Monterey spineflower (*Chorizanthe pungens* var. *pungens*)

5-Year Review: Summary and Evaluation

Photo: U.S. Fish and Wildlife Service/Todd Lemein

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

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GENERAL INFORMATION:

Species: Monterey spineflower (*Chorizanthe pungens* var. *pungens*)
Date listed: February 4, 1994
FR citation(s): 59 FR 5499-5510
Classification: Threatened

BACKGROUND:

Most recent status review:

U.S. Fish and Wildlife Service (Service). 2009. Monterey Spineflower (*Chorizanthe pungens* var. *pungens*) 5-Year Review: Summary and Evaluation. Ventura, California. 21 pages.

FR Notice citation announcing this status review:

84 FR 36116-36118. Initiation of 5-Year Status Reviews of 58 Species in California, Nevada, and the Klamath Basin of Oregon; Notice of initiation of reviews; request for information. July 26, 2019.

Critical Habitat Designation

Critical habitat for Monterey spineflower was designated in 2002 on 18,829 acres (ac) (7,620 hectares (ha)) in Santa Cruz and Monterey counties (Service 2002, 67 FR 37498). The designation was challenged in 2005. Final revised critical habitat was designated in 2008 (Service 2008, 73 FR 1525), which resulted in a decrease of 7,774 ac (3,146 ha) to a total of 11,055 ac (4,475 ha). The change in designated acreage was due to a revision of the primary constituent elements, reduction of included land under private ownership that had been developed, and removal of areas with soil types not known to support Monterey spineflower (Service 2008, 73 FR 1529). The 2008 final designation describes the primary constituent elements for Monterey spineflower as "a vegetation structure arranged in a mosaic with openings between the dominant elements (e.g., scrub, shrub, oak trees, or clumps of herbaceous vegetation) that changes in spatial position as a result of physical processes such as windblown sands and fire and that allows sunlight to reach the surface of the following sandy soils: coastal beaches, dune land, Baywood sand, Ben Lomond sandy loam, Elder sandy loam, Oceano loamy sand, Arnold loamy sand, Santa Ynez fine sandy loam, Arnold-Santa Ynez complex, Metz complex, and Metz loamy sand" (73 FR 1532).

ASSESSMENT:

Information acquired since the last status review

This 5-year review was conducted by the Service's Ventura Fish and Wildlife Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on July 26, 2019 (84 FR 36116). We also conducted a literature review and contacted local botanists, consultants, land trusts, and state and federal agencies. Survey data since the 2009 5-year review were provided by: (1) portions of the former Fort Ord where restoration,

development, and unexploded ordnance removal is occurring (Burleson 2019a, entire; Burelson 2018b, entire; Kemron 2019, entire); (2) Asilomar State Beach (Gray 2017, entire); (3) Naval Support Activity Monterey (NSA 2019, entire); (4) Elkhorn Slough Foundation (ESF 2017, data); and (5) the Monterey Regional Airport (SWCA 2019, entire; SWCA 2018, entire). In 2018, the Service provided funding to collect survey data of under reported occurrences (Childs 2018, entire).

Distribution

The Monterey spineflower occurs throughout southern Santa Cruz and northern Monterey Counties primarily in dune systems adjacent to Monterey Bay and in sandy openings in chaparral throughout the former Fort Ord (Figure 1). The majority of occurrences are found north of Point Lobos, east to Salinas and Prunedale, and north into southern Santa Cruz County near Aptos. A northern outlier occurs east of Scotts Valley and an extreme southern occurrence near San Simeon was recorded from an 1842 collection that is presumed extirpated. There are two historical inland occurrences in San Lucas and Soledad. The San Lucas occurrence is likely extirpated (CNDDB 2020, data) and the exact location of the Soledad occurrence is uncertain. However, Monterey spineflower was identified near Soledad on private land in 1994 and was still present, although the estimated population size had declined from approximately 5000 individuals in 1994 to 50 in 2013 (CNDDB 2020, data).

Monterey spineflower co-occurs with robust spineflower (*Chorizanthe robusta* var. *robusta*), a closely related species listed as federally endangered in 1994, at five occurrences in southern Santa Cruz and northern Monterey Counties.

