

5-YEAR REVIEW

Chloropyron maritimum subsp. *maritimum*
[*Cordylanthus maritimus* subsp. *maritimus* (salt-marsh bird's beak)]

GENERAL INFORMATION

Species: *Chloropyron maritimum* subsp. *maritimum* [*Cordylanthus maritimus* subsp. *maritimus*, (salt-marsh bird's beak)]

Date listed: September 28, 1978

FR citation(s): USFWS 1978 (43 FR 44810–44812)

Classification: Endangered

Associated rulemakings: None. We have not designated critical habitat for this subspecies.

BACKGROUND

Methodology used to complete the review: In accordance with section 4(c)(2) of the Endangered Species Act of 1973 (Act), as amended, the purpose of a 5-year review is to assess each threatened and endangered species to determine whether its status has changed and should be classified differently or removed from the List of Threatened and Endangered Wildlife and Plants. For this review, the U.S. Fish and Wildlife Service (USFWS) evaluated the biology and status of *Chloropyron maritimum* subsp. *maritimum*, which is the currently accepted scientific name of the listed entity (*Cordylanthus maritimus* subsp. *maritimus*). We used information from 1) the scientific literature, 2) responses to the Notice of Initiation of 5-year reviews, and 3) reports and surveys since the last 5-year review.

FR Notice citation announcing the species is under active review: USFWS 2019 (84 FR 36116–36188); Endangered and Threatened Wildlife and Plants; Initiation of 5-year Status Reviews of 58 Species in California, Nevada, and the Klamath Basin of Oregon; July 26, 2019.

Application of the 1996 Distinct Population Segment (DPS) policy: Because the species under review is a plant, the DPS policy is not applicable and is not addressed further in this review.

REVIEW ANALYSIS

UPDATED INFORMATION AND CURRENT SPECIES STATUS

Biology and Habitat

Since the 2009 5-year review, we have received new information about *Chloropyron maritimum* subsp. *maritimum* (CHMAMA) biology and habitat.

Several CHMAMA pollinator studies have been conducted at Naval Base Ventura County (NBVC) Point Mugu (Knapp and Schneider 2017, unpaginated; NBVC Point Mugu 2018a, entire) since our last review:

1. In 2016, Knapp and Schneider observed two bee taxa (*Anthidium edwardsii* and *Melissodes tepida timberlakei*) using CHMAMA at NBVC Point Mugu. They also surveyed pollinators in adjacent upland habitat, and conducted a plant-pollinator network study to identify which plant and pollinator species interacted at the site (Knapp and Schneider 2017, unpaginated). Two upland plant species—*Phacelia distans* and *Acmispon glaber*—attracted pollinators most similar to CHMAMA, and may be desirable plants for upland habitat restoration (Knapp and Schneider 2017, unpaginated).
2. During separate 2017 pollinator surveys at Point Mugu, two CHMAMA pollinators were observed: metallic sweat bees (*Lasioglossum* subgenus *Dialictus* sp.) and long-horned bee (*Melissodes* sp.) (NBVC Point Mugu 2018a, p. 6).
3. In 2017, Knapp and Calloway repeated the 2016 survey at Point Mugu. They observed one taxa (*Bombus sonorus*) not observed in 2016 (Knapp 2018, p. 10). They observed two additional bee taxa using CHMAMA not seen in 1985 or 2016: *Ceratina* sp. and *Hylaeus* sp. (Knapp 2018, p. 4). At Carpinteria Salt Marsh, they observed another pollinator taxon (*Agapostemon* sp.) using CHMAMA.

Milano and Vandergast (2018) (published in Milano *et al.* 2020) sampled CHMAMA from all extant populations across the subspecies' range, including three sites in Baja California, Mexico. Population structure analysis found five genetic clusters of CHMAMA: Morro Bay, Point Mugu, Upper Newport Bay, San Diego county marshes, and Baja California (Milano *et al.* 2020, p. 552). There was evidence of genetic differentiation between estuaries and regions, with higher differentiation between more distant estuaries (pp. 553–556). There was little or no genetic connectivity among the five genetic clusters (p. 556). Genetic diversity was lower in the northern part of the subspecies' range, and higher in the southern part of the range (at Tijuana Estuary and Bahía de San Quintín in Baja California) (p. 557).

