterbody layer was queried to identify this lake. Both linear and polygonal features were queried for using the information provided in Table 3.

Table 3. Gambel's watercress population site obtained from NHD Plus version 2 and the queries used to find corresponding shapes (USGS 2012).

County, State	Site	Source	Query	FC_Name
Santa Barbara, CA	San Antonio Creek tributaries	NHD Flowline Network	[manual selections intersecting or equal to GNIS_NAME = 'San Antonio Creek']	VSFB_SanAntonioCreek_trib
San Luis Obispo, CA	Oso Flaco Lake	NHD Waterbody	GNIS_NAME = 'Oso Flaco Lake'	Oso_Flaco_Lake

Resulting NHD shapes were buffered by 150 feet (ft) to find areas along the water bodies likely to provide suitable habitat for Gambel's Watercress. This distance was chosen based on a recommended distance for "Sensitive Resource Area," a space developed to ensure continued existence of the species in its original Recovery Plan document (FWS 1998). Finally, these buffered shapes (Oso Flaco Lake and the tributaries along San Antonio Creek) were merged and dissolved into a single shape representing the core map extent. See **Appendix 2 Section 3** for more information about the geoprocessing steps used to develop the core map for this species.

2.4. 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 Gambel's watercress, 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 of bicyclopyrone:

- "[Gambel's Watercress] is unlikely to establish on agricultural fields as it requires permanent wetlands, fresh or brackish, in marshes and swamps or along the borders of lakes and slow-flowing streams or ditches. The dilution effect of wetland habitat and the tidal influences [occurring] in brackish wetlands will likely minimize runoff exposure. The species' occurrence in lowland wet forests is also expected to minimize exposure via spray drift and runoff" (EPA 2025).

This removed only 0.43% of area (7 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 Gambel’s watercress was developed from multiple sources including PAD-US, NHD Plus, and FWS documentation. The species occurs only in two extant locations; the most recent 5-Year Review document includes information about these populations. These areas were developed for the core map as follows:

1. Load the PAD-US layer into a GIS. Use the Select by Attributes tool to query for the Vandenberg Space Force Base using the following query. Export selected features as a new layer, “VSFB”. Ensure that this layer and all subsequent ones developed are in the preferred projection, WKID = 102008. Unit_Nm LIKE '%Vandenberg%' And State_Nm = 'CA'
2. Use the Pairwise Clip tool to clip the NHD Plus v. 2 “Network Flowline” layer by the “VSFB” layer developed in the previous step. Save as “NHD_Network_pcVSFB”.
3. (Optional) Use the Select By Attributes tool to query for stream features associated with San Antonio Creek from within the previous layer (“NHD_Network_pcVSFB”), using the following query. Export selected features as “VSFB_SanAntonioCreek”.
 - GNIS_NAME = 'San Antonio Creek'
4. Use the Select tool to manually select network flowline features from “NHD_Network_pcVSFB” that are associated with the San Antonio Creek features identified in the previous step (“VSFB_SanAntonioCreek”). This resulted in the selection of 41 unique features. Export selected features as a new layer, “VSFB_SanAntonioCreek_trib”.
5. Use the Pairwise Buffer tool to buffer the previous layer (“VSFB_SanAntonioCreek_trib”) by 150 ft, and save as a new feature class, “VSFB_SanAntonioCreek_trib_pb150ft”.
6. Use the Pairwise Dissolve tool to dissolve the previous shape (“GW_extent”) into a feature class with a single feature, saved as “GW_extent_pd”.
7. Load the NHD Waterbody layer into the GIS. Use the Select By Attributes tool to select the feature associated with Oso Flaco Lake, using the following query. Save selected feature as a new layer, “Oso_Flaco_Lake”.
 - GNIS_NAME = 'Oso Flaco Lake'
8. Use the Pairwise Buffer tool to buffer the previous layer (“Oso_Flaco_Lake”) by 150 ft, and save as a new feature class, “Oso_Flaco_Lake_pb150ft”.
9. Use the Merge tool to merge the buffered water feature layers (“VSFB_SanAntonioCreek_trib_pb150ft” and “Oso_Flaco_Lake_pb150ft”) into a single feature class representing the core map extent, saved as “GW_extent”.
10. Use the Pairwise Dissolve tool to dissolve the previous layer (“GW_extent”) into a feature class with a single shape, saved as “GW_extent_pd”.

