

Chorizanthe valida
(Sonoma spineflower)

**5-Year Review:
Summary and Evaluation**

Photo by Doreen Smith



**U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
Sacramento, California**

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5-YEAR REVIEW

Chorizanthe valida (Sonoma spineflower)

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

Chorizanthe valida, a member of the buckwheat family (Polygonaceae), is an erect to spreading annual herb, 10 to 30 centimeters (3.9 to 11.8 inches) tall, shaggy-haired, with 1 to 5 centimeter (0.4 to 2.0 inch) long basal leaves that are typically wider near the tip. Flowers, which appear June through August, are white to lavender to rose in color, are 5 to 6 millimeters (0.20 to 0.24 inches) long (Reveal and Hardham 1989) and occur in dense, ball-shaped, pinkish clusters with green bracts below.

The species is restricted to a single natural population and a single reintroduced population at Point Reyes National Seashore (PRNS) in Marin County, California. Thought to be extinct since 1903, the plant was rediscovered at Abbotts Lagoon in 1980 (Davis and Sherman 1990). The species was once more widespread and historically grew south of the Abbott's Lagoon population near the old Point Reyes post office (Reveal and Hardham 1989). Additional historical collections of *Chorizanthe valida* were made near Petaluma and Sebastopol in the interior portion of Sonoma County (Reveal and Hardham 1989). Given the extensive urbanization in this area, these localities are considered extirpated (Reveal and Hardham 1989).

The habitat of *Chorizanthe valida* consists of well drained sandy coastal prairie grassland soils. According to a study conducted by Davis and Sherman (1992), densities of *C. valida* decrease in the absence of cattle grazing. Due to substantial variations in sampling and monitoring methods, population data comparisons from year to year at Abbott's Lagoon are not meaningful. However, it does appear abundance fluctuates from year to year. The long-term viability of the reintroduced population at Point Reyes is not known.

Methodology Used to Complete This Review:

This review was prepared by the Sacramento Fish and Wildlife Office (SFWO), following the Region 8 guidance issued in March 2008. We used information from the Recovery Plan, survey information from experts who have been monitoring various localities of this species, and the California Natural Diversity Database (CNDDDB) maintained by the California Department of Fish and Game. The Recovery Plan and personal communications with experts were our primary sources of information used to update the species' status and threats. We received one letter from the public in response to our Federal Notice initiating this 5-year review. This 5-year review contains updated information on the species' biology and threats, and an assessment of that information compared to that known at the time of listing or since the last 5-year review. We focus on current threats to the species that are attributable to the Act's five listing factors. The review synthesizes all this information to evaluate the listing status of the species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

Contact Information:

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Lead Field Office: Kirsten Tarp, Recovery Branch, Sacramento Fish and Wildlife Office; (916) 414-6600.

Federal Register (FR) Notice Citation Announcing Initiation of This Review: A notice announcing the initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register on March 25, 2009 (Federal Register 7(56):12878-12883).

Listing History:

Original Listing

FR Notice: Federal Register 57:27848

Date of Final Listing Rule: June 22, 1992

Entity Listed: *Chorizanthe valida*, a plant species

Classification: Endangered

State Listing

Chorizanthe valida was listed as endangered by the State of California in January 1990.

Review History: Since the original listing in 1992, no 5-year reviews have been conducted for this species.

Species' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for *Chorizanthe valida* is 5 according to the Service's 2009 Recovery Data Call for the

Sacramento Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). This number indicates that the taxon is a species that faces a high degree of threat and has a low potential for recovery.

Recovery Plan or Outline

Name of Plan or Outline: Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly

Date Issued: September 30, 1998

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Endangered Species Act defines “species” as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. Because the species under review is a plant, the DPS policy is not applicable, and the application of the DPS policy to the species’ listing is not addressed further in this review.

