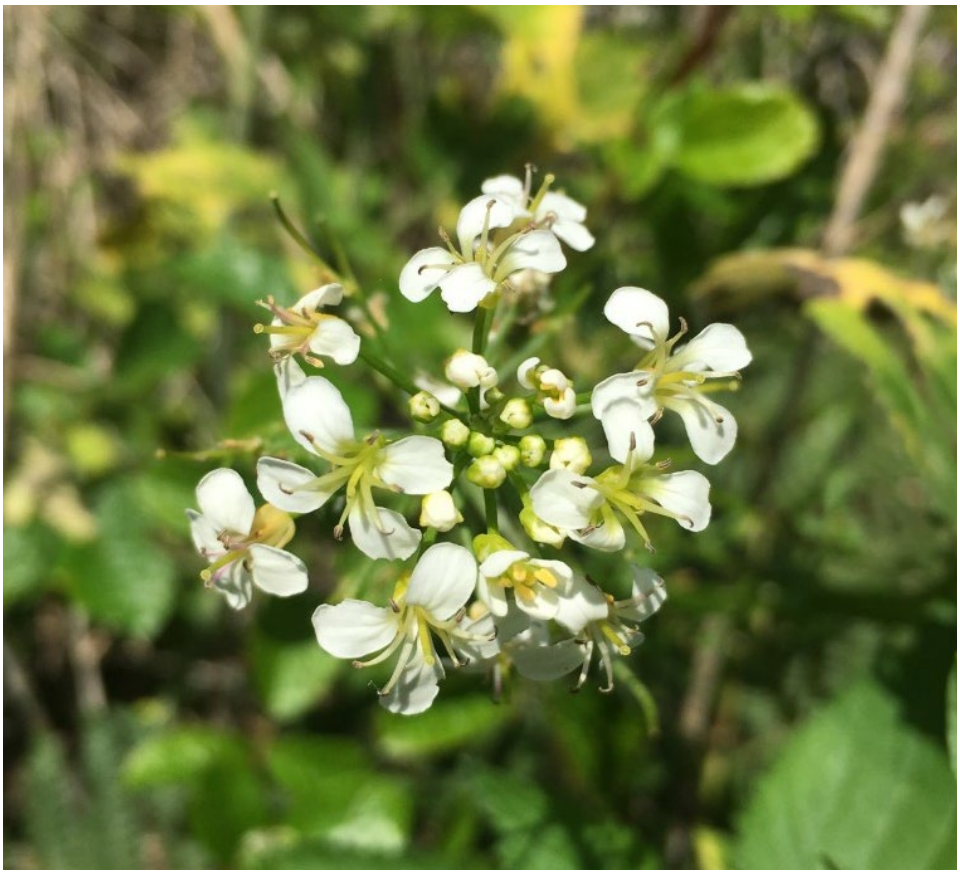
Gambel's Watercress (*Nasturtium gambelii* [*Rorippa gambellii*])

5-Year Review:
Evaluation and Summary



Kristie Scarazzo, USFWS 2021

U.S. Fish and Wildlife Service
Ventura Fish and Wildlife Office
Ventura, California

February 2022

5-YEAR REVIEW
Gambel's watercress (*Nasturtium gambelii* [*Rorippa gambellii*])

GENERAL INFORMATION

Species: *Nasturtium gambelii* (*Rorippa gambellii*)
FR citation: 58 FR 41378-41384 (as *Rorippa gambellii*)
Date listed: August 3, 1993
Classification: Endangered

BACKGROUND

Most recent status review:
U.S. Fish and Wildlife Service. 2011. *Rorippa gambellii* [*Nasturtium gambelii*] (Gambel's watercress) 5-Year Review: Summary and Evaluation. Ventura Field Office. Ventura, California.

FR Notice citation announcing this status review:
Initiation of 5-Year Status Reviews of 40 species in California, Nevada, and Oregon. Notice of initiation of reviews; request for information (87 FR 5832-5834), February 2, 2022.

Critical Habitat Designation:
No critical habitat has been designated.

State Listing:
The species was listed in 1990 as Threatened under the California Endangered Species Act (California Natural Diversity Database [CNDDB] 2021. State and Federally Listed Endangered, Threatened, and Rare Plants of California. California Department of Fish and Wildlife [CDFW]. Sacramento, California).