Noe *et al.* (2019) analyzed 26 years of CHMAMA monitoring data from the 1988 Sweetwater Marsh reintroduction, along with abiotic variables. They found that tidal range, winter rainfall (November through March), and May maximum temperature explained 82 percent of variation in inter-annual plant counts. Tidal range explained the most (43 percent) variation in counts: larger plant counts occurred when tidal ranges were greater, and counts were lower when tidal ranges were smaller (Noe *et al.* 2019, pp. 753–754). Noe *et al.* (2019, p. 754) also found that counts oscillated with the 18.6 year lunar nodal cycle, which influences tidal range.

Distribution and abundance

At listing, we considered the historical range of CHMAMA to extend from Santa Barbara County to San Diego County, and south into northern Baja California, Mexico (Figure 1). We considered CHMAMA to be extant only at Point Mugu, Tijuana Estuary, and northern Baja

California (USFWS 1978, 43 FR 44811). At the time of the 1985 recovery plan, CHMAMA was extant at six “general areas”: Carpinteria Salt Marsh, Mugu Lagoon/Ventura County Game Preserve/Ormond Beach (considered one area), Anaheim Bay (a 1982 reintroduction), Upper Newport Bay, Sweetwater Marsh, and the Tijuana River Estuary (USFWS 1985, p. 3). In the 2009 5-year review, CHMAMA was reported to be extant at seven coastal salt marshes (USFWS 2009, p. 7).

CHMAMA is currently extant at nine coastal marsh complexes across the species’ range. Seven marsh complexes are in the United States (Morro Bay, Carpinteria Salt Marsh, Ormond Beach/Mugu Lagoon, Upper Newport Bay, San Diego River Mouth, San Diego Bay (including Sweetwater Marsh) and Tijuana Estuary. Two marsh complexes are in Baja California, Mexico: Estero Punta Banda, and Bahía de San Quintín (Figure 1).

Since the 2009 5-year review, CHMAMA has been reported at one new marsh in the United States: CHMAMA at the San Diego River Mouth was reported in 2011, and is the result of a seeding event with seed from the Tijuana Estuary (Milano *et al.* 2020, p. 557). There aren’t any criteria for the length of occupancy needed in order to consider a CHMAMA introduction a “population.” However, we consider it an extant population for the following reasons: 1) CHMAMA has been continuously present at this location since at least 2014, and is reproducing on site; 2) it is being managed as an extant population; and 3) it is relatively large (SDMMP 2020c p. 182), despite current threats from nonnative *Limonium duriusculum*, and future threats from sea-level rise.

In 2009, we considered *Chloropyron maritimum* at Morro Bay to be subspecies *maritimum*, based on redetermination of specimens from that location (USFWS 2009, p. 7; USFWS 2013, pp. 139, 142). However, Milano *et al.* (2020, p. 557) noted distinct morphological differences between *Chloropyron maritimum* subsp. *maritimum* populations across the taxon’s range, and voucher specimens of both subspecies *maritimum* and *palustre* have been collected at Morro Bay (CCH 2019). Although we continue to consider *Chloropyron maritimum* at Morro Bay to be subspecies *maritimum* (USFWS 2013, pp. 139, 142), further phylogenetic and morphometric work is needed to clarify the distribution of the listed entity.

CHMAMA was introduced at the Huntington Beach Wetlands in 2015 and 2016 (Zahn 2017, p. 9). Plants were reported in three subsequent years (2017, 2019, and 2020), and are reproducing and dispersing on site (Tidal Influence 2019, p. 29; Zahn 2020, pers. comm., entire). However, the location is not yet considered an established population (Tidal Influence 2019, p. 29) and additional monitoring is needed. So, although CHMAMA currently occurs at Huntington Beach Wetlands, we didn’t include this site in our count of extant marshes.