Description

The Monterey spineflower is an annual species in the buckwheat family (Polygonaceae). The species is typically prostrate with branching stems 5 to 15 centimeters (cm) (2 to 6 inches (in)). The inflorescence is characterized by pink to white margins of the involucre and perianth lobes. The inflorescence, stems, and leaves are hairy, and the stems and leaves are slightly succulent. Robust spineflower (*Chorizanthe robusta* var. *robusta*) and diffuse spineflower (*C. diffusa*) may co-occur with Monterey spineflower. Robust spineflower differs from Monterey spineflower by having a typically erect habit 10 to 60 cm (4 to 24 in) and generally white involucre margins and perianth lobes. Diffuse spineflower may be differentiated from both Monterey spineflower and robust spineflower through a distinct yellow tinted inflorescence throat that contrasts with white involucre margins and perianth lobes. Additionally the involucre margins of diffuse spineflower are wider and more rounded than either Monterey spineflower or robust spineflower.

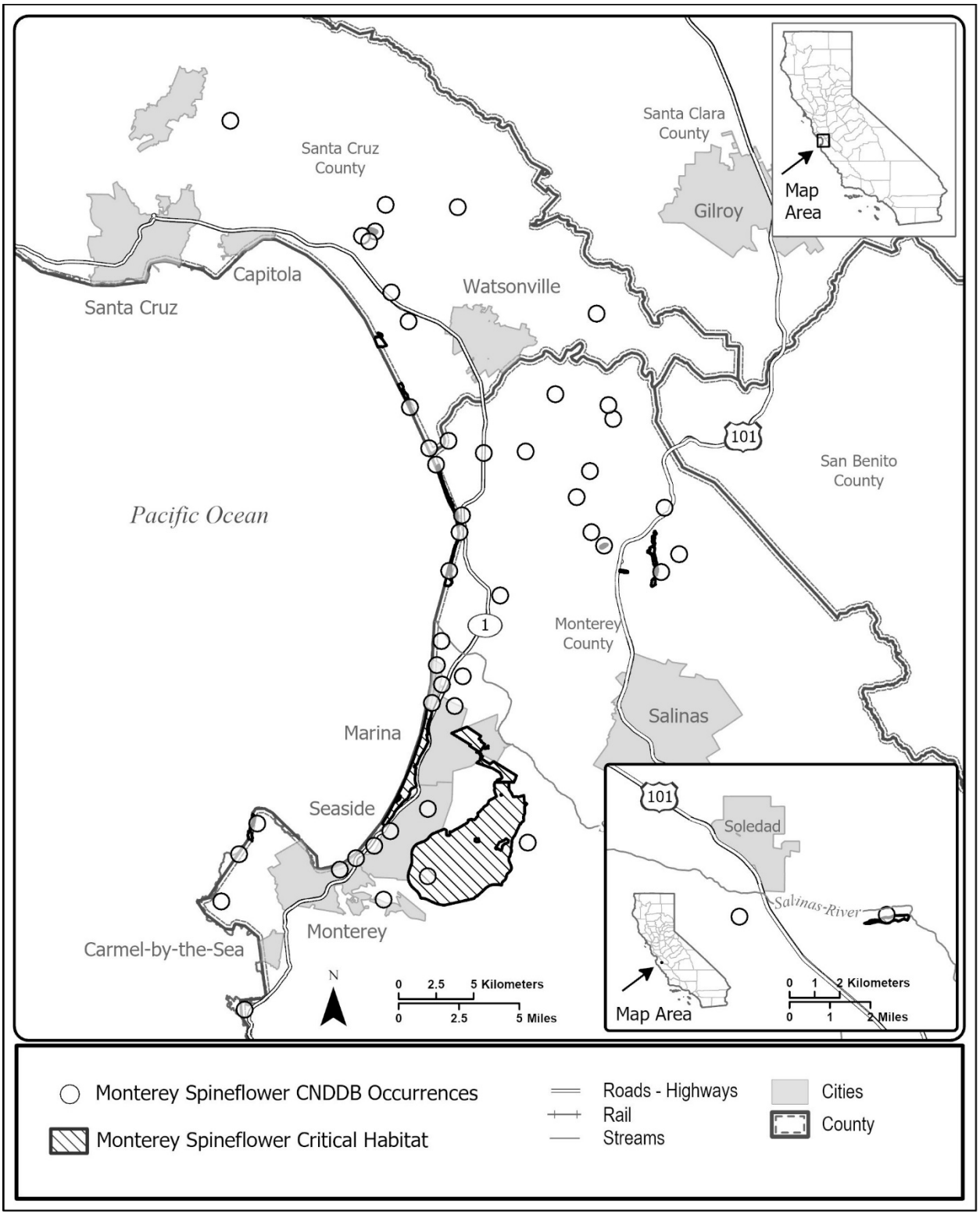

Figure 1. Location of Monterey spineflower California Natural Diversity Database (CNDDB) occurrences and US Fish and Wildlife Service designated Critical Habitat.