Recovery Plan:
U.S. Fish and Wildlife Service. 1998. Recovery Plan for Marsh Sandwort (*Arenaria paludicola*) and Gambel's Watercress (*Rorippa gambelii*). Fish and Wildlife Service, Portland, Oregon.

U.S. Fish and Wildlife Service. 2019. Recovery Plan Amendment for Marsh Sandwort (*Arenaria paludicola*) and Gambel's Watercress (*Nasturtium gambelii* [*Rorippa gambelii*]). Fish and Wildlife Service, Ventura, California.

ASSESSMENT

Overview:
Gambel's watercress is a rhizomatous (roots at nodes) aquatic, perennial herb in the Brassicaceae (mustard family). It has elongated inflorescences with white flowers that typically bloom May through August (Al-Shehbaz 2021, website). However, Gambel's watercress flowering can extend into October. Early reports suggested that the species is self-compatible (Mazer 1994,

pgs. 134-135). There is now increasing evidence for insect pollination and outcrossing (introgression or interbreeding) with other species in the genus (Le et al 2020, pgs. 20-23). Gambel's watercress has relatively long, narrow fruits that split along two seams (or valves), separated by a thin partition (or septum). This fruit type is unique to the Brassicaceae and is called a silique. Each silique generally produces 10 to 30 small (one to 1.2 millimeter or 0.4 to 0.5 inch wide), dark brown, shiny, egg-shaped seeds. Gambel's watercress seeds occur in one row per ovary chamber and this is a diagnostic characteristic of the species (Al-Shehbaz 2021, website). It is able to persist in the soil as a seed bank, but how long the seeds remain viable is unknown (Mazer and Parikh 2000, pgs. 35-37).

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 (Service 1993, 58 FR 41378-41384).

Information acquired since the last status review:
This 5-year review was conducted by the U.S. Fish and Wildlife Service (Service), Ventura Fish and Wildlife Office. Announcement of this review occurred through a Federal Register notice on February 2, 2022. We contacted other agencies and species experts to request any data or information we should consider in our review. We also conducted a literature search and a comprehensive review of information in our files.

New information has become available since our last 5-year review (Service 2011). We have updated information about the species current distribution and abundance, genetics, and seed banking. We also have additional information regarding climate change effects. Discussions of each of these topics are included in the assessment.

Population Distribution and Abundance:
Listing. At the time of listing in 1993, there were three known populations of Gambel's watercress. All three were located within southwestern San Luis Obispo County, California in aquatic features located approximately six kilometers ([km], or four aerial miles [mi]) from each other. These sites included locations within private properties along Black Lake Canyon, around the margins of Oso Flaco Lake, owned by the California Department of Parks and Recreation (Parks) and part of the Oceano Dunes State Vehicular Recreation Area, and locations associated with Little Oso Flaco Lake, predominantly privately owned, but under a lease agreement with Parks. The total abundance of the species within these three populations was estimated to be approximately 1,000 individuals. However, the level of certainty for the count was low (Service 1993, 58 FR 41378-41384).

Recovery Plan. The Service finalized a Recovery Plan for Gambel's watercress in 1998 (Service 1998). At this time, we presumed the Black Lake Canyon population was persisting at the three known locations. The most recent survey data for the population at the time was from 1994, which estimated approximately 500 individuals. The Oso Flaco Lake population was surveyed in 1998 and 468 individuals were counted. Botanists could not relocate the Little Oso Flaco Lake population and, therefore, determined it to be likely extirpated. Discovery of an additional

population of Gambel's watercress occurred around in 1996, along the banks of an unnamed stream tributary to San Antonio Creek on VSFB, in Santa Barbara County, California. Estimates of total abundance of this population were approximately 100 individuals.