3.2. Cultivated Lands-based Refinement

The Gambel’s watercress 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 Biological Evaluation (BE) for bicyclopurone, where the following was said about the species: “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 ("GW_extent_pd") according to a layer developed by EPA ("CultivatedAreas_Over25acres"). Save as a new layer ("GW_extent_pd_peCultivated25ac").
2. (Optional) Export features from the previous layer ("GW_extent_pd_peCultivated25ac") into a new layer recognizable as Gambel's watercress core map, "Gambels_watercress_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 and NHD Plus was selected as the outer extent of the core map.

References

Documents

- U.S. Environmental Protection Agency. 2024. Process EPA Uses to Develop Core Maps for Pesticide Use Limitation Areas. Accessed September 1, 2025. <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas>.
- U.S. Environmental Protection Agency. 2025. "Bicyclopyrone Biological Evaluation." Regulations.gov. Last modified September 1, 2025. <https://www.regulations.gov/document/EPA-HQ-OPP-2014-0355-0076>.
- U.S. Fish and Wildlife Service. 1998. "Recovery Plan for Marsh Sandwort (*Arenaria paludicola*) and Gambel's Watercress (*Rorippa gambellii*). Ventura, California. Accessed September 1, 2025. https://ecos.fws.gov/docs/recovery_plan/Service_1998%20recovery%20plan.pdf.
- U.S. Fish and Wildlife Service. 2011. "Gambel's Watercress (*Rorippa gambellii* [*Nasturtium gambellii*]) 5-Year Review: Summary and Evaluation. Ventura, California. Accessed September 1, 2025. https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1884.pdf.
- U.S. Fish and Wildlife Service. 2019. "Recovery Plan for Marsh Sandwort (*Arenaria paludicola*) and Gambel's Watercress (*Rorippa gambellii*) Amendment 1. Ventura, California. Accessed September 1, 2025. https://ecos.fws.gov/docs/recovery_plan/Recovery%20Plan%20Amendment_NAGA%20ROGA.pdf.
- U.S. Fish and Wildlife Service. 2022. "Gambel's Watercress (*Rorippa gambellii*) 5-Year Review: Summary and Evaluation. Ventura, California. Accessed September 1, 2025. https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3673.pdf.

Spatial Data & Software

- GBIF Secretariat. "Rorippa gambellii (Gambel's Watercress)." GBIF Backbone Taxonomy. <https://www.gbif.org/species/5384479>. GBIF.org (01 September 2025) GBIF Occurrence Download <https://doi.org/10.15468/dl.wn78qj>.
- iNaturalist. "Gambel's Watercress (*Rorippa gambellii*)." Accessed September 1, 2025. https://www.inaturalist.org/observations?taxon_id=78173.
- LANDFIRE. 2024. "Existing Vegetation Type (EVT)." U.S. Department of Agriculture and U.S. Department of the Interior. Accessed September 1, 2025. <https://landfire.gov/data/FullExtentDownloads>.
- NatureServe. 2025. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available <https://explorer.natureserve.org/>. Accessed September 1, 2025.
- Software used: ArcGIS Pro version 3.5.2.
- U.S. Fish and Wildlife Service. 2025. "Gambel's Watercress (*Rorippa gambellii*)." Environmental Conservation Online System (ECOS). Accessed September 1, 2025: <https://ecos.fws.gov/ecp/species/4201>.
- U.S. Geological Survey (USGS) Gap Analysis Project (GAP), 2024, Protected Areas Database of the United States (PAD-US) 4.1: U.S. Geological Survey data release, <https://doi.org/10.5066/P96WBCHS>.
- U.S. Geological Survey. 2012. National Hydrography Dataset Version 2.1. Accessed September 1, 2025. https://nhdplus.com/NHDPlus/NHDPlusV2_tools.php.