CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

California Endangered Species Act

Status Review for Morro Manzanita (*Arctostaphylos morroensis*)

Report to the Fish and Game Commission
May 2026

Cover page photo credit: Kristi Lazar (2025)

Suggested citation: California Department of Fish and Wildlife (CDFW). 2026. Status review for Morro manzanita (*Arctostaphylos morroensis*). A report to the Fish and Game Commission, California Natural Resources Agency, Sacramento, CA, USA.

Table of Contents

List of Figures

List of Tables

List of Abbreviations, Acronyms, and Terms

CAL FIRE – California Department of Forestry and Fire Protection

CalVTP – California Vegetation Treatment Program Programmatic Environmental Impact Report

CCVI – Climate Change Vulnerability Index

CEQA – California Environmental Quality Act

CESA – California Endangered Species Act

CNDDB – California Natural Diversity Database

CNPS – California Native Plant Society

Commission – California Fish and Game Commission

CRPR – California Rare Plant Rank

Department – California Department of Fish and Wildlife

ESA – Federal Endangered Species Act

ESHA – Environmentally Sensitive Habitat Area

et al. – "and others"

GIS – Geographic Information System

HCP – Habitat Conservation Plan

PCA – Priority Conservation Area

PRISM – Parameter-elevation Regressions on Independent Slopes Model

RCP – Representative Concentration Pathway

sp. – species

spp. – multiple species

State Parks – California Department of Parks and Recreation

subsp. – subspecies

TEK – Traditional Ecological Knowledge

UCSC – University of California Santa Cruz

USFWS – United States Fish and Wildlife Service

var. – variety

VegCAMP- Vegetation Classification and Mapping Program

Executive Summary

This status review for Morro manzanita (*Arctostaphylos morroensis*) has been prepared by the California Department of Fish and Wildlife (Department) for the California Fish and Game Commission (Commission) pursuant to California Endangered Species Act (CESA) requirements (Fish & G. Code, § 2050 et seq.). This status review is based on the best scientific information currently available to the Department regarding each of the components listed under section 2072.3 of the Fish and Game Code and section 670.1 of title 14 of the California Code of Regulations. In addition, this status review includes a preliminary identification of habitat that may be essential to the continued existence of the species and the Department's recommendations for management activities and other recommendations for recovery of the species (Fish & G. Code, § 2074.6). This status review has been independently reviewed by scientific peers (Fish & G. Code, § 2074.6).

Morro manzanita is an erect, evergreen shrub that is known from nine occurrences and is restricted to the coastal areas around the towns of Baywood Park and Los Osos in the Morro Bay region of San Luis Obispo County, California. Morro manzanita usually grows in Baywood fine sand soil and primarily occurs in maritime chaparral and coastal scrub habitat below 300 m (980 ft) in elevation. The amount of occupied Morro manzanita habitat remaining is estimated at between 340 and 397 ha (840 and 982 ac).

Morro manzanita has experienced a declining population trend since European colonization and settlement of the area mainly due to historical extirpations from residential development and planting of *Eucalyptus*. The Morro manzanita population has likely been somewhat stable since 1988 when a moratorium on wastewater discharge was enacted which slowed modification and destruction of Morro manzanita habitat in the Baywood Park-Los Osos area. Currently, Morro manzanita is primarily threatened by direct and indirect effects of potential development on private property; a geographically restricted population making the species highly vulnerable to extinction due to human activities, natural catastrophes, and chance events; and altered fire regime and fuel reduction activities negatively impacting the species ability to reproduce and persist in the future. Climate change, competition with invasive plants, and recreational impacts also threaten Morro manzanita. Seed predation, pathogens, and overcollection are not currently considered significant threats but may become significant in the future.

The petitioned action was to list Morro manzanita as endangered under CESA. Based on the criteria described above and the best scientific information available, the Department has determined that listing Morro manzanita as threatened under CESA is warranted at this time (Fish & G. Code, § 2075.5, subd. (e)(2)). Although not presently

threatened with extinction, Morro manzanita is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by CESA. The Department further recommends implementation of the management recommendations and recovery measures described in this status review.

1 Introduction

1.1 Status Review Overview

This status review serves as the basis for the California Department of Fish and Wildlife's (Department) recommendation to the California Fish and Game Commission (Commission) on whether the petitioned action to list Morro manzanita (*Arctostaphylos morroensis* Wiesl. & B. Schreib.) as endangered under the California Endangered Species Act (CESA) is warranted. This status review is based upon the best scientific information available to the Department. It is not intended to be an exhaustive review of all published scientific literature on Morro manzanita; rather, this status review is intended to summarize key points relevant to the status of the species and address regulatory report requirements.

Each of the petition components and listing factors that the Commission must consider in making its determination are included and addressed in this status review (Fish & G. Code, §§ 2072.3 and 2074.6; Cal. Code Regs., tit. 14, § 670.1). A petition to list a species under CESA must include "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant" (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)). A status review must include a preliminary identification of the habitat that may be essential to the continued existence of the species and recommend management activities and other recommendations for recovery of the species (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)(1)). Additionally, a species shall be listed as threatened or endangered "if the Commission determines its continued existence is in serious danger or is threatened by any one or any combination of the following factors: present or threatened modification or destruction of its habitat, overexploitation, predation, competition, disease, or other natural occurrences or human-related activities" (Cal. Code Regs., tit. 14, § 670.1, subd. (i)(1)(A)). In some instances, the Department has grouped similar components together and renamed components, described where applicable, to create a more cohesive and readable report.

In addition to addressing each of the petition components and listing factors, the Department must make a recommendation to the Commission as to whether the petitioned action to list Morro manzanita as endangered is warranted. An endangered species is defined under CESA as one "which is in serious danger of becoming extinct

throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease" (Fish & G. Code, § 2062). A threatened species under CESA is one that "although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by [CESA]" (Fish & G. Code, § 2067).

Receipt of this status review is to be placed on the agenda for the next available meeting of the Commission after delivery. At that time, the report will be made available to the public for a 30-day public comment period prior to the Commission taking any action on the petition.

1.2 CESA Petition History

1.2.1 1991 Petition

On August 16, 1991, Dr. Malcolm G. McLeod with the San Luis Obispo Chapter of the California Native Plant Society submitted a petition to the Commission to list Morro manzanita as threatened pursuant to CESA (Fish & G. Code, § 2050 et seq.) (McGuire and Morey 1992).

The Department evaluated the petition on its face and in relation to other relevant information the Department possessed or received and determined that sufficient information existed to indicate that the petitioned action may be warranted. The Department recommended to the Commission that the petition be accepted and considered (McGuire and Morey 1992).

On December 5, 1991, the Commission considered the petition, the Department's petition evaluation and recommendation, comments received, and oral testimony at a public meeting, and found that sufficient information existed to indicate the petitioned action may be warranted and accepted the petition for consideration (McGuire and Morey 1992). Morro manzanita became a candidate species.

After Morro manzanita became a candidate species, the Department prepared a written report to the Commission on the status of Morro manzanita dated November 1992 that included a recommendation that the Commission find the petitioned action warranted (McGuire and Morey 1992).

On January 5, 1993, the Commission voted on whether the petitioned action was warranted, which resulted in a tie vote (Cochrane 1996). Morro manzanita remained a candidate species and the Commission directed the Department to work with the petitioner and other parties to initiate a management plan for Morro manzanita (Cochrane 1996).

On June 17, 1993, the Commission postponed its listing decision until August 5, 1993 while regional planning efforts were underway (Cochrane 1996).

On August 5, 1993, the Commission found that listing Morro manzanita was not warranted based on regional planning efforts that had been initiated, ratified findings with conditions, and removed Morro manzanita from the list of candidate species. Results of these regional planning efforts are discussed in the "Existing Management" section of this status review.

1.2.2 2024 Petition

On July 20, 2024, the Commission received a petition from Dr. Christopher Kofron and Dr. Claudia Tyler to list Morro manzanita as endangered pursuant to CESA (Fish & G. Code, § 2050 et seq.).

On July 30, 2024, the Commission referred the petition to the Department for evaluation (Fish & G. Code, § 2073).

On August 9, 2024, the Commission published its notice of receipt of the petition in the California Regulatory Notice Register (Fish & G. Code, § 2073.3; Cal. Code Regs., tit. 14, § 670.1, subd. (c); Cal. Reg. Notice Register 2024, No. 32-Z, p. 1016).

On October 10, 2024, the Commission approved the Department's request for a 30-day extension to the 90-day timeline to complete its petition evaluation report (Fish & G. Code, § 2073.5).

On November 12, 2024, the Department provided the Commission with a report, "Petition Evaluation for Morro manzanita (*Arctostaphylos morroensis*)," and a recommendation as to whether the petitioned action may be warranted. Based upon the information contained in the petition, the Department concluded that sufficient information exists to indicate that the petitioned action may be warranted and recommended that the petition be accepted and considered.

On February 12, 2025, and April 16, 2025, at its public meetings, the Commission considered the petition, the Department's petition evaluation and recommendation, comments received, and oral testimony (Fish & G. Code, §§ 2074 & 2074.2). At its April 16, 2025 meeting, the Commission found that sufficient information exists to indicate the petitioned action may be warranted and accepted the petition for consideration (Fish & G. Code, § 2074.2; Cal. Code Regs., tit. 14, § 670.1, subd. (e)).

On May 16, 2025, the Commission published its notice of findings in the California Regulatory Notice Register, designating Morro manzanita a candidate species (Fish & G. Code, § 2074.2; Cal. Code Regs., tit. 14, § 670.1, subd. (e); Cal. Reg. Notice Register

2025, No. 20-Z, p. 635). The Department subsequently initiated this status review (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)).

1.3 Federal Status

On December 15, 1994, Morro manzanita was listed as a threatened species under the Federal Endangered Species Act (ESA) (16 U.S.C. § 1531 et seq.; 59 FR 64613). In 2008, 2013, and 2022, the United States Fish and Wildlife Service (USFWS) conducted 5-year reviews for Morro manzanita to ensure that its classification as a threatened species under the ESA provided the appropriate level of protection (USFWS 2008, 2013, 2022). All three USFWS 5-year reviews concluded that Morro manzanita still met the definition of a threatened species under the ESA.