5-Year Review. The Service completed the first 5-year review of the species in 2011 (Service 2011). By this time, the three original populations described in the listing rule (Black Lake Canyon, Oso Flaco Lake, and Little Oso Flaco Lake) were all determined to be likely extirpated. The one remaining extant population at VSFB had at least 56 individuals, based on surveys conducted in 2009. However, population estimates based on aerial stem counts, (which was the main field technique used) are likely overestimates of Gambel's watercress abundance because of its rhizomatous habit, and that many of the above ground stems observed are actually vegetative (or clonal) growth from a far fewer number of individuals (Prince 2008a, pg. 17). Therefore, we did not have an accurate approximation of the true species abundance within the last known remaining population on VSFB at this time.

Current Status. The CNDDB currently includes 13 Gambel's watercress element occurrence records. Five of these records have extirpated citations (numbers 4, 7, 13, 15, 16, and 17) and are from historical (1882-1949) herbaria collections. The locations include the type locality collected from an unknown location within the vicinity of the current City of Santa Barbara, California limits (CNDDD 2021, website).

Element occurrence number 2 also has an extirpated citation, which is from the Dune Lakes area in southwestern San Luis Obispo County and the last sightings of the species at this location are from the late 1980s (CNDDD 2021, website). The Land Conservancy of San Luis Obispo County holds a conservation easement with the private property owners. We have revisited this location several times recently and have not relocated the species. We agree with the likely extirpated citation from the Dune Lakes location.

Element occurrence numbers 10 and 11, from Black Lake Canyon, in southwestern San Luis Obispo County have possibly extirpated citations (CNDDD 2021, website). The Service and partners conducted multiple surveys for the species throughout these sections of the canyon and did not re-locate Gambel's watercress. The most recent efforts occurred in summer of 2020. Therefore, we consider the species extirpated from these two Black Lake Canyon occurrence locations.

Element occurrence number 1, Oso Flaco Lake, includes four polygons cited as presumed extant (CNDDD 2021, website). Portions of the occurrence are within privately owned properties and Parks owns and manages the majority. The Service, Parks, and partners recently conducted multiple surveys for the species throughout these previously mapped locations and did not relocate it. However, in July of 2020, Parks found a single, small plant next to the boardwalk, west of the causeway (Wagner 2021, pers comm). The Service, Parks, and partners also found another occupied stand within a drainage ditch located on an adjacent private property, with access agreements for Parks. The occupied stand is approximately 0.0008 hectare (0.002 acre). We consider the species likely extant from element occurrence number 1, based on its' recently confirmed presence and given other factors discussed below in the genetics section.

Element occurrence number 9 includes two polygons mapped near Little Oso Flaco Lake cited as possibly extirpated (CNDDD 2021, website). These locations have private ownership, but Parks has access agreements for its operations. The last observations of Gambel's watercress associated with this occurrence were by Parks and partners in 2005. Parks also surveyed these locations in summer of 2020 and did not relocate the species. Therefore, we consider this occurrence likely extirpated.

The last two CNDDB element occurrence records (numbers 12 and 14) are both located on VSFB. Element occurrence number 14 has a possibly extirpated citation, mapped in 1980 within Barka Slough (CNDDD 2021, website). Images or specimens to confirm the identity of the species observed at this location were not included with the original report. Numerous survey efforts were unsuccessful in relocating the species at this location. VSFB and partners surveyed Barka Slough for Gambel's watercress in 2015 and did not relocate the species at the mapped location (ManTech SRS Technologies, Inc. 2017, pg. 37). VSFB and partners also conducted surveys via helicopter over Barka Slough in summer of 2021. They did not observe any potentially suitable Gambel's watercress habitat and most of the areas observed have become overgrown with common watercress (ManTech SRS Technologies, Inc. 2021, pers comm). Therefore, we consider element occurrence number 14 likely extirpated.

CNDDB element occurrence number 12 has a presumed extant citation (CNDDD 2021, website). The Service, VSFB, and partners surveyed and mapped the population here several times during summer of 2021. The number of colonies mapped and their locations varies from year to year. This year, the population consisted of two colonies that occupy a total of 0.024 hectare/0.06 acre (Lum 2021, pers comm). We confirm occurrence number 12 is extant.

In summary, there are currently two confirmed, extant element occurrences of Gambel's watercress. These include CNDDB 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 (CNDDD 2021, website). Figure 1 shows the locations of the two extant populations.