We also have new information about CHMAMA in Baja California, Mexico. In Mexico, CHMAMA is extant at Estero Punta Baja and Bahía de San Quintín, but is extirpated from two historical sites [Arroyo San Telmo and Vicente Guerrero (Campos *et al.* 2019, p. 15; Mulligan 2019, pp. 13, 15)]. As part of the Baja Rare Project, a cross-border conservation effort, botanists collected seed, voucher specimens and tissue samples, and ecological data for CHMAMA at Bahía de San Quintín (Campos *et al.* 2019, pp. 7–9, 13).

Finally, we have new information about CHMAMA abundance from monitoring efforts, which occur annually at several sites:

1. At NBVC Point Mugu, CHMAMA is monitored annually. Biologists map the extent of CHMAMA occurrences as either points or polygons (NBVC Point Mugu 2018b, p. A-2). Biologists also record CHMAMA cover, phenology, and notes (NBVC Point Mugu 2018b, pp. A-3–A-4). Because of differences in mapping protocols between years, not all annual occurrence sizes are directly comparable; however, area occupied has generally declined since 2006 (NBVC Point Mugu 2019, p. 8).
2. At CHMAMA occurrences in San Diego County (at the San Diego River Mouth, Sweetwater Marsh, and Tijuana Estuary), the San Diego Management and Monitoring Program (SDMMP) conducts annual monitoring (SDMMP 2020c, p. 161). Biologists record plant abundance and occupied extent, and collect habitat and threats data according to the Inspect and Manage Monitoring Protocol (SDMMP 2020a, entire). Although monitoring hasn't occurred long enough to detect some trends, most occurrences of CHMAMA in San Diego County appear relatively stable (SDMMP 2020c, p. 170).
3. In 2017, Gevirtz and others mapped CHMAMA within Carpinteria Salt Marsh, using the protocol developed by NBVC Point Mugu (Gevirtz and Yould 2017, entire).
4. In 2018 and 2019, Tidal Influence (2019, p. 4) mapped CHMAMA at five estuaries in the United States: Morro Bay, Carpinteria Salt Marsh, Point Mugu/Ormond Beach, Upper Newport Bay, and the San Diego River Mouth. They used the monitoring protocol developed by NBVC Point Mugu.
5. Noe *et al.* (2019) monitored CHMAMA at Sweetwater marsh in the late 1980s and annually between 1990 and 1998, and also in 2014 and 2016 (refer to **Biology and Habitat**).



Figure 1. Current range of CHMAMA, showing the nine coastal marsh complexes where the subspecies is believed to be extant.

Threats Analysis

At listing, CHMAMA was threatened by the loss of coastal salt marshes, because the filling of coastal marshes had eliminated or drastically reduced habitat for the subspecies. We also discussed a proposed hydrological alteration at Mugu Lagoon (USFWS 1978, p. 44811). In 2009, Factor A threats to CHMAMA included off-highway vehicle (OHV) use and hydrological changes. We discussed habitat loss as a historical Factor A threat, but by 2009, habitat loss was no longer a significant or widespread threat to the subspecies (USFWS 2009, p. 18). Factor C threats to CHMAMA were from larval moth predation, but the extent of impacts to populations was unknown. Factor E threats included trampling, nonnative plants, and climate change. Due to lack of information in 2009, we did not assess the magnitudes of the Factor C and E threats.

Since the 2009 5-year review, we have received new information about threats impacting CHMAMA; however, we reference the 2009 review for those threats where no new information is available.

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

Habitat loss

As we discussed in the 1978 listing rule, CHMAMA was historically threatened by the filling in of coastal salt marshes (USFWS 1978, p. 44811). In our 2009 5-year review, we stated that the direct loss of coastal wetlands—including coastal salt marsh habitat suitable for CHMAMA—had been largely eliminated due to laws and regulations protecting coastal habitats (USFWS 2009, p. 16). That remains the case at the time of this assessment: development of coastal wetlands is not currently a direct threat to CHMAMA habitat. However, surrounding urbanization at many marshes reduces the area available for horizontal marsh migration, increasing marsh vulnerability to sea level rise (Callaway and Zedler 2004, p. 108; Fong and Kennison 2010, p. 246; Rosencranz *et al.* 2018, p. 1372; Thorne *et al.* 2018, p. 8).