While Morro manzanita is listed as a threatened species under the ESA, the primary take prohibition in the ESA does not extend to plants, and the narrow set of prohibitions the ESA does extend to endangered plants generally do not apply to lands outside of federal jurisdiction (16 U.S.C. § 1538). However, Morro manzanita is a covered species under the Los Osos Habitat Conservation Plan (HCP) which is a planning document required for obtaining a federal incidental take permit under the ESA and includes provisions for avoiding and reducing impacts to Morro manzanita, including on non-federal lands within the plan area. The Los Osos HCP is further discussed in the "Existing Management" section of this status review.

1.4 Additional Species Status Designations

1.4.1 NatureServe Conservation Status Ranks

NatureServe's conservation status ranks consist of a global conservation status rank (global rank or G rank), describing the status of a given taxon over its entire global distribution, and a subnational conservation status rank (subnational rank or S rank), describing the status of a given taxon over its state distribution (Master et al. 2012). NatureServe has assigned Morro manzanita a conservation status rank of G1 S1, indicating that the species is critically imperiled both globally and within California, with a very high risk of extirpation due to one or more of the following: very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors (CNDDB 2020, 2024).

1.4.2 California Rare Plant Rank

The California Native Plant Society (CNPS) works in collaboration with botanical experts throughout the state, including Department biologists, to assign rare plants a California Rare Plant Rank (CRPR) reflective of their rarity status (CNDDB and CNPS 2020). CNPS has assigned Morro manzanita a CRPR of 1B.1 (CNPS 2024). Plants with a

CRPR of "1B" are considered rare, threatened, or endangered throughout their range with the majority endemic to California (CNDDB and CNPS 2020). The threat code extension of ".1" indicates that the species is seriously threatened in California, with over 80% of occurrences threatened and a high degree and immediacy of threat (CNDDB and CNPS 2020)

1.5 California Native People and Traditional Ecological Knowledge

Since time immemorial, California Native American tribes have lived alongside the state's fish, wildlife, and native plants, including Morro manzanita. California Native American people have acquired knowledge of the environment over thousands of years; this is often referred to as Traditional Ecological Knowledge (TEK) and encompasses the world view where ecology, spirituality, human-animal relationships, and more should be in balance and are all interconnected. TEK and related practices support a deeper understanding of a species' life history and informs its management.

Through our tribal engagement process, the Department sought to understand how TEK and tribal practices of stewardship, restoration, and conservation relate to and affect Morro manzanita and its habitat. The Department receives permission from tribes before including any of this information in a status review. The Department seeks meaningful tribal engagement to promote collaborative management of California's natural resources and provide opportunities to participate in discussions of Morro manzanita conservation. The tribal engagement summary for Morro manzanita is described in Appendix B.

1.6 Notifications, Information Received, and Peer Review

Following the Commission's May 16, 2025 action to designate Morro manzanita as a candidate species for endangered status, the Department notified affected and interested parties and solicited data and comments on the petitioned action (Fish & G. Code, § 2074.4; Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)).

Tribal notifications were distributed by letter and email to tribes identified by the Native American Heritage Commission as having a cultural or traditional affiliation within the geographic area of Morro manzanita. The Department received three comments in response to the tribal notifications. See Appendix B for additional details.

Public notifications were distributed to affected and interested parties and sent to email distribution lists maintained by the Department and the Commission. A press release was also distributed through the Department's website. The Department received seven comments in response to public notifications. See Appendix C for additional details.

The draft status review was independently peer reviewed by three experts external to the Department (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)). The Department evaluated the input received and amended the status review as appropriate. See Appendix D for additional details.

2 Species Description and Taxonomy

2.1 Species Description

Morro manzanita is an erect, evergreen shrub in the heath family (Ericaceae) (Parker et al. 2023). Morro manzanita typically grows from 1 to 4 m (3.2 to 13.1 ft) tall, with more prostrate plants on west-facing slopes that are exposed to high winds and taller, tree-like plants growing further inland (Mullany 1990; Parker et al. 2023). Leaves are covered with matted hairs on the lower leaf surface (especially when leaves are young) and generally without hairs on the upper leaf surface (Wieslander and Schreiber 1939; Mullany 1990; Parker et al. 2023). Leaf blades are oblong-ovate to elliptic, 1.5 to 3.5 cm (0.6 to 1.4 in) long, and 1 to 2.6 cm (0.4 to 1 in) wide (Figure 1) (Mullany 1990; Parker et al. 2023). The leaf base is truncate and sometimes cordate but it does not clasp the stem (Figure 1) (Kauffmann et al. 2021). Stomata (pores) are present on the lower leaf surface but generally absent or sparse on the upper leaf surface (Mullany 1990).

Like all manzanita species, Morro manzanita flowers have petals fused into an urn-shape that are white to pink in color (Figure 1). There are five sepals (outermost whorl of flower parts) below the fused petals (Parker et al. 2023). Flowers are arranged in clusters called inflorescences, and inflorescences hang down when they are young (Parker et al. 2023). At the base of the inflorescences are bracts that are leaf-like, lanceolate to linear in shape, and minutely hairy (Wieslander and Schreiber 1939; Parker et al. 2023). Fruits are 7 to 10 mm (0.3 to 0.4 in) wide, berry-like, and shaped as spheres that have been flattened on the top and bottom (Figure 1) (Parker et al. 2023). Manzanita fruits are a type of drupe in which the fruit coat and mealy outer layer surround multiple stones (seeds encased by a hard stony layer) (Kauffmann et al. 2021; Parker et al. 2023). In Morro manzanita, the fruit coat is sparsely white, nonglandular hairy and each fruit typically has 8 to 10 stones that can be free or fused (Mullany 1990; Tyler and Odion 1996; Parker et al. 2023).

Morro manzanita stems have gray, shredding bark on older stems and both short and long, white, non-glandular hairs on twigs and young inflorescences (Figure 1) (Parker et al. 2023). One characteristic of many manzanita species is the presence of a basal burl (woody growth) which allows the species to resprout after fire, but Morro manzanita does not have a basal burl (Figure 1).

Figure 1. Photographs of Morro manzanita leaves (top left), flowers (top right), fruits (bottom left), and base of trunk showing no basal burl (bottom right). Photo credit: Kristi Lazar (2025).

2.2 Species Taxonomy

Morro manzanita was first described by Wieslander and Schreiber in 1939 (Wieslander and Schreiber 1939). The original description was based on collections from 1936 and 1938 from the vicinity of Hazard Canyon in what is now Montaña de Oro State Park in San Luis Obispo County (Wieslander and Schreiber 1939). Morro manzanita has been recognized as a species in all relevant floras since it was originally described, including the Jepson eFlora and the Flora of North America (Parker et al. 2009, 2023).

2.3 Similar Taxa

The genus *Arctostaphylos*, commonly known as manzanita, is widespread and abundant throughout much of California with over 90 taxa currently recognized (Parker et al. 2023). Manzanita species diversity is the highest along the coast of California with several manzanita species, including Morro manzanita, endemic to the central coast. In the Morro Bay area of San Luis Obispo County, Morro manzanita can grow adjacent to, and occasionally with, Oso manzanita (*A. osoensis*), dacite manzanita (*A. tomentosa* subsp. *daciticola*), and Pecho manzanita (*A. pechoensis*) but these species generally do not occur in intermixed stands as they grow in different types of soil and habitats (Kauffmann et al. 2021; CCH 2024). Generally, Morro manzanita occurs on sandy and sandstone soils, Oso manzanita and dacite manzanita occur on volcanic soils, and Pecho manzanita occurs on siliceous shale soils (Parker et al. 2009; Kauffmann et al. 2021). At Montaña de Oro State Park, Morro manzanita can grow intermixed with Pecho manzanita and brittle leaf manzanita (*A. crustacea* subsp. *crustacea*), which is a more widespread species that can occur in a variety of soil types (Mullany 1990; CCH 2024; K. Drexhage, personal communication, May 7, 2025).

Possible hybrids between Morro manzanita and Oso manzanita, as well as Morro manzanita, Pecho manzanita, and Arroyo de la Cruz manzanita (*A. cruzensis*), have been mentioned on herbarium collections and in the literature (Mullany 1990; CCH 2024). A 1990 study by Mullany found that the purported hybrid plants were likely just a reflection of the variation in leaf morphology present in Morro manzanita; however, genetic analyses are needed to confirm this finding (Mullany 1990).

Morro manzanita can be distinguished from other species of manzanita in the Morro Bay area through a combination of characters, including the presence or absence of a basal burl and leaf characteristics (Table 1). Dacite manzanita and brittle leaf manzanita have basal burls, which Morro manzanita does not have. Oso manzanita and Pecho manzanita have leaf bases that clasp the stem whereas Morro manzanita does not have clasping leaf bases (Kauffmann et al. 2021). In addition, Morro manzanita has leaves with densely matted, short, woolly hairs on the lower surface whereas Oso manzanita and Pecho manzanita have either sparse hairs or no hairs on the lower leaf surface (Parker et al. 2009; Kauffmann et al. 2021; Parker et al. 2023). Bark and twig characteristics, length of the nascent inflorescence (inflorescence present before blooming), and soil preferences can also be helpful characters to use when distinguishing between species.

Table 1. Distinguishing characteristics of select manzanita species in the vicinity of Morro Bay (Parker et al. 2009; Kauffmann et al. 2021; Parker et al. 2023; CCH 2024).