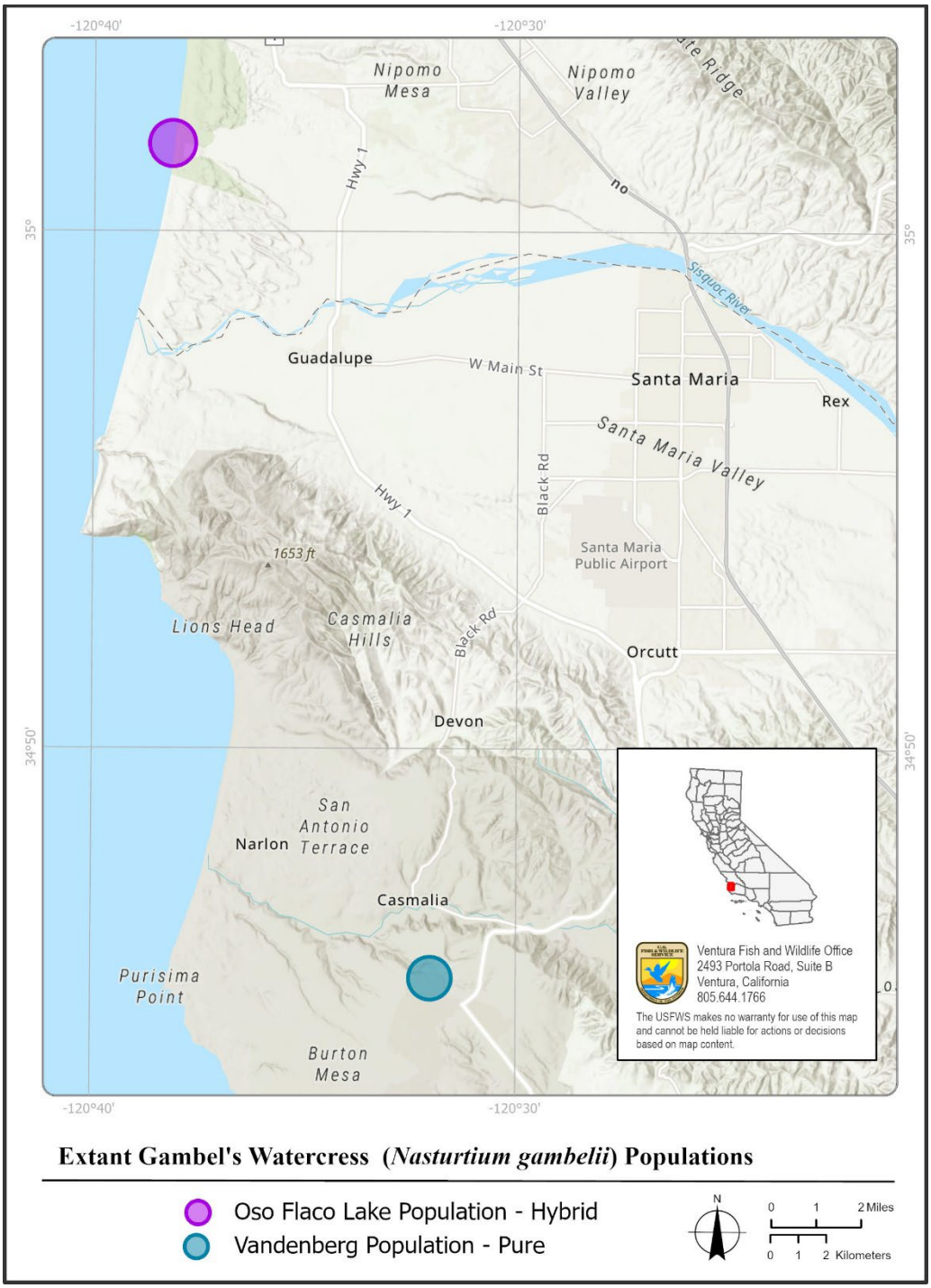


Figure 1. Extant Gambel's watercress (*Nastutium gambelii*) populations

Genetics:

Listing and Recovery Plan. Genetics of Gambel's watercress were unknown at the time of listing in 1993 (Service 1993, 58 FR 41378-41384). Some sequencing work was occurring when the Recovery Plan published in 1998 resulting in movement of the genus (*Rorippa*) back to its current placement in *Nasturtium* (Service 1998, pg. 3).