Marsh transition habitats—that provide nesting areas for CHMAMA pollinators—have also been lost and modified (Callaway and Zedler 2004, p. 110). These habitats may be vulnerable to development because they don't have the same protections as wetland habitats (Callaway and Zedler 2004, p. 110). Sea level rise may also reduce the amount of transitional habitat available in the future.

Historically, habitat loss due to development and urbanization was a high-magnitude threat to CHMAMA (Table 1). While urbanization is not currently a direct threat to CHMAMA, development surrounding coastal wetlands interacts with other threats—including altered hydrology and climate change—to reduce the amount of space available for marsh transgression.

Table 1. Summary of current threats, threat time-frame, and overall magnitude

Factor	Threat	Needs affected	Time-frame	Overall magnitude	Uncertainty in threat magnitude determination
A	Direct habitat loss	Individual, population, species	Historical	Low (historically high)	Low
A	Altered hydrology	Individual, population, species	Historical, ongoing (short- and long-term)	Moderate	High
A	Unauthorized OHV use	Individual	Short-term	Very low	Low
C	Predation	Individual, population	Historical, ongoing (short-and long-term)	Unknown	Low
E	Nonnative plants	Individual, population	Ongoing (short- and long-term)	Moderate	Moderate
E	Climate change	Individual, population, species	Ongoing (short- and long-term)	High	Low
E	Foot traffic and trampling	Individual	Short-term	Low	Low
E	Dune encroachment	Individual, population	Ongoing (short- and long-term)	Low	Moderate

Altered hydrology

Each CHMAMA-occupied estuary differs in historical and current site conditions, but many southern California coastal wetlands have followed similar trajectories of hydrological modification. In general:

1. Coastal estuaries have been dredged to create marinas and harbors, and some are managed to maintain open conditions. This has increased tidal access and area of subtidal habitat (Vogl 1966, p. 81; Trimble 2003, pp. 437; USFWS 2006, p. 3-11; USACE 2012, Appendix A; Stein *et al.* 2014, p. 25).
2. Upstream dams have altered sediment availability and reduced peak flows, while erosion and channelization (for agriculture and/or flood control) has increased sediment delivery to occupied marshes during flood events (Zedler 1996, p. 43; Kuhn and Zedler 1997, p. 391; Carle 2004, p. 80).

3. Agricultural and urban runoff has increased nutrient levels in estuarine soils and waters (Kennison and Fong 2014, p. S175).

In addition to altering vegetation community composition in salt marshes, altered hydrology could create conditions for some nonnative plant species (Kuhn and Zedler 1997, pp. 399–401). For example, Kuhn and Zedler found that germination of a nonnative annual beard grass (*Polypogon monspeliensis*) was reduced with increasing salinity.

Since CHMAMA abundance and extent hasn't been monitored before or after major modifications, it's difficult to determine how some hydrological alterations—particularly modified freshwater flows—have affected CHMAMA needs, especially relative to direct habitat loss. Although we don't have marsh-specific data about the effects of altered hydrology on CHMAMA abundance, hydrological alterations may affect CHMAMA at the individual level (by altering soil salinity) and at the population level (by reducing the area of marsh habitat and altering tidal influence to sites). Therefore, this threat is moderate in overall magnitude, but there is uncertainty about how some modifications affect CHMAMA plants and habitat (Table 1).

Unauthorized off-highway vehicle use

Currently, unauthorized OHV use is present at Ormond Beach Wetlands (the Mugu Lagoon/Ormond Beach population). At this site, Tidal Influence (2019, p. 17) observed impacts from recent off-roading activities. However, within that marsh, OHV use was noted in a relatively small area in 2019, so this threat likely has a small geographic scope. We don't have information about the frequency or intensity of OHV use at the site, but disturbances from OHVs likely only affects individual plants in the short-term. Therefore, this threat is low in overall magnitude (Table 1).