	Morro manzanita	Oso manzanita	Dacite manzanita	Pecho manzanita	Brittle leaf manzanita
Species	*morroensis*	*osoensis*	*tomentosa* subsp. *daciticola*	*pechoensis*	*crustacea* subsp. *crustacea*
Basal burl	No	No	Yes	No	Yes
Bark	Gray, shreddy	Gray, shreddy	Gray, shreddy	Red, smooth	Red, smooth
Twigs	Short and long non-glandular hairy	Sparsely short, non-glandular hairy	Sparsely short, non-glandular hairy	Short and long non-glandular hairy	Dense short hairs and long spreading hairs, generally non-glandular
Leaf bases	Truncate to cordate; not clasping	Lobed and clasping	Truncate to lobed; not clasping	Lobed and clasping	Truncate to lobed; not clasping
Lower leaf surface	Densely-matted, short, woolly hairs	Sparsely hairy or not	Densely-matted, short, woolly hairs	No hairs	Hairy or not; non-hairy with age
Nascent inflorescence length	0.5-0.8 cm	0.5-1 cm	1-2.5 cm	1-1.5 cm	1-2.5 cm
Soil type	Sand dunes, sandstone	Volcanic outcrops	Volcanic outcrops	Shale outcrops	Variable

3 Life History

This section considers the best available scientific information regarding the species' life history (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)). Much of the Morro manzanita life history information in this section is summarized from research conducted by Dr. Claudia Tyler and Dr. Dennis Odion. See the original scientific articles and reports for more detailed information (Tyler and Odion 1996; Tyler et al. 1998; Odion and Tyler 2002; Tyler and Odion 2020; Tyler et al. 2023).

Morro manzanita has been observed flowering from October through June, with peak flowering in December and January (Mullany 1990; iNaturalist 2025). Since Morro manzanita is self-incompatible and dependent on pollinators to reproduce, it produces abundant flowers in order to attract pollinators (Tyler et al. 2023). A study that looked at Morro manzanita flower production during a two year period in 1998 and 1999 found an average of 52 to 135 flowers produced per stem (Tyler et al. 2023). Flower production in Morro manzanita was found to be especially high in wet years, with nearly twice as many flowers produced in a year of above average rainfall compared to a year of below average rainfall (Tyler et al. 2023). A variety of pollinators have been observed visiting Morro manzanita flowers, including honeybees (*Apis mellifera*), digger bees (*Anthophora urbana*), halictid/sweat bees (family Halictidae), bee flies (family Bombyliidae), a syrphid fly (*Colletes* sp.), a monarch butterfly (*Danaus plexippus*), and Anna's hummingbirds (*Calypte anna*), with the most frequently observed pollinator being yellow-faced bumble bees (*Bombus vosnesenskii*) (Mullany 1990; Tyler et al. 2023). While a variety of pollinators have been documented to visit Morro manzanita flowers, insect activity is lower than expected given the large number of flowers. In 1998 and 1999, pollinators visiting Morro manzanita were recorded in 39 observation periods over 13 days and approximately half of those observation periods had no pollinator visits despite abundant flowers (Tyler et al. 2023). This may indicate a pollinator limitation that could be negatively affecting fertilization and subsequent fruit production in Morro manzanita but further studies are needed to confirm whether pollinator limitation is contributing to low fruit set in the species.

If fertilized, flowers produce fruits which ripen on the stem and drop from the plant (generally in summer) (Tyler et al. 2023). Morro manzanita fruits typically produce 8 to 10 seeds (Mullany 1990; Tyler and Odion 1996). A 2025 study on Morro manzanita seed germination found that Morro manzanita fruits contained an average of 4 to 5 seeds per fruit (with a range of 2 to 9 seeds per fruit) but this is likely a low estimate due to fused seeds possibly being counted as a single seed instead of multiple seeds (Stillman et al. 2025). While flower production is high, only 10 to 18% of Morro manzanita flowers were found to produce fruit in a study from 1998 and 1999 (Tyler et al. 2023). This indicates that Morro manzanita likely has low fruit production compared with related species;

other manzanitas and species within the heath family have been documented to have up to 73% of flowers produce fruit (Tyler et al. 2023). Manzanita species have a biennial (every other year) pattern of fruit production so long-term studies are needed to substantiate the observation of low fruit production for Morro manzanita in the 1998 and 1999 studies (Dr. V. Thomas Parker, personal communication, March 13, 2026).

In addition, Morro manzanita, like many other manzanita species, experiences high fruit predation from animals, with an estimated 60 to 70% of fruits removed within a few months of dropping to the ground (Keeley and Hays 1976; Keeley 1987b; Tyler et al. 2023). While no studies have been done to identify the animals that predate on Morro manzanita fruits and seeds, rodents (particularly woodrats (*Neotoma fuscipes*)) are thought to be the primary fruit and seed predators for Morro manzanita (Tyler and Odion 2020; Tyler et al. 2023). While animals predate on Morro manzanita fruits and seeds, they also serve an important role in seed dispersal and survival. For common species of manzanita, rodents have been shown to serve as short distance seed dispersers as a result of seed caching behavior, while coyotes, bears, and foxes can serve as long-distance seed dispersers since manzanita seeds pass through their digestive tract unharmed (Keeley and Hays 1976; Moore and Vander Wall 2015; Parker 2015). Rodent seed caching behavior plays an important role in manzanita seed survival after fire with soil around buried seeds serving as an insulating layer to protect seeds from the effects of high temperatures during a fire thereby increasing the probability of seed survival (Moore and Vander Wall 2015; Peterson and Parker 2016).

After fruits drop to the ground, they are removed from the area by animals (either through predation or dispersal) or remain under the shrub with seeds incorporated into the soil seed bank. The amount of Morro manzanita seeds in the soil seed bank is ten times higher under the shrub canopy than away from the shrub canopy, suggesting that most Morro manzanita seeds do not disperse far from the parent plant (Tyler and Odion 2020). A 1998 study conducted by Tyler et al. found that a middle-aged stand of Morro manzanita (47 years) had significantly higher soil seed bank densities than both a younger stand (35 to 38 years) and an older stand (47+ years) but the soil seed bank densities within each stand was highly variable (Tyler et al. 1998; Tyler and Odion 2020). In addition to the number of seeds in the soil seed bank, viability of those seeds is also an important factor when evaluating the ability of a species to persist long-term. Overall, Morro manzanita seed viability is low, with an average of 4% of Morro manzanita seeds in the soil seed bank being viable (Tyler et al. 1998; Tyler and Odion 2020). Of the inviable Morro manzanita seeds, an average of 43% were infertile with no embryo development (Tyler et al. 1998; Tyler and Odion 2020). Seed viability may be low due to insect predation of individual seeds and, if this is the case, the amount of seeds predated on by insects likely varies among years depending on the amount of manzanita seeds produced (Dr. V. Thomas Parker, personal communication, March 13, 2026).

Manzanita species have developed different reproductive strategies to survive in chaparral ecosystems that experience high intensity fire. Some manzanita species survive fire through the presence of a basal burl which allows them to resprout asexually after fire, but Morro manzanita is lacking a basal burl (Parker 2007). Morro manzanita is considered an obligate seeder since it is generally killed by fire and depends on viable seed in the soil seed bank to persist in the landscape after fire (Wells 1969; Parker 2007; Tyler et al. 2023). If a fire return interval is too frequent, obligate seeding manzanitas may not reach sexual maturity or may not have time to produce a large enough soil seed bank to prevent population decline. Seeds of obligate seeder manzanita species are long-lived and can survive for decades in the soil (Jepson 1922). A specific mechanism is generally required for these seeds to break dormancy so that they can germinate (Keeley 1987a; Tyler and Odion 1996). Like other manzanita species, Morro manzanita seed germination is increased when stimulated by fire-related cues. Morro manzanita seeds achieve the highest germination when exposed to a combination of heat and chemical cues from charred wood, but experience reduced germination with exposure to heat alone or charred wood alone (Tyler et al. 1998; Tyler and Odion 2020). Manzanita seeds can be killed by fire if seeds are exposed to temperatures that are too high. The behavior of rodents caching seeds under the soil surface has been shown to increase manzanita seed survival during fire events by insulating the seeds from high temperatures (Moore and Vander Wall 2015; Peterson and Parker 2016). Morro manzanita seeds are able to germinate without these fire cues, but seedlings and young individuals are not as common in areas that have not recently burned (Tyler and Odion 1996; Tyler et al. 1998). Germinated Morro manzanita seeds may need fire to create suitable habitat conditions for seedling emergence and survival such as reduced leaf litter, increased light, and reduced competition (Keeley and Zedler 1978; Tyler et al. 1998). Even after fire, Morro manzanita seedling mortality is high. A 2002 study found that only 4% of Morro manzanita seedlings survived the first year after a prescribed burn and 21% of seedlings that germinated in the second year after a prescribed burn survived to the third year (Odion and Tyler 2002). In areas with *Eucalyptus* trees growing adjacent to Morro manzanita, mechanical removal of *Eucalyptus* trees and duff as part of habitat restoration projects was sufficient to allow Morro manzanita seeds to germinate and seedlings to emerge (Department observation).

Morro manzanita stands generally consist of even aged plants due to the species' reproductive strategy (Tyler and Odion 1996, 2020). When a fire burns through an area, all Morro manzanita plants are generally killed and the seeds in the soil seed bank germinate to produce a new stand of Morro manzanita plants that are all the same age. As of 2025, the youngest stand of Morro manzanita is 27 years old (the result of a small prescribed burn in 1998) and the oldest stand is estimated to be at least 88 years old based on historical aerial photos from 1937 (USDA 1937a; Tyler and Odion 1996; Tyler et al. 2023). However, the oldest stand may be much older than 88 years since wildfires

over 4 ha (10 ac) have not been documented in the range of Morro manzanita since this information began being collected in the late 1800s (Tyler and Odion 1996; Kofron and Tyler 2024; CAL FIRE 2025b). In the 1990s, some of the Morro manzanitas in older stands were observed to be dead, which may be an indication that some older shrubs are reaching the age when they naturally senesce (Tyler et al. 1998; Tyler and Odion 2020).

Recovery of Morro manzanita was examined after a 2.3 ha (5.7 ac) prescribed burn of a 40-year-old Morro manzanita stand at Montaña de Oro State Park in 1998 (Odion and Tyler 2002). Prior to the prescribed burn, the area had approximately 40% cover of Morro manzanita (Odion and Tyler 2002). Post-burn, mortality of seeds and young seedlings was high, and three years after the burn, the density of Morro manzanita seedlings was less than half the density of the plants before the fire (Odion and Tyler 2002). Based on the results of this prescribed burn, it was concluded that the 40-year-old Morro manzanita stand may not have had an adequate seed bank to replenish the population after fire, and the fire return interval was too frequent (Odion and Tyler 2002). However, the prescribed burn area was revisited in 2023 and Morro manzanita was observed to have high shrub cover, ranging from 30 to 100%, with most Morro manzanita shrubs flowering, fruiting, and contributing to the post-fire seed bank (Tyler and Kofron 2024). This suggested that the prescribed burn did not have a negative effect on the species within the 40-year-old stand, contrary to how it appeared the first few years after the prescribed burn.