Information on the Species and its Status

Species Biology and Life History

Spatial Distribution

A single extant endemic population of *Chorizanthe valida* exists near the eastern end of Abbott’s Lagoon on the Lunny "G" Ranch, at Point Reyes National Seashore (PRNS) in Marin County, California at an elevation of approximately 15 meters (49 feet) above sea level. At the time of its listing in 1992 (Service 1992), *C. valida* was only known to occur on the eastern end of Abbott’s Lagoon.

This species was thought to be extinct for 77 years until 1980 when it was rediscovered at Abbott's Lagoon. Prior to its rediscovery at Abbott's Lagoon, the last known population of *Chorizanthe valida* was approximately 1.5 kilometers (0.93 mile) south of Abbott's Lagoon, northwest of Schooner Bay and north of Creamery Bay in Drakes Estero, near the historic site of the Point Reyes Post Office (Reveal and Hardham 1989). The location where the type specimen was collected in 1840-1841 is not known. Based on anecdotal evidence, Reveal and Hardham (1989) suggest the type specimen was collected "near" Fort Ross. However, Davis and Sherman (1990) suggest the type specimen may have been collected from the Point Reyes Peninsula in Marin County. Two additional historical occurrences were recorded from "near" Petaluma and Sebastopol in the interior portion of Sonoma County (Reveal and Hardham 1989), but the collections from these sites differ from Point Reyes specimens in flower color.

The population of *Chorizanthe valida* at Abbott's Lagoon exists as two disjunct subpopulations that are spatially separated from each other by approximately 80 meters (262 feet). The larger of the two subpopulations is referred to as the "main population" and is approximately 4 times as large as the smaller of the two subpopulations. The smaller of the two subpopulations is referred to as the "sub-population".

Since 1988, the PRNS has installed 12 (2 x 2 meter (6.6 x 6.6 feet)) experimental seed plots of 1,000 seeds each for the purpose of establishing new colonies (Figure 1). In 1988, Davis and Sherman (1992) established the first three experimental reintroduction plots (X, Y, and Z) in areas devoid of *Chorizanthe valida*, between 100 and 200 meters (328 to 656 feet) from the Abbott's Lagoon colony. In 1999, three more seed plots (dune, G1, and G2) were established in the same general area. In 1999, a second population was established at Bull Point (F1), at or near the site believed to be where the last known specimen was collected near the Point Reyes Post Office in 1903. In 2000, two more seed plots (F2 and F3) were installed at Bull Point, and another 3 plots (F4, F5, and F6) were installed at the site in 2002 (Rogers 2005).

Abundance

Based on the results of mapping the spacial distribution of the population in 1999, 2000, 2005, 2006 and 2008, the area occupied by *Chorizanthe valida* at Abbott's Lagoon fluctuates seasonally, but does not appear to be contracting (Williams 2008). According to the recovery plan (Service 1998), the entire Abbott's Lagoon population of *C. valida* was estimated to cover 358 square meters (1,076 square feet) in 1983. In 1984, more than 2,000 plants covered an area of 5,130 square meters (16,829 square feet) (Fowler and Fellers 1984). According to Davis and Sherman (1992), the entire population exists within 17,000 square meters (55,773 square feet). Between 1983 and 1998, the California Native Plant Society (CNPS) conducted a census of the population and the number of individuals varied widely from 100 to 30,000 plants (Rogers 2005). In 1999, PRNS staff began developing a long-term, quantitative monitoring program for the Abbott's Lagoon population. Over the next 6 years, several monitoring methods were tested.

In 1999, the number of *Chorizanthe valida* plants in the main population was estimated to be 18,000. In 2001, the number was calculated to be 184,311 individuals. The main population was not counted in 2000 or after 2002. From 2002 to 2004 permanent monitoring plots were used as indicators of the overall population trend in the main population. However, data collected using these permanent plots have now been rejected due to statistical invalidity. The number of plants in the sub-population has increased dramatically each year it has been censused, from 4,707 individuals in 1999 to 16,836 in 2001.