Habitat

Monterey spineflower primarily grows in openings of coastal dune, dune scrub, and chaparral in sandy soils where competition with other species is low. The species may also be found in other habitat types where low competition in sandy openings exist. Monterey spineflower is associated with the following soil series: coastal beaches, dune land, Baywood sand, Ben Lomond sandy loam, Elder sandy loam, Oceano loamy sand, Arnold loamy sand, Santa Ynez fine sandy loam, Arnold-Santa Ynez complex, Metz complex, and Metz loamy sand. A study of the closely related Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*), found that shade was a more significant limiting factor than soil series, suggesting that Monterey spineflower may be similarly limited by competition and shade rather than edaphic conditions (McGraw and Levin 1998, pp. 124-126).

The soil types where the Monterey spineflower is found are prone to periodic disturbances that create the open space needed for the species' establishment. Erosion, wind, and ocean based transport of sand results in periodic rearrangements of dune morphology that result in unoccupied areas where the Monterey spineflower successfully grows in coastal dune habitat. At inland sites in chaparral habitat, analogous openings in vegetation may be created by wildlife, fire, recreation, and development or maintenance of existing infrastructure.

Genetic Evaluation of Taxonomy

A genetic study using both ribosomal and chloroplast DNA to evaluate the taxonomy of a subset of *Chorizanthe* species, funded by the Service in 2003, was published in 2009 after the completion of the previous 5-year review (USFWS 2009, entire, Brinegar and Baron 2009, entire). Using ribosomal DNA internal transcribed spacer (ITS) sequencing, the study found that Monterey spineflower (*C. pungens* var. *pungens*) and robust spineflower (*C. robusta* var. *robusta*) were more closely related to one another than their closest taxonomic relatives, Ben Lomond spineflower (*C. pungens* var. *hartwegiana*) and Scotts Valley spineflower (*C. robusta* var. *hartwegii*) respectively. This suggests greater similarity between the predominantly coastal populations of Monterey spineflower and robust spineflower than the varieties of either species found in the Santa Cruz mountains (Brinegar and Baron 2009, p. 179). In contrast, using chloroplast DNA haplotypes, the same study found groups that more closely resembled the current taxonomic relationships. The chloroplast DNA haplotype results did not resolve a genetic difference between Ben Lomond spineflower and Scotts Valley spineflower but instead grouped them together. In contrast, the robust spineflower and Monterey spineflower did resolve into separate northern and southern groups respectively. Brinegar and Baron (2009, p. 179) concluded that it is likely that the species of *Chorizanthe* examined have recently diverged thus giving rise to the lack of strong genetic differentiation.

Abundance

At the time of listing, the Monterey spineflower was known to occur in sand dunes along the coast between Manresa State Beach and the Monterey Peninsula, Manzanita Park in the Prunedale Hills, throughout the former Fort Ord, and historical collections from Soledad and San Simeon (Service 1994, 59 FR 5500). The population size was estimated to be approximately 2 million individuals across seven occurrences (Service 1998, p. iii). Between the time of listing in

1994, and the publication of the Recovery Plan in 1998, the number of occurrences had increased to 26 (Service 1998, pp. 66-67). By 2009, 29 occurrences had been described (Service 2009, pp. 5, 18). In 2020, the CNDDB lists 51 occurrences (CNDDB 2020). Despite the increase in known occurrences, the range of the species remains similar to when the species was listed, although there has been an expansion in the northern extent of the range in southern Santa Cruz County and in the eastern extent of the range in the Prunedale Hills in northern Monterey County.

The CNDDB considers one occurrence extirpated, two possibly extirpated, and the remaining presumed extant. However, aerial imagery suggests that 19 occurrences have experienced habitat loss and/or fragmentation (37 percent), and nine occurrences have been developed or converted to agriculture (18 percent, including the extirpated and presumed extirpated occurrences from CNDDB). This suggests that 23 occurrences (45 percent) likely remain as they were when first described to the CNDDB in regard to land use (Table 1).