4 Range and Distribution

This section considers the species' range and distribution and provides a detailed distribution map (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)). A species' range for the purposes of CESA and this status review is the species' California range (Cal. Forestry Assn. v. Cal. Fish and Game Com. (2007) 156 Cal.App.4th 1535, 1551). Range describes the general geographical area in which a species occurs. Distribution describes the actual sites where individuals and populations of the species occur within the species' range.

Morro manzanita is a localized endemic that is restricted to coastal areas around the towns of Baywood Park and Los Osos in the Morro Bay region of San Luis Obispo County, California (CNDDB 2025). Morro manzanita occurs within the Morro Bay, Los Osos Creek, and Islay Creek watersheds (USGS 2023). It is a lower elevation species that occurs below 300 m (980 ft) in elevation, with most populations below 122 m (400 ft) in elevation. The total range of Morro manzanita is approximately 30 km^2 (12 mi^2) with dense stands of Morro manzanita present in the center of the range that thin out to scattered plants at the edges of the range. Historically, Morro manzanita likely had a similar range to what it has now which coincided with the distribution of Baywood fine sand soil; however, not all Baywood fine sand soil contains Morro manzanita. While

Morro manzanita's current range is likely similar to its historical range, within that range, the amount of habitat that contains Morro manzanita has declined due to development of the towns of Baywood Park and Los Osos.

The distribution of Morro manzanita is based mainly on data documented in the California Natural Diversity Database (CNDDB). The CNDDB is an inventory of the status and locations of plants, animals, and natural communities that are of conservation concern in California. The CNDDB assigns occurrence numbers to represent specific locations where a species has been known to occur (CNDDB 2020). Populations, individuals, or colonies of the same species that are located within 0.40 km (0.25 mi) of each other generally constitute a single CNDDB occurrence (CNDDB 2020). CNDDB occurrence numbers are initially assigned in sequential order but can be merged over time as more information becomes available giving the appearance of skipped numbers. CNDDB occurrences include data on both extant and extirpated populations, so occurrences reflect both historical and current data. A distribution map showing CNDDB occurrences for Morro manzanita is included as Figure 2 (CNDDB 2025). Specific occurrence locations for Morro manzanita are available at the CNDDB; the figures in this status review show occurrences with larger buffers, and have reduced map detail, to adhere to the CNDDB license agreement and protect the species from harm (CNDDB 2018).

CNDDB last updated its information for Morro manzanita in July 2025 (CNDDB 2025). There are nine CNDDB occurrences of Morro manzanita with all occurrences presumed extant (see Appendix A). Morro manzanita is concentrated in and near the towns of Baywood Park and Los Osos in the Morro Bay region with outlying occurrences as far north as Park Ridge and as far south as Valencia Peak. The two CNDDB occurrences at the southern-most end of the range (occurrence #1 and #22) are historical locations with one occurrence based on a 1936 herbarium collection and the other occurrence based on an observation of just one plant in 1989 that was not rediscovered during 2023 surveys. The remaining CNDDB occurrences have had Morro manzanita plants observed recently in at least a portion of each occurrence.

The distribution of Morro manzanita may have been more extensive prior to Morro manzanita habitat being removed for the development of Baywood Park, Los Osos, and the Cabrillo Estates. Scattered Morro manzanita plants remain in private yards, vacant parcels, and roadsides in these areas (Mullany 1990). A detailed survey of Baywood Park, Los Osos, and the Cabrillo Estates would likely find additional scattered Morro manzanita plants in landscaping or undeveloped lots. Most of the current distribution of Morro manzanita is on protected lands owned by the State of California (California Department of Parks and Recreation (State Parks), the Department, and the California State Lands Commission), the County of San Luis Obispo, and the U.S. Department of the Interior's Bureau of Land Management (Table 2, Figure 3).

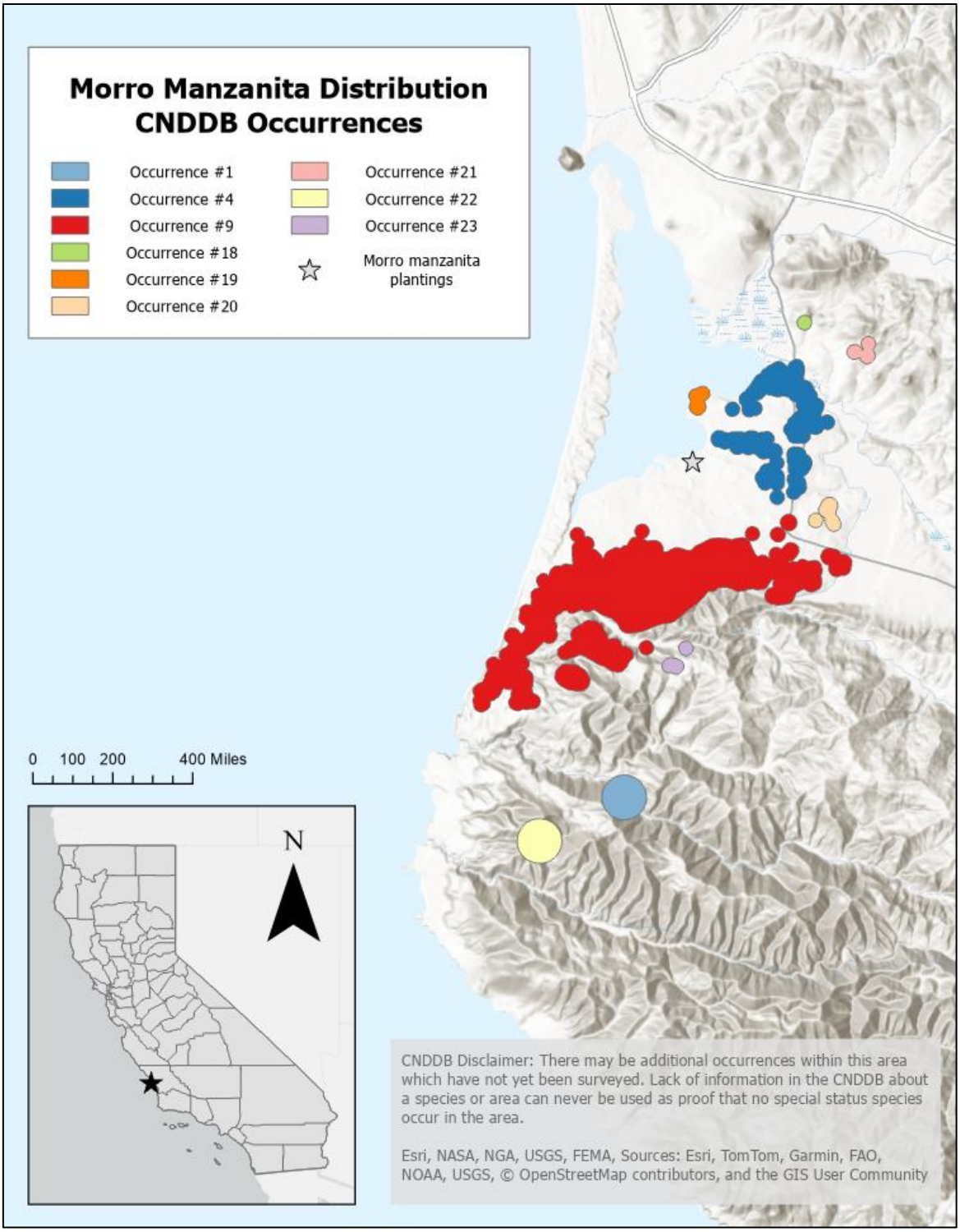

Figure 2. Morro manzanita distribution map (CNDDB 2025). Polygons represent CNDDB Morro manzanita occurrences as of July 2025; a buffer was added to the features to make them more visible on the map. The gray star represents planted Morro manzanita individuals at Sweet Springs Nature Preserve; these plantings are not represented in the CNDDB (CNDDB 2025; John Chesnut, personal communication, January 11, 2026).

Table 2. Area of occupied Morro manzanita by land ownership. Area estimates are based on updated survey data (post-1990) available to the Department.

Property	Ownership	Estimated Area of Occupied Morro Manzanita Habitat (Acres)	Percent of Total
Montaña de Oro State Park	State Parks	441	45%
Morro Bay State Park (including part of El Moro Elfin Forest Natural Area)	State Parks	33	3%
Los Osos State Natural Reserve	State Parks	10	1%
	State Parks (total)	**484**	**49%**
Morro Dunes Ecological Reserve	**California Department of Fish and Wildlife (total)**	**210**	**21%**
Part of El Moro Elfin Forest Natural Area	County of San Luis Obispo	17	2%
Broderson site	County of San Luis Obispo	18	2%
South Bay Bridge Right of Way	County of San Luis Obispo	1	<1%
	County of San Luis Obispo (total)	**36**	**4%**
Part of El Moro Elfin Forest Natural Area	**California State Lands Commission (total)**	**3**	**<1%**
Property north of Los Osos Middle School	**Bureau of Land Management (total)**	**2**	**<1%**
Sweet Springs Nature Preserve (planted Morro manzanita)	**Morro Coast Audubon Society (total)**	**<1**	**<1%**
Private property in vicinity of the Cabrillo Estates	Private	184	19%
Miscellaneous private property in Baywood Park/Los Osos	Private	54	6%
Conservation easements	Private	8	<1%

Property	Ownership	Estimated Area of Occupied Morro Manzanita Habitat (Acres)	Percent of Total
	Private (total)	**246**	**25%**
	Total	**982**	**100%**

Morro manzanita has been planted at the Sweet Springs Nature Preserve in Los Osos (Table 2, Figure 3). The Sweet Springs Nature Preserve is a 32-acre preserve owned and managed by the Morro Coast Audubon Society (MCAS undated). Morro manzanita plants were grown from seed collected near the Sweet Springs Nature Preserve and an unknown number were planted at the west end of the preserve in 1991 (John Chesnut, personal communication, January 11, 2026). Additional Morro manzanita individuals have been planted at the east end of the preserve in 2013/2014 (several plants), 2017 (four plants), and 2025 (eight plants) (John Chesnut, personal communication, January 11, 2026). These plantings are reportedly doing well, and it has been noted that plantings of Morro manzanita at Sweet Springs Nature Preserve are in soil that is typical for Morro manzanita elsewhere in its range (John Chesnut, personal communication, January 26, 2026). Morro manzanita individuals have also been reported in the immediate area surrounding Sweet Springs Nature Preserve with these individuals possibly representing relict Morro manzanita shrubs that survived the land being cleared of vegetation in the early 1900s (John Chesnut, personal communication, January 29, 2026). However, Marilyn Mullany searched throughout the range of Morro manzanita in 1989 in an effort to document the full distribution of the species and did not find any Morro manzanita individuals in the Cuesta-by-the-Sea area of Los Osos (which is near Sweet Springs Nature Preserve) (Mullany 1990). The Department has included the Morro manzanita plantings at Sweet Springs Nature Preserve in its assessment of the range and distribution of Morro manzanita in this status review since the individuals are close to populations of Morro manzanita that are known to be natural, and the plantings appear to be doing well (John Chesnut, personal communication, January 11, 2026). Further surveys and documentation are needed to confirm if relict Morro manzanita individuals are present in the area surrounding Sweet Springs Nature Preserve.