Beginning in 2005, PRNS staff began sampling the main population of *Chorizanthe valida* using a macroplot. The macroplot is 100 x 40 meters (328 x 131 feet), encompassing 35 temporary quadrats each measuring 40 x 0.05 meters (131 x 0.16 feet). Sample results estimated there were 560,171 plants in the macroplot in 2005, with 95% confidence that the true number of plants in the macroplot is between 470,000 and 650,275. Data extrapolation to the entire population is beyond reasonable statistical inference. Since 2005, the population within the macroplot has fluctuated from an estimated 62,580 individuals in 2006 to 710,460 individuals in 2009.

Of the six experimental plots established adjacent to the main population in 1988 and 1999, three were located and monitored through 2005 (Y, G1, and G2; Table 1). Overall, two of these plots demonstrate viability and expansion potential (Y and G1). The success of the six reintroduction plots (F1-F6) established at Bull Point between 1999 and 2002 is variable. Two of the six plots (F5 and F6) appear to be viable with expansion potential, while the other reintroduced plots have either failed or are likely to fail in the near future.

Habitat or Ecosystem

The Abbott's Lagoon colony is located in coastal prairie grassland and occurs on the Sidrak sand soil type, consisting of well-drained, Pleistocene dune sands with a 2-4 percent slope, bearing to the north-northwest (towards Abbott's Lagoon). This soil type has low to moderate available water capacity, and can support only a limited plant community that is drought tolerant (Davis and Sherman 1992). These deep soils exclude the more mesic-perennial coastal prairie grassland bordering the main colony of *Chorizanthe valida*. The Abbott's Lagoon colony is within a pastoral zone and is subject to annual cattle grazing. The site is a federally-leased cattle pasture with a grazing history that extends over a century. The species is unpalatable to cattle, and based on experiments conducted by Davis and Sherman (1992), plant density decreases in the absence of cattle grazing. Seed dispersal by small mammals such as badger (*Taxidea taxus*), pocket gopher (*Thomomys bottae*) and black-tailed jackrabbit (*Lepus californicus*) was posited by Davis and Sherman (1992); however, their conclusion was based on a generic trait of species in the genus *Chorizanthe*, whereby many species in this genus have hardened hooked or spreading involucre (bracts that appear in a whorl subtending an inflorescence) tube awns which hook to animal coats and aid in long-range dispersal. *C. valida* does not have hardened hooked or spreading involucre tube awns like most of its congeners, so long-range dispersal in this manner is unlikely (Williams 2008).

Changes in Taxonomic Classification or Nomenclature

The Service is not aware of any changes in the taxonomic classification or nomenclature of *Chorizanthe valida* since its listing.

Genetics

The Service is not aware of any genetic studies that have focused on *Chorizanthe valida*.

Species-specific Research and/or Grant-supported Activities

Davis and Sherman (1992) erected 2 x 2 meter (6.6 x 6.6 feet) experimental cattle exclosures around *Chorizanthe valida* plants at the Abbott's Lagoon population to determine the effects of cattle grazing on the species. They also established reintroduction plots within a few hundred meters of the Abbott's Lagoon population. The results of their work indicated *C. valida* density increases in conjunction with cattle grazing. Although plant density was lower in the absence of grazing, most *C. valida* plants within the exclosures were 3-4 times taller, had many more inflorescences, and greater crown diameters than the plants in the grazed population. They also

found that successful reproduction occurred within reintroduction plots and that within 3 years two plots had reproduction occurring outside of the reintroduction plots.

In 2009, we awarded PRNS with a \$58,850 Preventing Extinction Grant to: 1) Remove invasive plants (i.e., *Holcus lanatus*, *Lupinus arboreus*, and nonnative grasses) from within and adjacent to the Abbott's Lagoon population; 2) realign a dirt road that runs through the Abbott's Lagoon population; 3) collect *Chorizanthe valida* seeds and accession; 4) establish additional seed reintroduction plots; 5) collect soils and other physical and biological information to better select reintroduction sites; and 6) to assist the PRNS with tracking grazing. Funded activities are to be conducted between January and October 2010.