Table 1. Number of occurrences listed by level of estimated disturbance: assumed present; loss of habitat, increase in fragmentation; land conversion, assumed absent. Based on data within the California Natural Diversity Database and clear changes in land use based on aerial photographs.

	Number of Occurrences	**Percent**
Assumed present	23	45
Loss of habitat, increase in fragmentation	19	37
Land conversion, assumed absent	9	18

Of the 51 occurrences, 21 (41 percent) occur on land that is owned and managed by an entity with conservation objectives (e.g. California State Parks, Elkhorn Slough Foundation, The Nature Conservancy, federal lands, and others). The remaining 30 occurrences (59 percent) occur on mostly private land.

Population data on each of the occurrences is sparse and continuous data is only available for Naval Support Activity (NSA) Monterey and portions of the former Fort Ord (CNDDB occurrences 2 and 8 respectively, Figure 2). The data provided by NSA Monterey suggest an annually fluctuating population that can vary from less than 100 individuals to 10,000 individuals (NSA 2019, p. 5). Large fluctuations like this are likely natural due to the species' response to annual variations in weather affecting seed set in any given year (Fox et al. 2006, p 166-169). Numbers of individuals within the former Fort Ord are consistently greater than 10,000, and often exceed several hundred thousand (Burleson 2018, unpublished data), largely because the size of the former Fort Ord occurrence is greater than 10,000 acres, compared to smaller occurrences such as the 16 acres occupied by the NSA Monterey occurrence (CNDDB 2020).

The former Fort Ord military base in Monterey County is the largest occurrence of Monterey spineflower and encompasses two Critical Habitat Units; 3 (Marina), and 8 (Fort Ord). The

Marina unit in characterized by coastal dune habitat and the Fort Ord unit is characterized by maritime chaparral habitat. Remediation, closure, development, and restoration activities described under the closure and reuse plan (USACE 1997, entire) and regulated by the programmatic biological opinion (Service 2017, entire) are ongoing. A draft Habitat Conservation Plan (HCP) that addresses impacts to all listed species, including Monterey spineflower, was open for public review in November 2019 (ICF 2019, entire). Monitoring of Monterey spineflower currently occurs in response to ongoing remediation and restoration projects and is not comprehensive over the entire occurrence. Furthermore, not all areas undergoing remediation and restoration are in the same year or phase of monitoring, making comparisons between units, within the occurrence, or between the entire Fort Ord occurrence and other occurrences difficult. Similarly, trend evaluation and population status of Monterey spineflower throughout the former Fort Ord is not possible, despite some data having been collected for those purposes, due to differences in duration of monitoring and relationship to remediation and restoration activities.

Data for the remaining 49 occurrences is sparse since 1994 with very few data points from which to evaluate trends in abundance (Figure 2). In many cases, only presence or absence data is available. The resulting lack of continuous, comparable data makes evaluation of trends in the species' population numbers unfeasible. Figure 2 depicts estimated abundance of Monterey spineflower occurrences from 1994 through 2019 and shows that abundance data is lacking for the majority of known occurrences, including those within Critical Habitat and on land that is managed for conservation.