5-Year Review. Genetics issues with the species putative hybridization with common watercress (*N. officinale*) were a major focus in the 2011 5-year review (Service 2011). Mazer and Parikh (2000) used seeds collected from two individuals grown at VSFB (CNDDB occurrence number 12) and six individuals grown from seeds collected at from Oso Flaco Lake (CNDDB occurrence number 1) in an analysis of nuclear sequence data. The results showed evidence of hybridization between Gambel's and common watercress from the Oso Flaco Lake individuals. The individuals from VSFB did not show the same molecular evidence of hybridization. Therefore, the study provided no evidence of hybridization with common watercress within the VSFB samples and we presumed the population was pure. Mazer and Parikh (2000) also evaluated morphological differences of sampled individuals. The Oso Flaco Lake plants had several intermediate morphological characters between those of Gambel's and common watercress, while the VSFB morphologies had none, further supporting conclusions that it was the only extant, unhybridized population (Mazer and Parikh 2000, pg. 58-60).

Prince (2008, a and b) completed another set of studies on Gambel's watercress and putative hybrids with samples from the VSFB and Oso Flaco lake populations. The results showed that genetic variation within the VSFB population was much lower than previously expected, indicating that census data based on aerial stem counts were overestimates of the true population size. Two of the VSFB samples and individuals at Oso Flaco Lake provided evidence of hybridization with common watercress (Prince 2008a, pgs. 16-18). Additional samples from VSFB were all pure (not hybridized) and the results showed the presence of one more novel genotype within the population samples (Prince 2008 b, pg. 2).

Current Status. Prince (2012) continued work on Gambel's watercress genetics using the nuclear ribosomal ITS region (previously used by Mazer and Parikh 2000) to further evaluate the species' hybridization with common watercress. The results showed that the only pure (non-hybrid) Gambel's watercress plants sampled were from VSFB. Using the ITS techniques, the VSFB samples thought to be hybrids in the 2008 study showed no evidence of introgression (Prince 2012, pgs. 10-11). The signal detected in the previous study were likely just rare sequences within the Gambel's watercress genome (Prince 2012, pgs. 10-11). All samples from Oso Flaco Lake exhibited strong genetic and morphological evidence of hybridization with common watercress (Prince 2012, pg. 11).

Most recently, the Service and VSFB jointly funded a genetics study to evaluate the current genetic integrity of Gambel's watercress to help inform future management actions (Le et al. 2020). The researchers used restriction-associated DNA sequencing (RADSeq) (Le et al. 2020, pg. 7). The study found no evidence of hybridization between Gambel's and common watercress at VSFB and identified 12 distinct genotypes, out of 14 contemporary, non-hybrid samples collected from two separate patches on VSFB. The results also confirmed the previously untested hypothesis that Gambel's watercress spreads clonally to new locations. A single genotype first collected upstream in 2017, appeared again in a different patch, downstream in 2019, indicating that a piece of that individual moved downstream, spread clonally, and established. The researchers further concluded that there are likely several unique genotypes within relatively close proximity to one another (Le et al. 2020, pg. 21-22).

The study revealed extremely low genetic diversity and high homogeneity at the population level of both pure VSFB and hybrid Oso Flaco Lake samples compared to many other rare plant species. These data reinforce expectations of narrow genetic variation within populations, but wider differentiation between pure and hybrid populations (Le et al. 2020, pg. 22-23).

Seed Banking:

Listing and Recovery Plan. An accession of 202 seeds collected from Little Oso Flaco Lake (CNDDB occurrence number 9) and another of 530 seeds collected from Oso Flaco Lake (CNDDB occurrence number 1), both made in 1989 for conservation purposes, existed prior to the time of listing in 1993 (58 FR 41378). The seeds remain in long-term storage at the California Botanic Garden Conservation (CBG) Seed Bank (CNDDB 2021, website; Birker 2021, pers comm). There were no additional conservation seed accessions in 1998 (Service 1998).