Five-Factor Analysis

The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

At the time of listing (Service 1992), we stated the imminent threat facing *Chorizanthe valida* and six other species was the ongoing and threatened destruction and adverse modification of dune systems by commercial and residential development, off-road vehicle use, trampling by hikers and equestrians, sand mining, and disposal of dredged materials from adjacent bays and waterways. Factor A threats specific to *C. valida* at the time of its listing included accidental incursion and the unknown effects of cattle grazing. Inappropriate levels of grazing by livestock was also defined as a threat in Factor E at the time of listing. Of the threats defined at the time of listing, off-road vehicle use, trampling by hikers, the unknown effects of cattle grazing, and inappropriate levels of grazing by livestock remain threats.

Because both the endemic and reintroduced populations of *Chorizanthe valida* occur within a National Seashore, commercial and residential development, trampling by equestrians, sand mining, and disposal of dredged materials do not currently threaten the species (see Factor D for more information on the National Park Service's policy on managing threatened or endangered plants and animals). Trampling by hikers and accidental incursion still pose a minor threat to *C. valida*. Due to the presence of a road that bisects the Abbott's Lagoon population, which is used for ranching activities, off-road vehicle use still poses a threat. However, off-road vehicle use within PRNS is not permitted for recreational purposes and the road bisecting the Abbott's Lagoon population is scheduled for realignment in 2010; thus, this threat will be drastically reduced as a result.

The unknown effects of cattle grazing also remain a threat. However, since *Chorizanthe valida* is unpalatable to cattle and cattle consume many of the nonnative invasive plants that threaten the species, the removal of cattle from the system could in itself threaten the species. Due to the results of Davis and Sherman (1992), it is now believed the damage caused by livestock trampling is outweighed by the benefits of grazing livestock in reducing competition with other plant species. As part of the Preventing Extinction Grant awarded to PRNS, tracking of grazing

animals will occur in 2010. The results of which will help managers to determine an appropriate level of livestock grazing.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial purposes was not known to be a factor in the 1992 final listing rule (57 FR 27848). Overutilization for any purpose does not appear to be a threat at this time.

FACTOR C: Disease or Predation

Disease and predation were not known to be factors at the time of listing (Service 1992). Disease and predation are not known to be a threat at this time.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing (57 FR 27848), regulatory mechanisms thought to have some potential to protect *Chorizanthe valida* included: listing under the California Endangered Species Act (CESA) in 1990; and the Native Plant Protection Act (NPPA). In addition to those regulatory mechanisms, *C. valida* is protected by the California Environmental Quality Act, the National Environmental Protection Act (NEPA), the Federal Endangered Species Act and the National Park Service Organic Act. A lack of regulatory mechanisms is not considered a threat at this time. The following is a summary of the regulatory mechanisms protecting *C. valida*.

State Protections in California

The State's authority to conserve rare wildlife and plants is comprised of four major pieces of legislation: the California Endangered Species Act, the Native Plant Protection Act, the California Environmental Quality Act, and the Natural Community Conservation Planning Act.

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA): The CESA (California Fish and Game Code, section 2080 *et seq.*) prohibits the unauthorized take of State-listed threatened or endangered species. The NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. The CESA requires State agencies to consult with the California Department of Fish and Game on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities.

Furthermore, with regard to prohibitions of unauthorized take under NPPA, landowners are exempt from this prohibition for plants to be taken in the process of habitat modification. Where landowners have been notified by the State that a rare or endangered plant is growing on their land, the landowners are required to notify the California Department of Fish and Game 10 days in advance of changing land use in order to allow salvage of listed plants.

California Environmental Quality Act: The CEQA requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA section 21002). Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved.

Federal Protections

National Environmental Policy Act: NEPA (42 U.S.C. 4371 *et seq.*) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of such projects with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigation alternatives that would offset those effects (40 C.F.R. 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public.

Endangered Species Act of 1973, as amended: The Act is the primary Federal law providing protection for this species. The Service's responsibilities include administering the Act, including sections 7, 9, and 10 that address take. Since listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2), which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 CFR 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project.