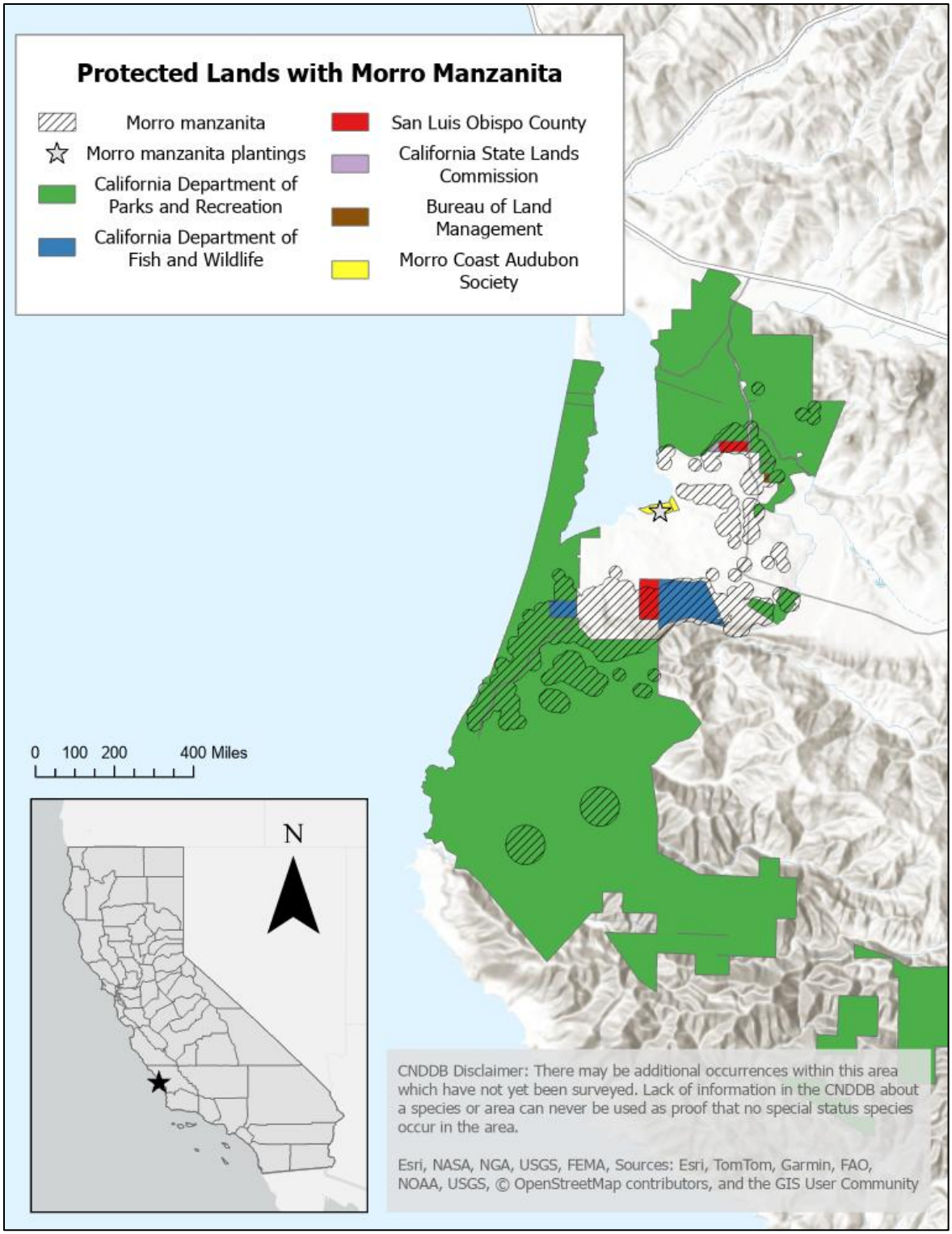

Figure 3. Map showing locations of Morro manzanita in relation to protected lands in the Morro Bay area of San Luis Obispo County. Morro manzanita locations based on data in the CNDDB (black hatched polygons) and information on Morro manzanita plantings at Sweet Springs Nature Reserve (gray star) (John Chesnut, personal communication, January 11, 2026).

5 Habitat

This section considers the best available scientific information regarding the kind of habitat necessary for the species survival (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)), and a preliminary identification of the habitat that may be essential to the continued existence of the species (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)(1)).

5.1 Geology and Soils

Morro manzanita is restricted to coastal areas in the Morro Bay region of San Luis Obispo County, California. Morro Bay is surrounded by Quaternary alluvial and sand dune deposits underlain by rock of the Franciscan complex, which consists of a mixture of sedimentary, igneous, and metamorphic rocks from the Cretaceous to Jurassic period (201 to 66 million years ago) (Hall et al. 1979; Wiegers 2021; Jodi McGraw Consulting 2022). Further inland from the Quaternary deposits are Tertiary deposits, primarily of the Pismo and Obispo formations, and exposed rock from the Franciscan complex. Morro manzanita mainly occurs on stabilized sand dune deposits of moderately consolidated windblown sand from the late to middle Pleistocene (2.6 million to 11,700 years ago) but can also occur on the Pismo Formation (Miguelito member; siltstone and claystone) from the early Pliocene (5.3 to 2.6 million years ago) to late Miocene (23 to 5.3 million years ago) at the south end of its range and on volcanic rocks from the Oligocene (34 to 23 million years ago) at the north end of its range (Hall et al. 1979; Wiegers 2021).

Morro manzanita usually grows on soil formed from old sand dune deposits called Baywood fine sand by the Natural Resource Conservation Service (Soil Conservation Service 1984; Mullany 1990; Wiegers 2021). Baywood fine sand soil is somewhat excessively drained with a soil profile that is fine sand throughout (Soil Conservation Service 1984; Soil Survey Staff 2024). The surface layer is about 91 cm (36 in) thick with very dark grayish-brown and dark brown fine sand (Soil Conservation Service 1984). The underlying material extends to a depth of 152 cm (60 in) or more and is composed of dark grayish brown and brown fine sand (Soil Conservation Service 1984). The surface layer is slightly acidic, becoming more acidic as depth increases (Soil Conservation Service 1984). Baywood fine sand soil is very permeable meaning the soil has a low water-holding capacity (Soil Conservation Service 1984). This soil can also include areas with small amounts of sandy loam, silt, and clay components (Mullany 1990; Soil Survey Staff 2024). Baywood fine sand soil covers approximately 2,219 ha (5,483 ac) in the Morro Bay region and is subdivided into three units based on percent slope: 2-9% slope (1,326 ha/3,276 ac), 9-15% slope (624 ha/1,542 ac), and 15-30% slope (269 ha/665 ac) (Soil Conservation Service 1984; McGuire and Morey 1992). On Baywood fine sand soil, Morro manzanita has the highest shrub cover on slopes of 9-

30%, with fewer plants and less cover on 2-9% slopes (McGuire and Morey 1992; Tyler and Odion 1996).

At the edges of its distribution, Morro manzanita is occasionally found in areas that transition from Baywood fine sand soil into other soil types, primarily loam soils including Santa Lucia channery clay loam, Salinas silty clay loam, Lopez very shaly clay loam, Concepcion loam, and rock outcrops near Los Osos loam (Soil Survey Staff 2024). While it can occur on other soils, most of Morro manzanita's historical and current distribution is on Baywood fine sand soil.

McGuire and Morey (1992) discuss observations from Dr. David Chipping and Dr. Donald Asquith that suggest moisture retention and soil nutrient levels of the Baywood fine sand soil may influence the distribution and density of Morro manzanita. Dr. Chipping observed that areas with high concentrations of Morro manzanita appear to have a hard, nutrient-poor soil horizon just below the loose sand. This nutrient-poor soil may allow Morro manzanita to outcompete surrounding plants that are less-suited to the soil. Areas with lower density of Morro manzanita do not appear to have this nutrient-poor soil horizon. Dr. Asquith also observed that areas with high density of Morro manzanita may hold moisture for longer periods. A dense stand of Morro manzanita surveyed by Dr. Asquith was found to have non-marine sedimentary deposits at shallow soil depths that tend to hold moisture longer than areas without the deposits.

5.2 Climate

Morro manzanita grows in a coastal Mediterranean climate characterized by warm, dry summers, and cool, moist winters (Soil Conservation Service 1984). Precipitation in the form of rain is concentrated in the winter months while summer drought is tempered by fog, the marine layer (low clouds that form over the ocean), and sea breezes (Wells 1962; Vasey et al. 2014). Both fog and the marine layer allow the climate immediately adjacent to the coast to stay relatively cool and moist in the summer which increases water availability for plants (Vasey et al. 2014).