We do not know the exact time when hybridization between Gambel's and common watercress began. However, specimens collected from Oso Flaco Lake (CNDDB occurrence number 1) that show intermediate morphological characters associated with hybridization were present in herbaria collections starting in 1962 (Service 2011, pg. 7; CNDDB 2021, website). A specimen collected from this site in 1949 shows non-hybrid Gambel's watercress morphology and this is the only collection of the species made, prior to the 1962 morphological hybrid collections (Service 2011, pg. 7). Specimens collected from Little Oso Flaco Lake (CNDDB occurrence number 9) with morphological signs of hybridization were present in herbaria collections since 1994 (Service 2011, pg. 8; CNDDB 2021, website). Therefore, we assume each of the 1989 conservation seed bank accessions are of hybrid origins.

5-Year Review. CBG conducts periodic germination testing of seeds within its seed bank for viability, if accessions are large enough to support this research. They conducted seed viability tests on the accession from Oso Flaco Lake (CNDDB occurrence number 1) in 1999. CBG made a subsequent accession of 285 seeds collected from the test plants (F1 progeny) stored in 2000 (Birker 2021, pers comm). We assume this accession is also of hybrid origins because they are offspring of likely hybrid individuals.

Current Status. In 2020, the Service 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.

Evaluation of Threats:

Listing and Recovery Plan. When listed in 1993, the known threats to Gambel's watercress were changes in hydrology, competition with encroaching eucalyptus trees (or blue gum, *Eucalyptus globulus*), urban development, and stochastic loss due to the small number of populations with

low numbers of individuals (Service 1993, 58 FR 41378-41384). The 1998 Recovery Plan included an expanded discussion of predominantly these same threats. It lists habitat degradation and destruction, and competition with exotic species as the most immediate threats to the species. It identifies habitat loss due to changes in hydrology likely resulting from groundwater pumping for agriculture and urban development, increased erosion from surrounding development, and sand encroachment from adjacent dunes, exacerbated by off-highway vehicles, and competition from eucalyptus trees and veldt grass (*Ehrharta calycina*, both primarily upland species) as the main threats to the species. The recovery plan lists other biological and genetic factors and stochastic loss due to small population size as secondary threats to the species (Service 1998, pgs. 18-21).

5-Year Review. In 2011, the 5-year review reiterated the same threats listed in the Recovery Plan (Service 2011, pgs. 12-13 and 17-19). In addition, it identified nutrient loading in watersheds, climate change, and genetic swamping as new threats to the species (Service 2011, pgs. 12-13 and 18-19). Excessive amounts of nitrogen and other nutrients, likely from runoff associated with agriculture and urban development, cause nutrient loading in watersheds (eutrophication). This results in excessive plant and algal growth (biostimulation) that impairs water bodies. Overgrown vegetation of both natives and nonnative species caused by nutrient loading in watersheds eventually results in type conversion of marshes, lakes, ponds, and streambank habitats to thick, closed-canopy riparian communities with highly altered hydrology. Gambel's watercress cannot compete with these overgrown communities, and habitats become no longer suitable (Service 2011, pgs. 12 and 18). The discussion of climate change added that coastal dunes may be vulnerable to even mild climate change effects, including increased erosion and sea level rise, increased temperatures, extreme weather events, and drought (Service 2011, pgs. 18-19). Lastly, the 5-year review emphasized the severity of the threats related to hybridization with common watercress (Service 2011, pg. 19).

Current Status. With our current understanding of the status of the two existing populations of Gambel's watercress (genetically pure at VSFB and introgressed at Oso Flaco Lake, Figure 1), and the surrounding land uses, all threats previously described continue to act on the species. These threats include habitat loss and degradation, competition with both native and nonnative species, development and urbanization, stochastic loss due to small population size and low numbers of individuals, watershed eutrophication, hydrologic alteration, genetic introgression, and effects of climate change.

Langridge et al. (2018) provides a comprehensive assessment of the climate changes that will affect California's Central Coast bioregion, including increased maximum and minimum temperatures, slightly increased precipitation with substantially increased variability, increased locally extreme rainfall events, accelerated sea level rise, increased drought, loss of ecosystem services provided by marshes and estuaries, and considerable beach narrowing and erosion (Langridge et al. 2018, pg. 6). The tolerance of Gambel's watercress to these climate changes is unknown (Table 1, Cal-Adapt 2021, website).