Section 9 prohibits the taking of any federally listed endangered or threatened species. Section 3(18) defines "take" to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Service regulations (50 CFR 17.3) define "harm" to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harassment is defined by the Service as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. The Act provides for civil and criminal penalties for the unlawful taking of listed species. Incidental take refers to taking of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). For projects without a Federal nexus that would likely result in incidental take of listed species, the Service may issue incidental take permits to non-Federal applicants pursuant to section 10(a)(1)(B). To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved Habitat Conservation Plan (HCP) that details measures to

minimize and mitigate the project's adverse impacts to listed species. Regional HCPs in some areas now provide an additional layer of regulatory protection for covered species, and most of these HCPs are coordinated with California's related Natural Community Conservation Planning program or other permits through the California Department of Fish and Game.

With regard to federally listed plant species, section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed plant species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the "take" of federally endangered wildlife; however, the take prohibition does not apply to plants. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e., collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation or in the course of any violation of a state criminal trespass law. Federally listed plants may be incidentally protected if they co-occur with federally listed wildlife species.

The National Park Service: The only extant population and the only reintroduced population of *Chorizanthe valida* exist on lands managed by PRNS which is part of the National Park Service. The following is the National Park Service's Policy on Management of Threatened or Endangered Plants and Animals:

The [National Park] Service will survey for, protect, and strive to recover all species native to national park system units that are listed under the Endangered Species Act. The Park Service will fully meet its obligations under the NPS Organic Act and the Endangered Species Act to both proactively conserve listed species and prevent detrimental effects on these species. To meet these obligations, the [National Park] Service will cooperate with both the U.S. Fish and Wildlife Service and the NOAA Fisheries to ensure that [National Park] Service actions comply with both the written requirements and the spirit of the Endangered Species Act. This cooperation should include the full range of activities associated with the Endangered Species Act, including consultation, conferencing, informal discussions, and securing all necessary scientific and/or recovery permits; undertake active management programs to inventory, monitor, restore, and maintain listed species' habitats; control detrimental nonnative species; manage detrimental visitor access; and reestablish extirpated populations as necessary to maintain the species and the habitats upon which they depend; manage designated critical habitat, essential habitat, and recovery areas to maintain and enhance their value for the recovery of threatened and endangered species; cooperate with other agencies to ensure that the delineation of critical habitat, essential habitat, and/or recovery areas on park-managed lands provides needed conservation benefits to the total recovery efforts being conducted by all the participating agencies; participate in the recovery planning process, including the provision of members on recovery teams and recovery implementation teams where appropriate; cooperate with other agencies, states, and private entities to promote candidate conservation agreements aimed at precluding the need to list species; and conduct actions and allocate funding to address endangered, threatened, proposed, and candidate species.

The [National Park] Service will inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible. In addition, the [National Park] Service will inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and will manage them to maintain their natural distribution and abundance. The [National Park] Service will determine all management actions for the protection and perpetuation of Federally, state, or locally listed species through the park management planning process, and will include consultation with lead Federal and state agencies as appropriate.

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

At the time of listing, nonnative invasive species, stochasticity, inappropriate levels of livestock grazing (addressed under Factor A in this 5-year review), and the complete suppression of fires were defined as threats to *Chorizanthe valida* and six other species.

Stochasticity: Because *Chorizanthe valida* exists as a single endemic population and a single reintroduced population, with plant densities that fluctuate annually, it is highly susceptible to stochastic events such as prolonged drought, fire, disease, or other unforeseen causes of extinction. Stochasticity remains a major threat to the species. As part of the Preventing Extinction Grant awarded to PRNS and to reduce the threat of stochasticity, new seed reintroduction plots will be established in 2010.

Climate Change: Impacts to this species as a result of climate change are unclear. A trend of warming in the mountains of western North America is expected to decrease snowpack, hasten spring runoff, and reduce summer stream flows, and increased summer heat may increase the frequency and intensity of wildfires (IPCC 2007). While it appears reasonable to assume that the species may be affected, we lack sufficient certainty on knowing how and when climate change will affect the species, the extent of average temperature increases in California/Nevada, or potential changes to the level of threat posed by drought, fire, etc. The most recent literature on climate change includes predictions of hydrological changes, higher temperatures, and expansion of drought areas, resulting in a northward and/or upward elevation shift in range for many species (IPCC 2007). We have no knowledge of more detailed climate change information specifically for this species' range.