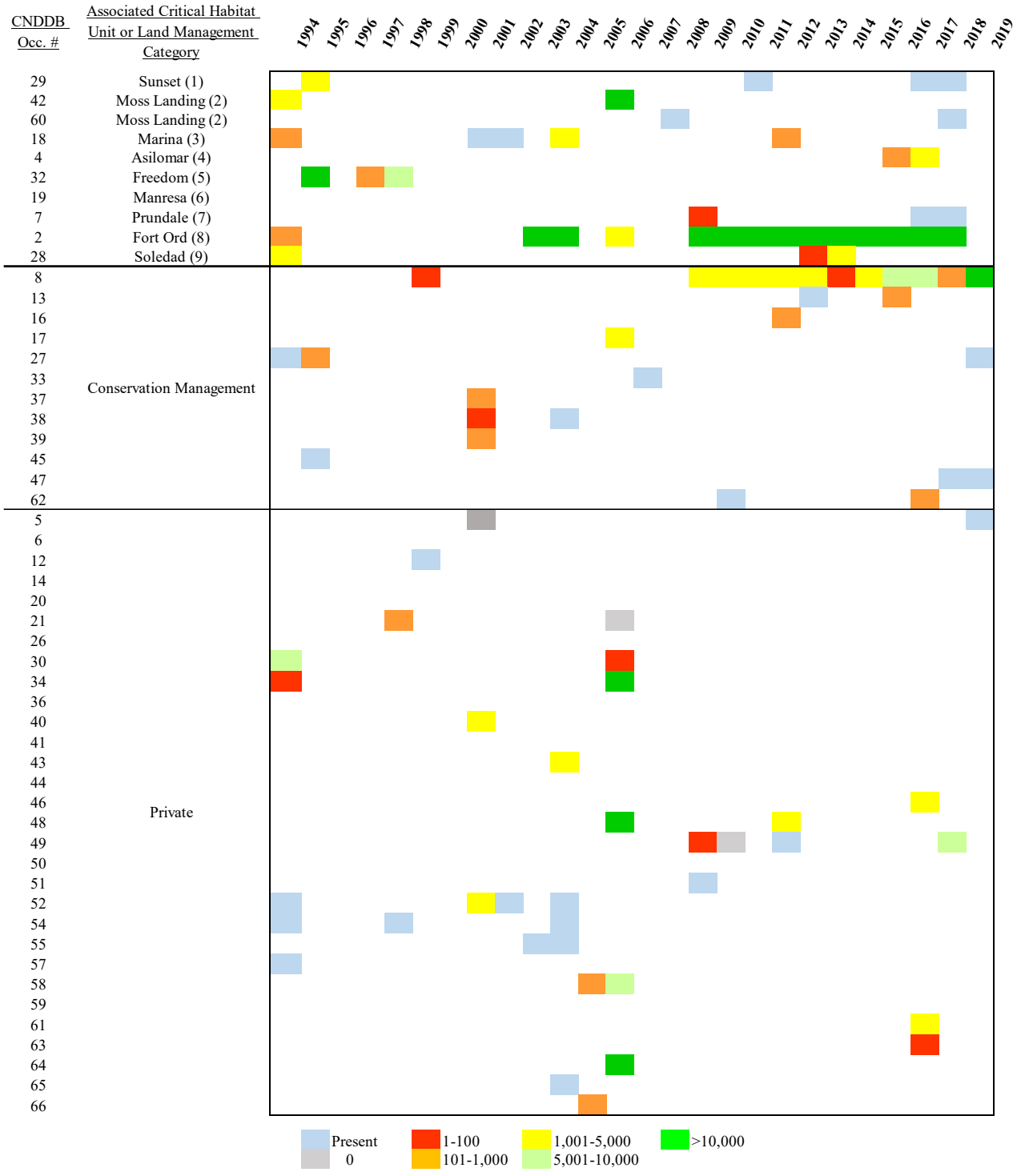

Figure 2. Estimated abundance of Monterey spineflower (*Chorizanthe pungens* var. *pungens*) from 1994 through 2019 by California Natural Diversity Database occurrence number. Occurrences associated with Critical Habitat Units are listed first, followed by occurrences on land managed for conservation. The remaining occurrences are located on private land.

Threats

At the time of listing, habitat destruction due to residential and golf course development, agricultural land conversion, sand mining, military activities, encroachment by alien plant species, recreation, and dune stabilization projects were identified as threats to the species (59 FR 5499, 5504). These threats were again recognized in the 1998 Recovery Plan with emphasis placed on the threat of iceplant (*Carpobrotus* spp.) invasion and dune stabilization (Service 1998, p. 22). Restoration programs were implemented on protected lands in dune habitat between the 1998 Recovery Plan and 2009 5-year review that reduced the severity of that threat during that period.

The 2009 5-year review recognized development, agricultural land conversion, invasive species and habitat succession, sand mining, and recreation as the main threats to the Monterey spineflower (Service 2009, pp. 8-11). Development throughout the species range continued since listing and resulted in loss of habitat and increased habitat fragmentation (Service 2009, pp. 7-8). By 2009, military activities had largely ceased and the former Fort Ord occurrences were subjected to disturbance from activities outlined in the closure and reuse plan, programmatic biological opinion, and draft HCP (USACE 1997, entire; Service 2017, entire; ICF 2019, entire; Service 2009, p.8). Although invasive species control had been implemented within some occurrences in dune habitat, the lack of control of invasive species at inland sites was highlighted in the 5-year review as a growing threat to the species in openings of maritime chaparral. European dune grass (*Ammophila arenaria*), jubata grass (*Cortaderia jubata*), French broom (*Genista monspessulana*), wild oats (*Avena* spp.), and bromes (*Bromus* spp.), were also recognized as threats to Monterey spineflower habitat (Service 2009, pp. 10-11).