Factor B: Overutilization for commercial, recreational, scientific, or educational purposes

In the listing rule and 2009 5-year review, we didn't identify any threats attributable to Factor B (overutilization for commercial, recreational, scientific, or educational purposes). We don't have any new information about overutilization, so our previous assessments remain accurate.

Factor C: Disease or Predation

In the listing rule, we didn't consider predation a threat to CHMAMA. In 2009, we considered insect predation a threat to occurrences at Tijuana Slough National Wildlife Refuge in San Diego County and Mugu Lagoon in Ventura County, because pre-dispersal seed predation can lower reproductive output (USFWS 2009, p. 18; USFWS 2013, p. 144).

Despite signs of larval moth granivory, Parsons and Zedler (1997, p. 259) reported that granivory did not significantly affect the number of CHMAMA seeds produced in 2 years of study. However, in San Diego County, biologists have noted high levels of seed predation at CHMAMA occurrences, especially at drier locations (SDMMP 2020c, p. 169). Overall, the magnitude of this threat is unknown (Table 1).

Factor D: Inadequacy of Existing Regulatory Mechanisms

In the 2009 5-year review, we discussed State, Federal, and regional regulatory mechanisms that provide protection for CHMAMA. This assessment remains accurate; refer to USFWS 2009 (pp. 18–23).

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

Nonnative plants

Nonnative plants can affect native plants by directly competing for resources, and by altering biotic interactions. There is uncertainty about the intensity of effects to CHMAMA plants and habitat from nonnative species, but we do have evidence that a nonnative annual (*Parapholis incurvata*) is a less effective host (a “pseudo-host”) for CHMAMA (Fellows and Zedler 2005, p. 97). If nonnative species reduce the resources available for CHMAMA growth and reproduction, reduced input to the seed bank over time could reduce CHMAMA population resiliency.

Nonnative plants are present at all CHMAMA-occupied estuaries in the United States. The nonnative species of highest concern (*Limonium ramosissimum* and *L. duriusculum*) are present at five of seven occupied estuaries: Morro Bay, Carpinteria Salt Marsh, Upper Newport Bay, San Diego River Mouth, and San Diego Bay (Sweetwater Marsh) (Tidal Influence 2019, p. 27). *Limonium* control measures are being implemented at these five locations (Tidal Influence 2019, p. 29), and other nonnative plant control measures are occurring at Mugu Lagoon (NBVC Point Mugu 2019, p. 36).

Nonnative plants represent a moderate level threat because they occur across the U.S. range of CHMAMA, can affect individual plants and populations, and can affect CHMAMA over the short- and long-term (Table 1).

Climate change

Greenhouse gas emissions drive climate and ocean change (Rhein *et al.* 2013, p. 258; Sievenen and Phillips 2018, p. 15). Sea-level rise has accelerated in the late 20th and early 21st centuries, and is projected to continue to accelerate, especially under high-emissions scenarios (Rhein *et al.* 2013, p. 258; Griggs *et al.* 2017, p. 10; Sievenen and Phillips 2018, pp. 16–17). Between 1900 and 2020, sea levels along the southern and central California coast have risen an average of 2.13 ± 0.19 millimeters per year (Griggs *et al.* 2017, p. 23).

Since the 2009 5-year review, modeling for California tidal marshes has incorporated elevation, accretion rates, and rates of sea-level rise to project marsh vulnerability to future sea-level rise (Thorne *et al.* 2016, entire; Thorne *et al.* 2018, entire; Rosencranz *et al.* 2018, entire). Thorne *et al.* (2016, entire), Thorne *et al.* (2018, entire), and Rosencranz (2018, entire) modeled tidal marsh elevation and habitat change under low, mid, and high sea-level rise scenarios at 14 estuaries on the U.S. Pacific coast, including at 5 CHMAMA-occupied estuaries (Morro Bay, Carpinteria, Point Mugu, Upper Newport Bay, Sweetwater Marsh, and Tijuana Estuary) (Thorne *et al.* 2016, pp. 6–8;

Thorne *et al.* 2018, p. 4). The low, mid, and high scenarios correspond to 44, 93, and 166 centimeters (1.4, 3.0, and 5.4 feet) of end-of-century sea-level rise (NRC 2012, p. 96).