The Parameter-elevation Regressions on Independent Slopes Model (PRISM) provides a localized estimate of climate using point measurements of climate data, a digital elevation model, and other spatial datasets to generate 4 km cell gridded estimates of climatic variables (primarily precipitation and temperature) (Daly et al. 1994; Daly et al. 2008). According to PRISM output from 1991 through 2020 across Morro manzanita's range, daily maximum temperature averaged over all days in each month was 18.7°C (65.6°F) and was warmest in September (Prism Climate Group 2024). Daily minimum temperature averaged over all days in each month was 9.1°C (48.3°F) and was coldest in December (Prism Climate Group 2024). Precipitation across Morro manzanita's range falls as rain and averages 46.5 cm (18.3 in) per year with most rain falling in January

and February (Prism Climate Group 2024). Precipitation can be highly variable in the Morro Bay area with some drought years receiving as little as 8.4 cm (3.3 in) of rain while other years receive as much as 108.7 cm (42.8 in) (Prism Climate Group 2024).

5.3 Vegetation

Vegetation describes the assemblage and arrangement of plants in an area (CNPS 2024). Vegetation is often considered the single best surrogate for habitat and ecosystems (CSUN and CDFW 2014). Vegetation can be classified into types based on species composition, percent cover of species, structure (e.g., tree height), and/or environmental information (e.g., slope, aspect, and soil texture) (CSUN and CDFW 2014). Vegetation types are a useful classification unit for assessing and monitoring habitat conditions, habitat changes, and management strategies (CSUN and CDFW 2014). The Department's Vegetation Classification and Mapping Program (VegCAMP) is completing a statewide vegetation classification and map that includes San Luis Obispo County; however, this information is not finalized. In the absence of a vegetation classification and map, this section describes the general vegetation types that Morro manzanita is known to occupy and common associates within those vegetation types.

5.3.1 Maritime Chaparral

Morro manzanita is a component of maritime chaparral in the Los Osos area. Californian maritime chaparral refers to dense communities of evergreen, drought-tolerant shrubs along the coast, with this type of vegetation generally characterized by a combination of locally endemic species of manzanita (*Arctostaphylos* spp.) and California lilac (*Ceanothus* spp.) (Barbour and Major 1988; NatureServe 2025). Californian maritime chaparral is considered by NatureServe to have a conservation status rank of G2, indicating it is imperiled globally (NatureServe 2025).

The most common associates of Morro manzanita in maritime chaparral include chamise (*Adenostoma fasciculatum*), wedgeleaf ceanothus (*Ceanothus cuneatus*), California goldenbush (*Ericamerica ericoides*), orange bush monkeyflower (*Diplacus aurantiacus*), and deerweed (*Acmispon glaber*) (Tyler and Odion 1996). Other common associates include brittle leaf manzanita, toyon (*Heteromeles arbutifolia*), California coffee berry (*Frangula californica*), gooseberries (*Ribes* spp.), black sage (*Salvia mellifera*), poison oak (*Toxicodendron diversilobum*), and coast live oak (*Quercus agrifolia*) (Mullany 1990). In the understory of dense stands of Morro manzanita, there are few associated species, with small specimens of California man-root (*Marah fabacea*) and orange bush monkeyflower sometimes present (Tyler and Odion 1996).

Maritime chaparral vegetation can be further described and classified based on species composition and habitat. Holland's 1986 "Preliminary Descriptions of the Terrestrial Natural Communities of California" is an older vegetation classification system that

assigns California's vegetation into natural communities (Holland 1986). Using this classification, Morro manzanita is predominately part of the central maritime chaparral natural community. As described by Holland (1986), central maritime chaparral contains drought-tolerant shrubs of moderate to high cover dominated by forms of woollyleaf manzanita (*Arctostaphylos tomentosa*) plus one or more other narrowly distributed manzanitas. It also contains well-drained, sandy substrates and is within the zone of summer coastal fog incursion (Holland 1986).

In 2009, the second edition of *A Manual of California Vegetation* was published and is currently updated online (Sawyer et al. 2009; CNPS 2024b). This classification system separated Holland's central maritime chaparral natural community into several alliances (vegetation classification categories) based mainly on the dominant or characteristic species of manzanita present in the stand (Sawyer et al. 2009). One of those alliances is the *Arctostaphylos morroensis* Shrubland Alliance (Morro manzanita chaparral) which is characterized by more than 30% relative cover of Morro manzanita in the shrub canopy. This alliance is also characterized by the presence of chamise, brittleleaf manzanita, California sagebrush (*Artemisia californica*), coyote brush (*Baccharis pilularis*), wedgeleaf ceanothus, orange bush monkeyflower, California goldenbush, Indian Knob mountainbalm (*Eriodictyon altissimum*), California coffee berry, hollyleaf cherry (*Prunus ilicifolia*), and black sage (CNPS 2024b). While currently the *Arctostaphylos morroensis* Shrubland Alliance is treated at the alliance level, it is anticipated to be moved to an association within the *Arctostaphylos* (*crustacea*, *tomentosa*) Alliance in the future (VegCAMP, personal communication, December 17, 2025).

Other publications specific to Morro manzanita have provided more detailed descriptions of the maritime chaparral habitat that Morro manzanita occupies. Tyler and Odion (1996) described much of the vegetation in the area of Morro manzanita as Morro Bay maritime chaparral, which is an assemblage of maritime chaparral shrubs, subshrubs, and herbs with considerable bare ground. The dominant and indicator species of Morro Bay maritime chaparral include Morro manzanita, California goldenbush, chamise, wedgeleaf ceanothus, orange bush monkeyflower, and deerweed (Tyler and Odion 1996). Within Morro Bay maritime chaparral, Morro manzanita can occur in different stands including: 1) patches of pure Morro manzanita with few associated species, 2) patches of coast live oak with California man-root, fuchsia-flowered gooseberry (*Ribes speciosum*), and poison oak in the understory, and 3) patches of dead Morro manzanita (Tyler and Odion 1996; Tyler and Kofron 2024).

In 2022, the Los Osos HCP was prepared for the County of San Luis Obispo and described general vegetation and land cover associated with Morro manzanita within the plan area (Jodi McGraw Consulting 2022). This report noted Morro manzanita as occurring in three types of central maritime chaparral: Morro manzanita, Morro

manzanita-wedgeleaf ceanothus, and Morro manzanita-California sagebrush. The Morro manzanita community has dense cover of Morro manzanita with coast live oak, wedgeleaf ceanothus, orange bush monkeyflower, and black sage. The Morro manzanita-wedgeleaf ceanothus community contains Morro manzanita and wedgeleaf ceanothus as co-dominant species with California sagebrush, black sage, and orange bush monkeyflower potentially present as well. The Morro manzanita-California sagebrush community contains Morro manzanita and California sagebrush as co-dominant with other possible associates being California buckwheat (*Eriogonum fasciculatum*), deerweed, wedgeleaf ceanothus, orange bush monkeyflower, and black sage.

5.3.2 Coastal Scrub

Morro manzanita is also regularly part of the central dune scrub natural community, which is a dense coastal scrub community of scattered shrubs, subshrubs, and herbs (Holland 1986). Common associates of Morro manzanita in coastal scrub include California sagebrush, black sage, coyote brush, dune bush lupine (*Lupinus chamissonis*), and coastal bush lupine (*Lupinus arboreus*) (Tyler and Kofron 2024). Other coastal scrub species found near Morro manzanita include Eastwood's spineflower (*Chorizanthe eastwoodiae*), California aster (*Corethrogyne filaginifolia*), peak rush-rose (*Crocanthemum scoparium*), California croton (*Croton californicus*), lance-leaf liveforever (*Dudleya lanceolata*), perennial woolly-star (*Eriastrum densifolium*), California goldenbush, seacliff wild buckwheat (*Eriogonum parvifolium*), golden-yarrow (*Eriophyllum confertiflorum*), wedgeleaf horkelia (*Horkelia cuneata*), San Luis Obispo monardella (*Monardella undulata* var. *undulata*), dune food (*Pholisma* sp.), sand almond (*Prunus fasciculata* var. *punctata*), cardinal catchfly (*Silene laciniata*), and rod wirelettuce (*Stephanomeria virgata*) (Mullany 1990; Tyler and Odion 1996; Gowen and Johnson 2020). Exotic grass (e.g., perennial veldt grass (*Ehrharta calycina*)) and iceplant (*Carpobrotus* spp. and *Conicosia pugioniformis*) invasion are common in coastal scrub (Tyler and Odion 1996). Tyler and Odion (1996) also mention that when maritime chaparral has been disturbed, a coastal scrub assemblage of species becomes evident with reduced Morro manzanita cover and dominance of coastal scrub species (Tyler and Kofron 2024).

5.3.3 Other Vegetation

Morro manzanita occurs as a large component of the *Arctostaphylos morroensis* Shrubland Alliance (Morro manzanita chaparral) but the species can also occur as a smaller component in other vegetation alliances, possibly including *Salvia mellifera*-(*Artemisia californica*) Shrubland Alliance (black sage-California sagebrush scrub), *Artemisia californica*-(*Salvia leucophylla*) Shrubland Alliance (California sagebrush-(purple sage) scrub), *Lupinus chamissonis-Ericameria ericoides* Shrubland Alliance

(silver dune lupine-mock heather scrub), *Baccharis pilularis* Shrubland Alliance (coyote brush scrub), *Quercus agrifolia* Forest and Woodland Alliance (coast live oak woodland and forest), and *Eucalyptus* (*globulus*, *camaldulensis*) Semi-Natural Woodland Stands (Mullany 1990; GIC 2024). In the future, the Department's vegetation classification and map that is currently in development may further clarify the alliances that contain Morro manzanita.

While not a typical environment for Morro manzanita, the species has been documented on the periphery of a northern coastal salt marsh natural community (Holland 1986; Mullany 1990). In addition, Mullany (1990) noted that Morro manzanita is frequently associated with transitional zones between natural community types.