In this 5-year review, we update the Service's understanding of the threats of development, agricultural land conversion, invasive species and habitat succession, sand mining, and recreation.

Development

Aerial imagery suggests that 19 of 51 occurrences (37 percent) have experienced habitat loss and/or fragmentation due to development. Development continues to be a primary threat to the species through direct habitat loss and habitat fragmentation. The primary source of development is continued urban expansion throughout the range of the species and associated development of infrastructure (e.g. roads). The single greatest impact to the species is from development and remediation as part of the former Fort Ord closure and reuse plan. Under the closure and reuse plan 2,745 acres of Monterey spineflower habitat will be developed and 1,036 acres will be developed with restrictions (Service 2017, p.8). Remediation activities will temporarily affect an additional 2,231 acres of suitable habitat, but restoration to comparable pre-disturbance conditions is required (Service 2017, pp. 39-54). The closure and reuse plan will also permanently affect 1,320 acres of critical habitat. Remediation activities will affect 3,966 acres of critical habitat (Service 2017, p. 8).

The amount of suitable habitat threatened by development throughout the range of Monterey spineflower outside of the former Fort Ord is unknown. However, urban expansion in Monterey and Santa Cruz counties with associated expansion of infrastructure (e.g. roads) within the range

of the Monterey spinedflower is a cumulatively large effect not offset by restoration and monitoring as required on the former Fort Ord.

Agricultural Land Conversion

Aerial imagery suggests that nine of 51 occurrences (18 percent) have been developed or converted to agriculture, but the amount of acres or number of individuals affected cannot be determined without survey data. Currently, there is very little land where Monterey spineflower occurs that could be converted to agriculture. We expect that the threat of agricultural land conversion will continue to decrease with time because coastal populations are not subject to agricultural conversion and the majority of inland suitable habitat occurs on the former Fort Ord where conversion to agriculture is not planned.

Invasive Species and Habitat Succession

Invasive species continue to be a threat throughout the species range. Invasive species colonize open areas within coastal dune and chaparral habitat for Monterey spineflower, outcompete Monterey spineflower for light and water, and inhibit the natural processes that create open spaces where Monterey spineflower grows. In areas where there are active weed control programs, the threat is lessened, but funding to maintain invasive species management is not guaranteed. The threat is more severe in areas where there is no management of invasive species.

Invasive species are being managed within coastal dune habitat by California State Parks, and at inland areas within chaparral habitat within the former Fort Ord. Control of European dune grass began at Zmudowski State Beach in 2012 and has resulted in a decrease of cover and increase in naturally recruiting native vegetation. However, iceplant has also begun to colonize and has required additional effort to control (Palkovic 2020, personal communication). At Salinas River State Beach, 20 acres of iceplant removal began in 2015 and was completed in 2019. Following the iceplant removal, native plants were installed. In 2019, additional funding was granted to continue iceplant control and expand the area of iceplant removal and subsequent restoration (Palkovic 2020, personal communication). At Fort Ord Dunes State Park, a 20 acre iceplant removal project began in 2016 and concluded in 2019, although new recruitment of iceplant suggests that long-term control will remain necessary. California State Parks also has management programs to control slender iceplant (*Conicosia pugioniformis*), short pod mustard (*Hirschfeldia incana*), jubata grass, veldt grass (*Ehrharta calycina*), and European annual grasses (Palkovic 2020, personal communication).

Inland chaparral habitat on the former Fort Ord continues to be managed as governed by the Habitat Management Plan, programmatic biological opinion, and draft Habitat Conservation Plan. Restoration and monitoring associated with remediation activities described in the above documents and in the closure and reuse plan are ongoing and will continue until restoration efforts (including invasive species control) have been evaluated. Monitoring of annual species occurs every other year for five years including a baseline analysis (0, 1, 3, 5 years in relation to the activity). Shrub monitoring occurs over an eight year span with baseline monitoring occurring before the activity (0, 3, 5, 8 years in relation to the activity) (Tetra Tech and EcoSystems West 2015, pp. 1, 38-39).