In general, Thorne *et al.* (2018, p. 5) reported that Pacific coast marshes were highly vulnerable to sea-level rise, and that marsh migration potential in some areas was limited due to urbanization and/or local topography. Under a high sea-level rise scenario, Morro Bay and Upper Newport Bay have relatively limited area available for marsh migration, and are projected to lose substantial elevation by the end-of-century (Thorne *et al.* 2018, p. 5). Sweetwater Marsh (within San Diego Bay) and Tijuana Estuary are less vulnerable to sea-level rise, either because they will maintain elevation, or because they have more space for marsh migration (Thorne *et al.* 2018, pp. 3, 5). Relative to current marsh area, Sweetwater Marsh has the most space for upland migration (Thorne *et al.* 2018, p. 5). However, by end-of-century under a high sea-level rise scenario, Thorne *et al.* (2018, p. 4) project a complete loss of low, mid, and high marsh habitat at four CHMAMA-occupied marshes studied (within Morro Bay, Upper Newport Bay, San Diego Bay, and Tijuana Estuary). However, habitat for marsh transgression is available at some locations, but more study is needed to determine potential future transgression space.

Future conditions of climate warming—sea level rise, increased temperature, and more frequent and intense storms and droughts—will likely affect CHMAMA at the individual, population, and species levels:

1. Projected sea-level rise will likely increase marsh inundation frequency and duration, reducing the amount of high marsh habitat within Pacific coastal estuaries (Thorne *et al.* 2018, pp. 2–5), and lowering CHMAMA population resiliency.
2. Sea-level rise could cause local extirpation from some areas within marshes, and CHMAMA could be completely extirpated from some currently-occupied habitat, based on projections by Thorne *et al.* (2018). That would lower both representation and redundancy, affecting CHMAMA at the species level. However, at some marshes, transgression space is available, so CHMAMA could move into new areas.
3. Increasing temperatures could impact individuals by increasing plant water stress and lowering reproduction (Noe *et al.* 2019, p. 755), which would lower population resiliency in the long-term by reducing input to the seed bank.
4. Increasing temperatures could cause shifts in plant and pollinator phenology and pollinator physiology, affecting the individual need for pollination. However, there is uncertainty about these potential effects.
5. There is uncertainty about how some effects of changing climate—increasing atmospheric CO₂ concentrations, and increased precipitation extremes—will impact CHMAMA.

Climate change could affect CHMAMA at the individual, population, and species levels. And, since this threat is present long-term, it's high in overall magnitude (Table 1).

Foot traffic and trampling

At the time of this assessment, trampling has been noted at seven CHMAMA-occupied marshes in the United States (Tidal Influence 2019, p. 27). However, within marshes, trampling is generally present at a relatively small percentage of occurrences.

While we don't have information about foot traffic frequency and intensity, direct impacts to CHMAMA are likely short-term, and effect only individual plants. Therefore, the overall magnitude of this threat is likely low (Table 1).

Dune encroachment

Dune encroachment wasn't discussed at listing or in 2009, but has since been identified as a threat to CHMAMA at NBVC Point Mugu (Tidal Influence 2019, p. 16).

The construction and management of Port Hueneme—north of Ormond Beach and NBVC Point Mugu—caused landward dune migration, resulting in the loss of over 100 acres of wetlands at Ormond Beach (ESA 2019, p. 2-6). It's unclear whether CHMAMA at Ormond Beach was impacted as a result of this dune migration.