Loarie et al. (2008) predicts ranges of many commonly occurring species to change to follow climatic conditions that are favorable for persistence and survival (pgs. 3-5). Rare species like Gambel's watercress, that have reduced geographic ranges and other habitat restrictions, are

unlikely to be able to disperse along changing climatic gradients. Many beaches along the Central Coast will narrow substantially, and the associated ecosystems (such as marshes and estuaries) will be completely lost within the next century (Langridge et al. 2018, pg. 55).

Table 1. Changes in precipitation, minimum average temperature, and maximum average temperature for low and high emissions scenarios, compared to historical averages for each population of Gambel's watercress

	Precip (inches)	**Precip (inches)**	**Min T (deg. F)**	**Min T (deg. F)**	**Max T (deg. F)**	**Max T (deg. F)**
Population	Historical Average	RCP 4.5/ RCP 8.5	Historical Average	RCP 4.5/ RCP 8.5	Historical Average	RCP 4.5/ RCP 8.5
Oso Flaco Lake	15.1	15.6/16.4	49.6	50.8/52.2	73.1	77.9/80.7
VSFB	13.9	14.4/15.1	45.9	49.4/50.9	72.7	77.6/80.5

Precip = Precipitation; Min T = Minimum Average Temperature; Max T = Maximum Average Temperature. Reported values for the modeled futures are based on the average of the HadGEM2-ES (warmer and drier) and CNRM–CM5 (cooler and wetter) future scenarios. The Representative Concentration Pathway (RCP) 4.5 scenario refers to a future scenario where emissions peak near 2040 and then decline, while RCP 8.5 refers to a scenario where emissions continue to rise strongly through 2050 and plateau near 2100. The historical average is based on the years 1950–2005 as reported by cal-adapt.org. The modeled values are estimates from the years 2022–2099. Reported values are from spatial files delineating a location grid cell approximately 6 km by 6 km/3.7 by 3.7 mi in size that includes the extent of each population.

None of the current threats acts in isolation. Rather, the effects are cumulative and synergistic. The current threats act both directly and indirectly on the species, and in combinations that result in feedback loops, which further intensifies the effects. For example, surrounding development and urbanization increase watershed eutrophication, which causes overgrowth of hydrophytic vegetation. Increased hydrophytic vegetation expedites changes in hydrology, which promotes habitat loss and degradation, and increased competition with other co-occurring native and nonnative species. Further, increased competition can exacerbate genetic introgression with common watercress, one of the dominant species in impaired watersheds that support Gambel's watercress.

Summary of Threats:
Current threats to Gambel's watercress include habitat loss and degradation, competition with both native and nonnative species, development and urbanization, stochastic loss due to small population size and low numbers of individuals, watershed eutrophication, hydrologic alteration, genetic introgression, and effects of climate change. None of these threats acts in isolation. Rather their effects are cumulative and synergistic, causing feedback loops that increase the overall intensity.

EVALUATION OF RECOVERY CRITERIA

Downlisting Criteria:
The recovery plan provides preliminary downlisting criteria (Service 1998, pgs. 30-31):

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, and

4. The populations remain viable for at least five years.

There is currently only one extant, non-hybridized Gambel's watercress population at VSFB, consisting of two separate colonies that occupy a total of 0.024 hectare/0.06 acre (Lum 2021, pers comm). Abundance is unknown due to difficulty of discerning genetically unique individuals above-ground. Currently, we do not have any proposed outplanting projects for the species.

Because the downlisting recovery criteria have not been met and the population remains limited in abundance and distribution, with all threats at listing still present, delisting criteria are not considered at this time.

CONCLUSION

We reviewed the best available scientific information and evaluated the threats affecting Gambel's watercress in 2021 under factors in 4(a)(1) of the U.S. Endangered Species Act of 1973 (as amended). We conclude that the species still meets the definition of an endangered species and recommend no change in status at this time.

RECOMMENDATIONS FOR FUTURE ACTIONS

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 Osos 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.

APPROVAL

Lead Field Supervisor, Fish and Wildlife Service

Approved STEPHEN HENRY Digitally signed by STEPHEN HENRY Date: 2022.02.22 15:25:46 -08'00'

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