Sand Mining

A sand extraction operation was run on a portion of sand dunes and beach between Marina State Beach and the Salinas National Wildlife Refuge from 1986 through 2013 (CCC 2017, Exhibit 5, p. 3). The effect of this operation was the loss of approximately 243,000 cubic yards/year of sand from the Southern Monterey Bay littoral cell resulting in causing or worsening shoreline retreat and dune erosion (CCC 2017, Exhibit 5, p. 3). A settlement agreement in 2017 closed the operation and initiated reclamation of the extraction operation (CCC 2017, Appendix A, entire). Under the settlement agreement, removal of extraction equipment and facilities, and regrading and restoration will occur between 2020 and 2025 (CCC 2017, Appendix A, pp. 33-37).

The closure of the sand extraction operation is likely to result in greater amounts of sand deposition on beaches within the range of the Monterey spineflower and reduce effects of shoreline retreat and coastal erosion. If the settlement agreement timeline is adhered to, sand mining will no longer be a threat to individuals or habitat of Monterey spineflower.

Recreation

Recreation from hiking, biking, equestrian, or other activities may create open space that can provide habitat for Monterey spineflower. However, sustained use of open areas is not likely to support the species because of direct damage to plants through trampling, erosion along trail systems, and introduction of invasive species that compete with Monterey spineflower. Recreation had historically been a threat at Sunset State Beach, but has been reduced through fencing that directs the impacts of recreational use to areas not occupied by Monterey spineflower (Service 2009, p. 8). It is possible that as the former Fort Ord becomes more open to the public that recreational use will increase and potentially impact Monterey spineflower.

Threats Summary

In summary, as of 2020, we have determined that development, and invasive species and habitat succession are the greatest threats to the Monterey spineflower. Invasive species and habitat succession can be ameliorated through invasive species control programs, but permanent funding is required for efforts to be long lasting. California State Parks have continued to restore habitat that was degraded from invasive species and habitat succession, but do not have permanent funding to restore the entirety of dune habitat or to continue to control invasive species in areas that have been restored. The draft HCP for the former Fort Ord outlines a structure that would provide funding for invasive species control for a period of 50 years but the document has not yet been approved. Agricultural land conversion and recreation are minor threats, and sand mining is no longer a threat to the species.

Recovery Plan Objectives

Recovery criteria for Monterey spineflower were included in the "Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly" (Service 1998, entire). The general criteria for all species covered were (Service 1998, p. 90):

- Inhabited dune systems are secure with experience to demonstrate that exotic plants and other threats are controlled.

- Inhabited locations through the species' range are secured.
- Reintroductions should be attempted in restored habitat within the historic range of the species.
    - A reintroduction may be considered successful if a population is naturally reproducing under natural conditions without excessive maintenance.
    - Evidence of successful reintroduction and restoration includes the natural expansion of a population as adjacent habitat is restored to suitable conditions.
- A delisting determination must be based on at least 15 years of monitoring and include years of above average precipitation and drought.
- Delisting can be considered when sites are secure from habitat modification (development) and occupied habitat is stable, or improving, and free of weed invasion.

The additional delisting criteria specific to Monterey spineflower are (Service 1998, pp. 90-91):

1. The Fort Ord disposal and reuse process has led the management agencies to develop, fund, and implement permanent protection plans for the species' habitat including permanent iceplant suppression programs;

2. Beach dune occurrences on State Park and private lands throughout its current range from Santa Cruz to the Monterey Peninsula are covered under a permanent protection plan.
    a. When the Recovery Plan was published approximately 60 percent of habitat on the former Fort Ord were planned to be conserved. If this changes, a reassessment should be made on the ability to recover the former Fort Ord occurrence.
    b. Existing management along the coast at the State Parks need to be supplemented with protection and management on private lands. The amount of supplementation is to be determined after a thorough analysis of the beach populations.

Evaluation of Recovery Criteria

General Criteria

- A majority of occurrences in coastal dune habitat are owned and managed by California State Parks, National Wildlife Refuge, or land trusts for which conservation of Monterey spineflower is a management objective. A notable exception to this is in Sand City where coastal development is currently being proposed at several locations where Monterey spineflower either occurs or where suitable habitat exists. Invasive species are currently being managed at the sites in conservation management, but permanent funding to maintain a low abundance of invasive species does not exist.

- Inland occurrences outside of the former Fort Ord are generally not protected and occur on private land.

- Reintroduction of the species has not been attempted although there are opportunities on restored land in coastal dunes and throughout the former Fort Ord.

- The suggested monitoring timeframe of 15 years has not been met for any of the occurrences. The only occurrences with continuous data greater than 5 years are portions of the former Fort Ord and the NSA Monterey dunes.