At NBVC Point Mugu, some CHMAMA sites are adjacent to dunes. Marsh-dune transition could provide areas of lower soil salinity for CHMAMA, because salts are more easily leached from saline soils. NBVC Point Mugu (2017, p. 21) suggested further study of surface dune hydrology. However, dune movement inland could displace high marsh habitat. Dune encroachment was the most prevalent threat to CHMAMA reported at Mugu Lagoon in 2019 (Tidal Influence 2019, pp. 8, 16).

Dune encroachment could affect CHMAMA individuals and the population in the longer-term by converting high-marsh habitat to dunes; it is a moderate threat at that site. However, there is uncertainty about what amount of CHMAMA habitat will be lost. Since dune encroachment is present at only one population across the subspecies' range, it's low in overall magnitude (Table 1).

Conservation efforts

CHMAMA conservation is ongoing in estuaries throughout the subspecies' range. Annual monitoring occurs in some marshes across the range (refer to **Distribution and abundance**), a rangewide monitoring effort was completed in 2019 (Tidal Influence 2019), and research since 2009 has provided new information about CHMAMA genetics, pollinators, and biology (refer to **Biology and Habitat**). Seed collection for *ex situ* (off-site) conservation has also occurred at marshes across the species range (Knapp and Schneider 2017, unpaginated; SDMMP 2020b; SDMMP 2020c, pp. 99–100).

In 2012, the USFWS Coastal Program and Tidal Influence, LLC initiated a project to collect CHMAMA seeds from Upper Newport Bay and outplant a portion of seeds at Magnolia Marsh, within the Huntington Beach Wetlands. In November 2015 and March 2016, seeds were experimentally sown at different elevations within the marsh (Zahn 2017, p. 7). Surveys in March 2017 found plants at and above the high tide line (Zahn 2017, p. 9). The Huntington

Beach Wetlands Conservancy continues to enhance habitat for CHMAMA, monitor previously outplanted occurrences, and outplant new occurrences of CHMAMA (Marcum 2019, *in litt.*, pp. 1–2).

In 2018, we funded a project to assess suitable marshes for CHMAMA translocation and introduction. These marshes are currently unoccupied, but are within the historical range of the species. A range of habitat suitability criteria are being assessed for the project, including the presence of high marsh habitat, pollinator presence, and potential threats (Long 2018, *in litt.*, unpaginated).

In 2020, SDMMP completed the Management Strategic Plan Framework Rare Plant Management Plan for Conserved Lands in Western San Diego County, which provides a framework to manage rare plants on conserved lands in San Diego County, including CHMAMA (SDMMP 2020c, pp. 1, 7). The Plan identifies Best Management Practices to restore CHMAMA habitat and occurrences, makes recommendations for reintroduction, introduction, and translocation, and identifies additional research needs (SDMMP 2020c, pp. 191–201).

RECOVERY CRITERIA

Recovery Plan: USFWS 1985

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. Overall, recovery and the assessment of a species' degree of recovery is a dynamic process requiring adaptive management, which 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 (and since the 2009 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, the extent to which threat factors have been reduced or eliminated indicate progress towards fulfilling recovery criteria. Criteria for downlisting and delisting from the 1985 Recovery Plan are discussed below.

Downlisting criteria: *15 acres [6 hectares] of secured and protected high marsh habitat at appropriate elevations is required at a minimum of eight marshes for a period of at least 5 consecutive years.*

Discussion: This criterion has been partially met. CHMAMA is present at nine coastal marsh complexes across the subspecies' range (seven in the United States, and two in Mexico), not counting an ongoing reintroduction effort at Huntington Beach Wetlands. At least 15 acres (6 hectares) of high marsh habitat is conserved within seven of the nine marshes (all except Estero Punta Banda and Bahía de San Quintín, where the amount of conserved habitat is unknown).

At seven of nine marshes (all except Estero Punta Banda and Bahía de San Quintín), CHMAMA has been continuously present for at least 5 years, although plant abundance fluctuates annually. The new population at the San Diego River Mouth has been continuously present since at least

2014. However, only seven of nine occupied marshes contain at least 15 acres (6 hectares) of high marsh habitat; we don't have marsh acreage estimates for marshes in Mexico.