A modeling study completed by Loarie *et al.* (2008) provides an evaluation of potential trends to California's floristic communities under climate change scenarios. In general, plant diversity will shift in two divergent directions: along the coast and northwards at higher elevations; and southwards at higher elevations of the Sierra Nevada. The models suggest that climate change has the potential to break up local floras, resulting in new species combinations, with new patterns of competition and biotic interactions (Loarie *et al.* 2008). Based on these models, *Chorizanthe valida* plants would likely be unable to shift their range because of their dependence on a rare soil type and their supposed limited ability for seed dispersal.

Nonnative Invasive Species: The population of *Chorizanthe valida* at Abbott's Lagoon is surrounded by the invasive perennial grass species *Holcus lanatus* (common velvetgrass) on all

sides. This nonnative invasive grass is of concern to the long term management of this population. No significant encroachment by *H. lanatus* was evident from mapping 1999-2000; however, there did appear to be increased encroachment towards the sub-population in 2005. Mapping has not been conducted since 2005. As part of the Preventing Extinction Grant awarded to PRNS, *H. lanatus* and *Lupinus arboreus* will be removed from the area. Regardless, nonnative invasive species remain an ongoing threat to *C. valida*. Although management activities can remove nonnative invasives, the sustainable and long-term control of these species remains questionable.

Fire Suppression: The effects of fire suppression on *Chorizanthe valida* are not known. The natural fire return interval at PRNS is likely relatively long due to persistently moist and cool conditions coupled with relatively low incidence of lightning strikes (Keeley 2002). However, the use of fire by Native Americans in the area is not known. At this time, there are no plans to experiment with fire in the management of *C. valida*.

III. RECOVERY CRITERIA

The recovery plan for *Chorizanthe valida* (Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly) was approved in 1998 (Service 1998).

Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, over all, the threats have been minimized sufficiently, and the species is robust enough, to downlist or delist the species. In other cases, new recovery approaches and/or opportunities unknown at the time the recovery plan was finalized may be more appropriate ways to achieve recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery is a dynamic process requiring adaptive management, and assessing a species' degree of recovery is likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species was listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated.

According to the recovery plan (Service 1998); the following are the downlisting criteria for *Chorizanthe valida*:

1. *Habitat occupied by the species that is needed to allow delisting has been secured, with long-term commitments and, if possible, endowments to fund the conservation of native vegetation.*

Is criterion still valid: Yes.

Listing factors addressed: Listing Factor A.

Has criterion been met: No. Both existing populations of *Chorizanthe valida* are secure with long-term commitments to fund conservation of the species, but a third population (required for downlisting in criterion number 6) has not been established. If an additional population was established at PRNS, this criterion would be met.

2. *Management measures are being implemented to address the threats of invasive species and other problems, including grazing, pedestrians, and off-road vehicles at some sites.*

Is criterion still valid: Yes.

Listing factors addressed: Listing Factor E.

Has criterion been met: Yes. Currently, *Holcus lanatus* is encroaching on the Abbott's Lagoon population and managers are addressing this threat by monitoring the encroachment and removing the invasives.

3. *Monitoring reveals that management actions are successful in reducing threats of invasive non-native species.*

Is criterion still valid: Yes.

Listing factors addressed: Listing Factor E.

Has criterion been met: No. Management actions have not yet been implemented to address the encroachment by *Holcus lanatus*, but the Preventing Extinction Grant money will begin to implement this management action.

4. *Additional restored habitat has been secured, with evidence of either natural or artificial long-term establishment of additional populations, and long-term commitments (and endowments, where possible) to fund conservation of the native vegetation.*

Is criterion still valid: Yes.

Listing factors addressed: Listing Factor A.