6 Abundance and Population Trend

This section considers the species' abundance and population trends (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

There are nine occurrences of Morro manzanita in the CNDDB. Morro manzanita occurs as scattered individuals, small groupings, or pure stands within these occurrences. Three approaches to estimating abundance of Morro manzanita are considered in this status review: 1) area of occupied Morro manzanita habitat, regardless of Morro manzanita density, 2) area of Morro manzanita within occupied habitat, and 3) the number of Morro manzanita plants. All three approaches for estimating abundance are imprecise due to lack of range-wide, detailed survey data. Morro manzanita abundance and population trend are further discussed below.

6.1 Area of Occupied Habitat

One method for estimating abundance of Morro manzanita is to look at the area occupied by the species. This includes areas with a few scattered Morro manzanita individuals as well as areas with 100% cover of Morro manzanita. McGuire and Morey (1992) estimated Morro manzanita to have historically occupied between 786 and 1,100 ha (1,942 and 2,719 ac) prior to development of the area. Based on the distribution of Baywood fine sand soil and the extent of the known distribution of Morro manzanita, recent estimates by Department staff suggest Morro manzanita could have historically occupied as much as 1,416 ha (3,500 ac).

LSA Associates Inc. (1992) and McGuire and Morey (1992) estimated the area of occupied habitat for Morro manzanita in the early 1990s to be between 340 and 361 ha (840 and 891 ac) (Table 3). These estimates were primarily based on calculations derived from hand-drawn maps of occupied Morro manzanita habitat in Marilyn Mullany's 1990 Master's thesis (Mullany 1990). In 2025, Department staff used geographic information systems (GIS) to digitize maps from Mullany (1990) and

McGuire and Morey (1992) to provide more accurate estimates. Using GIS, Department staff estimated the area of habitat occupied by Morro manzanita in the early 1990s to be 372 ha (918 ac) (Table 3).

Table 3. Estimated area of occupied Morro manzanita habitat by cover classes (<1%, 1-5%, 5-25%, 25-50%, 50-75%, 75-100%). Sources: LSA Associates Inc. 1992, McGuire and Morey 1992, the Department.

	<1%	1-5%	5-25%	25-50%	50-75%	75-100%	**Total area (acres)**
LSA Associates, Inc. (1992)*	N/A	84	281	25	182	319	**891**
McGuire and Morey (1992)	112	242	93	33	97	227	**840** (includes 36 ac of unknown cover)
CDFW based on Mullany (1990) and McGuire and Morey (1992)	148	262	100	35	95	242	**918** (includes 36 ac of unknown cover)
CDFW based on newer sources**	N/A	N/A	N/A	N/A	N/A	N/A	**982**

*LSA Associates, Inc. (1992) adjusted the density category for some mapped polygons from Mullany (1990) which explains some of the acreage differences in this table.
**Newer sources do not provide percent cover estimates for Morro manzanita.

In 2025, Department staff calculated an updated estimate of the area occupied by Morro manzanita using data that, while not comprehensive, is more recent than Mullany (1990) and McGuire and Morey (1992). This estimate is imprecise since it is not based on a comprehensive Morro manzanita survey but instead is based on data currently available to the Department on: 1) areas with vegetation identified as Morro manzanita, Morro manzanita-California sagebrush, Morro manzanita-wedgeleaf ceanothus, 2) areas of Morro manzanita chaparral and mixed manzanita chaparral in Montaña de Oro State Park, and 3) opportunistic observations of Morro manzanita scattered across the range of the species. These data included locations of Morro manzanita at the El Moro Elfin Forest Natural Area as documented in 2003 and 2019 reports, a vegetation map in the 2022 Los Osos HCP, 2024 vegetation map data for Montaña de Oro State Park, 2024 map data from the South Bay Boulevard Bridge Project, point data from a 2024 report

on the ecology and conservation status of Morro manzanita, 2009 through July 2025 iNaturalist observations, and 2025 field survey observations from the Department, County of San Luis Obispo, and State Parks (Morro Group 2003; Terra Verde Environmental Consulting 2019; Jodi McGraw Consulting 2022; County of San Luis Obispo 2024b; GIC 2024; Tyler and Kofron 2024; iNaturalist 2025). Using this information, Department staff calculated a rough area estimate of 397 ha (982 ac) of occupied Morro manzanita habitat remaining in 2025 (Table 3). The increased area estimate in 2025 relative to estimates from the early 1990s is due to the availability of more comprehensive and precise data and use of modern GIS mapping tools and does not mean that occupied Morro manzanita habitat has increased between the 1990s and 2025.

Estimates of the amount of occupied Morro manzanita habitat are imprecise due to a lack of recent, range-wide data, but they are nevertheless useful as a rough gauge of Morro manzanita abundance prior to development relative to Morro manzanita abundance today. Despite differing estimates of area occupied by Morro manzanita, available data suggest that the area occupied by Morro manzanita has decreased in the period following development of the Baywood Park-Los Osos area by between 50 and 76%.

6.2 Area of Morro Manzanita within Occupied Habitat

While the current area of occupied Morro manzanita habitat is estimated to be between 340 and 397 ha (840 and 982 ac), the area within this habitat that is actually covered by Morro manzanita is estimated to be much smaller (Table 3 and Table 4). The percent cover of Morro manzanita within occupied habitat varies across its range, which means that some of the habitat acreage represents areas with sparse Morro manzanita plants and other areas contain dense stands. Over 40% of the area mapped by Mullany (1990) as occupied Morro manzanita habitat has sparse cover of the species (5% or less cover of Morro manzanita) indicating that a large amount of the 340 to 397 ha (840 to 982 ac) of occupied habitat consists of scattered Morro manzanita plants.

The area of ground covered by Morro manzanita in the early 1990s within occupied habitat was estimated by Tyler and Odion (1996) using cover classes. Tyler and Odion (1996) found that Morro manzanita covered a maximum of 143 ha (353 ac) within the 340 ha (840 ac) of occupied habitat estimated by McGuire and Morey (1992). Department staff used the same methodology as Tyler and Odion (1996), but with refined area estimates, and found that Morro manzanita covered approximately 150 ha (370 ac) within the 372 ha (918 ac) of occupied habitat in the early 1990s. While Department staff estimated the area of remaining occupied Morro manzanita habitat in 2025 (see “Area of Occupied Habitat” section), cover class information was not available

for that data, so more recent estimates of the area covered by Morro manzanita were not made.

Table 4. Estimated area of Morro manzanita within occupied habitat, calculated using cover classes as a multiplier (occupied habitat in Table 3 multiplied by maximum cover class within each range). Cover class multipliers: 0.01, 0.05, 0.25, 0.5, 0.75, and 1. Sources: LSA Associates Inc. 1992, McGuire and Morey 1992, Tyler and Odion 1996, the Department.

	<1%	1-5%	5-25%	25-50%	50-75%	75-100%	**Total area (acres)**
Tyler and Odion (1996) based on Mullany (1990) and McGuire and Morey (1992)	1	12	23	17	73	227	**353**
CDFW based on Mullany (1990) and McGuire and Morey (1992)	1	13	25	18	71	242	**370**

6.3 Number of Plants

Estimating the number of Morro manzanita plants is challenging due to the species occurring in dense and often impenetrable stands in portions of its range and its sometimes sprawling growth habit making it difficult to determine where one individual ends and the next begins (McGuire and Morey 1992). When Morro manzanita was proposed for CESA listing in 1991, the petitioner estimated there were not more than 2,000 plants based on personal observations of the extant populations (McLeod 1991). The number of Morro manzanita plants was estimated in 1992 based on: 1) area occupied by Morro manzanita, 2) percent cover of Morro manzanita within occupied area, and 3) average shrub diameter (9 square meters/100 square feet to 16 square meters/177 square feet) (LSA Associates 1992). Using this more thorough method for estimating plant numbers, the number of Morro manzanita plants in the early 1990s was estimated to be between 76,500 and 153,100 depending on the estimate of average shrub diameter used (LSA Associates 1992; McGuire and Morey 1992). Using the same shrub diameters from 1992, but refined acreage estimates, Department staff estimate there were between 53,700 and 107,500 plants in the early 1990s. These estimates of Morro manzanita abundance are imprecise because they are extrapolated from imprecise estimates of occupied area, plant cover, and shrub diameter.

6.4 Population Trend

Population monitoring has not been conducted for Morro manzanita, but it can be inferred that the species has experienced a declining population trend since European colonization and settlement based on habitat loss and known extirpations of Morro manzanita throughout portions of its range. The main causes of Morro manzanita extirpations have been residential development and planting of *Eucalyptus*.

While it is difficult to ascertain the full distribution of Morro manzanita prior to development, it is clear that Morro manzanita has been negatively impacted by development of the towns of Baywood Park and Los Osos in coastal San Luis Obispo County. Development began in the Baywood Park-Los Osos area in the late 19th century with just a few buildings and residents (Tornatzky 2016; John F. Rickenbach Consulting 2020). Large developers came to the area in the 1920s and the towns of Baywood Park and Los Osos began to fully form with the population steadily increasing from just a few people in 1919 to about 600 people by 1950, 1,500 by 1958, 3,500 by 1970, 11,000 by 1980, and over 14,000 by 1990 (Roest 1982; San Luis Obispo Council of Governments 2004; Tornatzky 2016). A moratorium on wastewater discharge was implemented in the Baywood Park-Los Osos area in 1988, which slowed, but did not stop, modification and destruction of Morro manzanita habitat from development (John F. Rickenbach Consulting 2020). Some development outside of the moratorium zone and within areas occupied by Morro manzanita was allowed during this time and likely resulted in negative impacts to the species (David Keil, personal communication, March 12, 2026).

The Baywood Park-Los Osos area is mostly on Baywood fine sand soil with 2 to 9% slopes and, prior to development, consisted of coastal sage scrub, maritime chaparral, and oak woodland (Mullany 1990; John F. Rickenbach Consulting 2020; Soil Survey Staff 2024). Development of these towns resulted in removal of most native vegetation for residences, businesses, and roads (Figure 4). An estimated 50 to 76% of Morro manzanita's occupied habitat was likely lost to development based on area estimates from LSA Associates, Inc. (1992), McGuire and Morey (1992), and Department staff. In 2014, the USFWS estimated that about 75% of Morro manzanita's historical habitat was lost to development (USFWS 2013).