As we discussed in 2009, new threats from climate change and nonnative plants affect our assessment of recovery progress. In 2009, we did not consider high marsh habitat sufficiently secure and protected, because of ongoing sea level rise. Since 2009, modeling of CHMAMA-occupied marshes has projected losses of high marsh habitat under scenarios of mid- and high-sea-level rise. Therefore, although habitat is protected, we do not consider it sufficiently secure.

Delisting criteria: *20 acres [8 hectares] of secured, protected, and managed high marsh habitat at appropriate elevations is required at each of the 12 major marshes within the historical range of the plant for a period of 10 consecutive years.*

This recovery criterion has been partially met, as we discussed above. However, CHMAMA is not yet established in 12 major marshes for a period of 10 years.

The 1985 Recovery Plan didn't include threats-based criteria, and in the 2009 5-year review, we recommended that a recovery plan revision include assessments of sea-level rise (USFWS 2009, p. 26). There are additional threats to CHMAMA that the recovery criteria do not address: sea-level rise was not discussed in the recovery plan, and recent modeling (Thorne *et al.* 2016, entire; Thorne *et al.* 2018, entire; Rosencranz *et al.* 2018, entire) projects future losses of high marsh habitat in CHMAMA-occupied estuaries. Nonnative *Limonium* has also emerged as a threat to the subspecies.

SYNTHESIS

CHMAMA is currently extant at nine coastal marsh complexes across the species' range, including seven marsh complexes in the United States [Morro Bay, Carpinteria Salt Marsh, Ormond Beach/Mugu Lagoon, Upper Newport Bay, San Diego River Mouth, San Diego Bay (including Sweetwater Marsh) and Tijuana Estuary], and two marsh complexes in Baja California, Mexico (Estero Punta Banda, and Bahía de San Quintín). One new population has been established since the last 5-year review, at the San Diego River Mouth. Conservation efforts have occurred and are ongoing throughout the subspecies' range, including work to introduce CHMAMA at Magnolia Marsh, within the Huntington Beach Wetlands.

We considered threats to CHMAMA under the same five factors considered at listing. Nonnative *Limonium* has emerged as a moderate threat to the subspecies and occurs at five of the extant marshes. Models of wetland accretion and sea level rise—developed since the previous 5-year review—project considerable losses of high marsh habitat in the 21st century (Thorne *et al.* 2018, p. 3–6). Therefore, we recommend no change in listing status at this time. We find that CHMAMA still meets the definition of an endangered species, due to new and ongoing threats to the subspecies.

RESULTS

Recommended Classification:

Downlist to Threatened

Uplist to Endangered

Delist (Indicate reasons for delisting per 50 CFR 424.11):

Extinction

Recovery

Original data for classification in error

No change is needed

Review Conducted By: Carlsbad Fish and Wildlife Office

New Recovery Priority Number: No change

RECOMMENDATIONS FOR FUTURE ACTIONS

1. Continue to work with partners to expand the current distribution of CHMAMA, including planning, site selection, and augmentation and reintroduction efforts.
2. Collect voucher specimens and conduct genetic work to resolve taxonomic questions about the distribution of the listed entity, especially at Morro Bay.
3. Continue to support partners in removing nonnative *Limonium* from occupied marshes. Conduct additional research into CHMAMA seed tolerance to solarization when treating *Limonium*.
4. Engage stakeholders and species experts in CHMAMA sea-level rise planning.
5. Conduct additional research into environmental covariates important for CHMAMA abundance at marshes, using existing monitoring data where available.

REFERENCES

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U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW

Chloropyron maritimum* subsp. *Maritimum
[*Cordylanthus maritimus* subsp. *maritimus* (salt-marsh bird's beak)]

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

Downlist to Threatened

Uplist to Endangered

Delist (Indicate reasons for delisting per 50 CFR 424.11):

Extinction

Recovery

Original data for classification in error

No change is needed

Review Conducted By: Carlsbad Fish and Wildlife Office

New Recovery Priority Number and Brief Rationale: No Change

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve

Scott A. Sobiech
Field Supervisor