Has criterion been met: No. The establishment of one reintroduced population has been attempted at PRNS, but the long-term viability of this population remains in question. However, because the reintroduced population is within PRNS, the site is secure with long-term commitments to fund conservation. Aided by Preventing Extinction Grant funding, an additional reintroduction at PRNS should occur in 2010.

5. *Management plans must be approved and implemented for the one population.*

Is criterion still valid: Yes.

Listing factors addressed: Listing Factors A, B, C, D, and E.

Has criterion been met: No. However, PRNS is working to finalize a management plan.

6. *Two additional populations have been established and sustained with long-term management.*

Is criterion still valid: Yes.

Listing factors addressed: Listing Factor E.

Has criterion been met: No. The establishment of one additional population at Bull Point has been attempted, but the viability of this population in the long-term has not yet been proven.

According to the recovery plan (Service 1998); the following are the delisting criteria for *Chorizanthe valida*:

Full recovery will be achieved when the dune system it inhabits is secure, with experience to demonstrate that exotic plants and other threats (recreational, off-road vehicles, etc.) are controlled and managers have demonstrated their ability to keep the threats under control. It is secure in its presently-occupied range, and opportunities should be taken to introduce it to restored habitat in or near its historic range. To be counted towards recovery, (re)introduced populations should be naturally reproducing in vegetation that also appears to be persisting without excessive maintenance or "gardening." The area occupied by the species should increase commensurate with improving habitat conditions. The determination that delisting is possible must be based on at least fifteen years of monitoring to include wet and drought years. The demography and population biology must be understood to be assured that populations are likely to persist.

Is criterion still valid: Yes.

Listing factors addressed: Listing Factors A and E.

Has criterion been met: No.

IV. SYNTHESIS

The only naturally occurring extant population of *Chorizanthe valida* at Abbott's Lagoon experiences natural fluctuations in abundance and extent. Reintroduction plots adjacent to the Abbott's Lagoon population have increased in abundance and extent; which indicates that expansion of the Abbott's Lagoon population may be possible. The reintroduced population near Bull Point has declined since its establishment, but two of the plots may be self-sustaining.

At the time of listing, commercial and residential development, off-road vehicle use, trampling by hikers and equestrians, sand mining, disposal of dredged materials from adjacent bays and waterways, accidental incursion, the unknown effects of cattle grazing, inappropriate levels of livestock grazing, stochasticity, and fire suppression were cited as threatening the species. Current threats to the species include accidental incursion, trampling by hikers, off-road vehicle use, stochasticity, unknown effects of cattle grazing and inappropriate levels of livestock grazing, nonnative invasive species, and climate change. Management actions to occur in 2010 that may reduce or alleviate these threats include nonnative invasive plant removal, road realignment, establishing additional reintroduction plots, and tracking cattle grazing. Based on potential threats of nonnative invasive species, climate change, competition by invasive plants, and very small population sizes restricted to only two parcels of land, we conclude that *Chorizanthe valida* still meets the Act's definition of endangered. No status change is recommended at this time.

V. RESULTS

Recommended Listing Action:

- Downlist to Threatened
- Uplist to Endangered
- Delist (indicate reason for delisting according to 50 CFR 424.11):
 - Extinction*
 - Recovery*
 - Original data for classification in error*
- No Change

New Recovery Priority Number and Brief Rationale: No change.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

The highest priority for the species should be to maintain and increase the size and extent of the population at Abbott's Lagoon. This includes establishing an encroachment threshold for *Holcus lanatus* that triggers management action. Second, attempts should be made to increase the size and extent of the reintroduced population at Bull Point and to determine the factors that influenced success and failure of the reintroduction plots. Finally, a suitable site should be located to establish a second reintroduction at PRNS or outside of the park at a protected site.

VII. REFERENCES CITED

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U.S. FISH AND WILDLIFE SERVICE 5-YEAR REVIEW

Chorizanthe valida (Sonoma spineflower)

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Review Conducted By: Ben Solvesky

Date Submitted to Region 8: _____

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service

for

Approve Cay C. Mond Date July 28, 2010