- The majority of occurrences are lacking information regarding population trends, vegetation composition, and permanent funding for invasive species control. Very little is known about any of the inland occurrences on private land that are not associated with the former Fort Ord.

Criteria Specific to Monterey Spineflower

1. A draft Habitat Conservation Plan would provide the funding and guidelines for protection, habitat enhancement, restoration, and invasive species control for a period of 50 years following the issuance of Federal and State permits (ICF 2019, p. ES-1).

2. A majority of beach dune occurrences occur on protected land, but there is no permanent or range-wide protection or monitoring plan.
    a. As of 2020, the estimated amount of habitat conservation on the former Fort Ord is estimated at 72 percent (ICF 2019, p. 4-18).
    b. The amount of supplementation needed has not been evaluated.

SUMMARY

Development on private property throughout the species range remains the primary threat to the species. Aerial imagery suggests that 19 occurrences have experienced habitat loss and/or fragmentation (37 percent) due to development. The extent to which occurrences have been altered or lost from development between the 2009 5-year review and the present 5-year review is unknown due to a lack of survey data or monitoring information. The projected cumulative loss of habitat and individuals from continued development throughout the species range is known only for the planned development that will occur on the former Fort Ord. Development is planned for coastal dune habitat in Sand City but the extent of impacts to Monterey spineflower are unknown. Additional development throughout the species range is likely to result in increased habitat loss and fragmentation. Although many of the occurrences that were known at the time of listing now occur on land managed for conservation (e.g. former Fort Ord, California State Beaches, National Wildlife Refuge) there is no monitoring data from which to assess trends in populations of Monterey spineflower. The existing data on the former Fort Ord assesses only those areas where restoration has begun following remediation or reclamation activities and in many cases has not been occurring long enough to evaluate success. There is currently no monitoring program to evaluate the status of the species on California State Parks or National Wildlife Refuge land. The Recovery Plan recommends 15 years of monitoring; thus, there is a reasonable need to establish a range wide monitoring program in order to consider a change in the species' status.

Invasive species continue to be a threat although efforts to control them and restore native habitat are ongoing within California State Beaches and on land owned by the Big Sur Land Trust. However, there is no source of permanent funding for the continued control of invasive species in these areas and there is a possibility that the efforts to establish a majority of native vegetation

may be temporary. The control of invasive species on the former Fort Ord would have greater security in funding with the approval of the draft Habitat Conservation Plan. Invasive species will continue to be a threat where they occur or where they may be introduced.

The remaining threats of agricultural land conversion, sand mining, and recreation have all been reduced relative to when Monterey spineflower was listed. There is very little land where Monterey spineflower occurs that could now be converted to agriculture. With the closure of the sand extraction facility, sand mining will no longer be a threat to Monterey spineflower. The closure of the facility provides opportunity to restore native habitat that may be suitable for Monterey spineflower. Recreation will remain a minor threat on public land where hiking, equestrian, and mountain biking remain popular. It is unlikely that these activates, or others, will result in extirpation of populations but habitat fragmentation may occur.

CONCLUSION:

After reviewing the best available scientific information, we conclude that Monterey spineflower (*Chorizanthe pungens* var. *pungens*) remains a threatened species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act and analysis of the status of the species in our 2009 5-year review (Service 2009, entire) remains an accurate reflection of the species current status.

RECOMMENDATIONS FOR FUTURE ACTIONS:

The following actions are recommended based on the current 5-year review:

- A range wide monitoring program should be created in order to evaluate occurrences of Monterey spineflower that are deemed essential to the recovery of the species.
- Monitoring of Monterey spineflower populations on California State Beaches and the former Fort Ord should begin with the goal of having continuous long-term monitoring that will meet the intent of the stated recovery criteria.
- Restoration and reintroduction should be attempted in coastal dune systems where past disturbance or invasive species have inhibited establishment of Monterey spineflower.
- The taxonomy of the varieties of *Chorizanthe pungens* and *Chorizanthe robusta* should be reevaluated to determine if revisions are necessary or warranted.
- The recovery criteria should be revisited to evaluate the importance of having protected populations in the interior north (Santa Cruz) and central (Prunedale Hills) portions of this taxon's range.

APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approved STEPHEN HENRY Digitally signed by STEPHEN HENRY Date: 2020.04.01 14:57:25 -07'00' Date _____

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