The impact of development on Morro manzanita varies depending on the density of Morro manzanita plants within developed habitat. The densest areas of Morro manzanita are on Baywood fine sand soil with steeper slopes of 9 to 30% (Tyler and Odion 1996). Since the towns of Baywood Park and Los Osos are on Baywood fine sand soil that primarily have gentler slopes (2 to 9%), it is likely that the area had low cover of Morro manzanita (Tyler and Odion 1996). Nevertheless, a large area of presumably occupied Morro manzanita habitat (over 405 ha/1,000 ac) was removed or highly disturbed by development of the Baywood Park-Los Osos area (Figure 4).

Figure 4. Aerial imagery from the vicinity of Baywood Park, San Luis Obispo County. Prior to development of Baywood Park, Morro manzanita was likely scattered throughout this area. Top image is from 1937 (USDA 1937a). Bottom image is from 2024 (ESRI 2024).

At the southwest end of the town of Los Osos, just north of Montaña de Oro State Park, is an area of Baywood fine sand soil with 15 to 30% slopes that has a nearly monospecific stand of Morro manzanita. Part of this area with high density of Morro manzanita, called the Cabrillo Estates, was developed beginning in the mid-1960s (Figure 5) (USDA 1937b; Morro Group 1985; Mullany 1990). While the Cabrillo Estates is not as large of an area as the towns of Baywood Park and Los Osos, it accounts for the extirpation of approximately 28 ha (70 ac) of occupied Morro manzanita habitat, with at least half of that area once containing high density Morro manzanita.

While the majority of past impacts to Morro manzanita were the result of land clearing for residential development, Morro manzanita has also been impacted by military activities. The Baywood Park Training Area was approximately 3,561 ha (8,800 ac) in size and mainly encompassed the area that is now the north end of Montaña de Oro State Park and the Pecho Unit of the Morro Dunes Ecological Reserve; areas known to contain Morro manzanita (California Coastal Commission 1995; U.S. Army Corps of Engineers 2017). From 1943 to 1946, the Baywood Park Training Area was used for a variety of military training exercises, including a maneuver area for troops, vehicles, and equipment and as an ordnance range and impact area (U.S. Army Corps of Engineers 2017). Following World War II, the Baywood Park Training Area was reportedly left "largely a waste land, littered with still-live ordnance" and in subsequent years, the area was further disturbed by efforts to remove the ordnance for public safety (U.S. Army Corps of Engineers 2017; Estero Bay News 2026). While the extent of the damage from these military training exercises to Morro manzanita is unknown, it is likely that some damage to Morro manzanita habitat occurred from these activities.

In addition, Morro manzanita plants have been removed at the southern end of the range when extensive *Eucalyptus* stands were planted in the late 1800s and early 1900s (Mullany 1990). When Morro manzanita and *Eucalyptus* are present in the same area, Morro manzanita generally stops growing right at the edge of *Eucalyptus* stands, which is a strong indicator that Morro manzanita plants were removed from the site when the *Eucalyptus* were initially planted and may have experienced further declines as the *Eucalyptus* stands expanded (Figure 6) (Mullany 1990). A 2024 vegetation map for Montaña de Oro State Park estimated a total of 83 ha (206 ac) of *Eucalyptus* stands currently within the park (GIC 2024). Of the 83 ha (206 ac) of *Eucalyptus*, an estimated 69 ha (170 ac) are immediately adjacent to occupied Morro manzanita habitat indicating that *Eucalyptus* may have caused the extirpation of up to 69 ha (170 ac) of historically occupied Morro manzanita habitat (GIC 2024). In addition, more than 10 ha (25 ac) of *Eucalyptus* are present within occupied Morro manzanita habitat on private land south of the Cabrillo Estates and in the Pecho unit of the Morro Dunes Ecological Reserve, representing additional areas where Morro manzanita abundance has been reduced due to *Eucalyptus*.

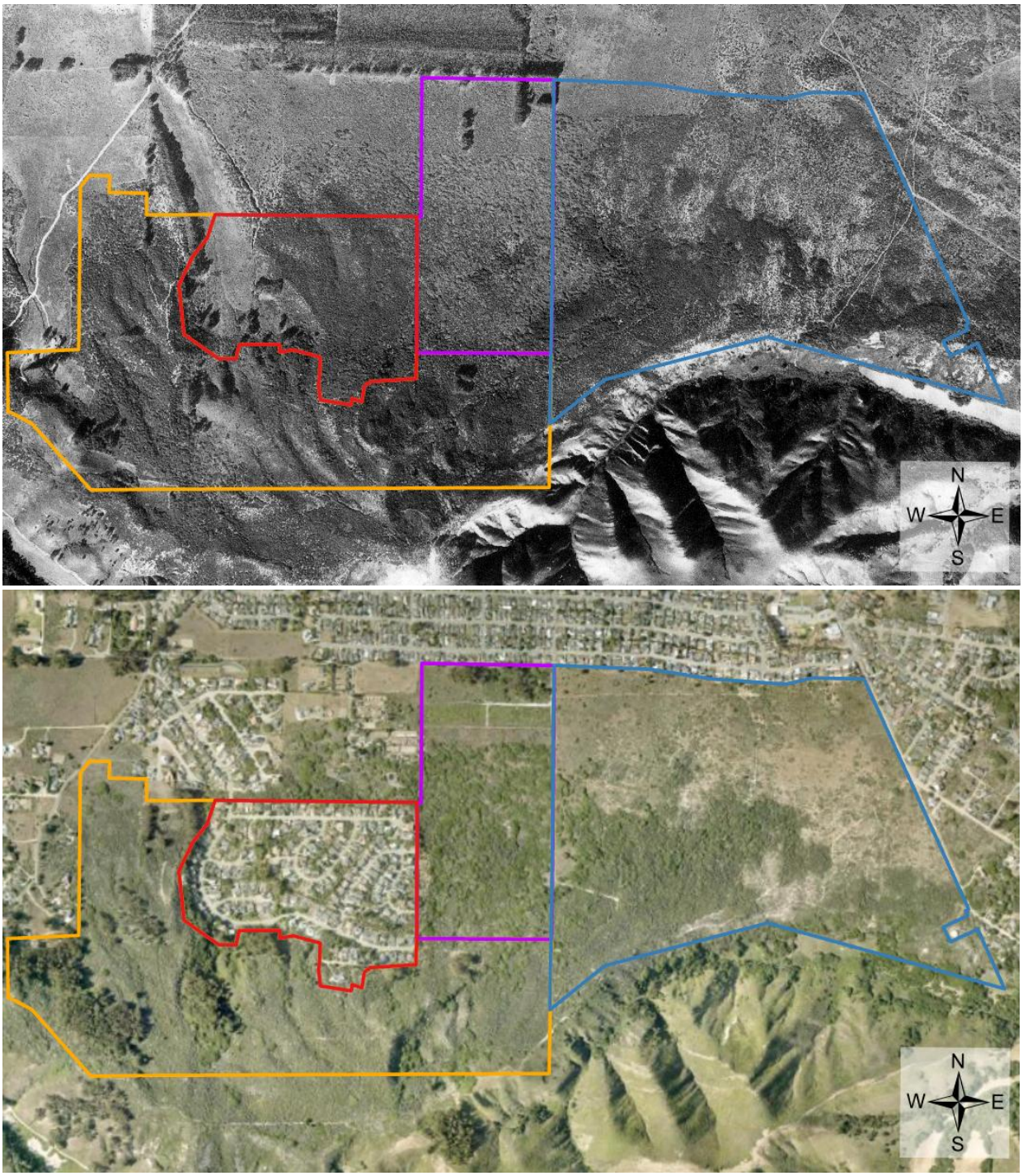

Figure 5. Aerial imagery from the south end of Los Osos in the vicinity of a high cover stand of Morro manzanita showing land ownership and development. The area outlined in blue is part of the Morro Dunes Ecological Reserve; the area outlined in purple is owned by the County of San Luis Obispo; the area outlined in red is part of the Cabrillo Estates development; and the area outlined in orange is undeveloped private land. To the south of the orange polygon is Montaña de Oro State Park property. Top image is from 1937 and bottom image is from 2024 (USDA 1937b; ESRI 2024).

Figure 6. Photographs from along the Hazard Reef Trail (left photo) and the East Rim Trail (right photo) in Montaña de Oro State Park showing Morro manzanita growing right up to the edge of Eucalyptus *stands. No Morro manzanita plants were observed growing under the* Eucalyptus *canopy in these areas. Photo credit: Kristi Lazar (2025).*

All of these impacts across the range of Morro manzanita have contributed to a Morro manzanita population that is currently much smaller than it was prior to the development of the Baywood Park-Los Osos area, prior to impacts from military training exercises, and prior to the planting of *Eucalyptus* stands. For these reasons, Department staff have determined that Morro manzanita has experienced a declining population trend since European colonization and settlement. The Morro manzanita population has likely been somewhat stable since 1988 when a moratorium on wastewater discharge was enacted which slowed modification and destruction of Morro manzanita habitat in the Baywood Park-Los Osos area (further discussed in the "Present or Threatened Modification or Destruction of Habitat" section of this status review). It is unlikely that Morro manzanita will naturally experience a significant increase in abundance in the future since much of the area it previously occupied has been developed and is no longer habitat; however, some increases in the Morro manzanita population can occur with *Eucalyptus* removal and habitat restoration on protected lands. In addition, Morro manzanita usually grows on Baywood fine sand soils, which are limited in extent, thereby reducing the ability of the species to expand its range.

7 Threats

This section considers the factors affecting the ability of the species to survive and reproduce, and the degree and immediacy of threat (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)). In addition, this section addresses the six listing

factors identified in title 14 of the California Code of Regulations section 670.1, subdivision (i)(1)(A): present or threatened modification or destruction of habitat, overexploitation, predation, competition, disease, or other natural occurrences or human-related activities. This section reviews the best scientific information available, and assesses the degree of threat, for each factor. The sixth listing factor, "other natural occurrences or human-related activities," is addressed under the following subsections: vulnerability of geographically restricted species, altered fire regime and fuel reduction activities, climate change, and recreation.

7.1 Present or Threatened Modification or Destruction of Habitat

Modification or destruction of habitat is a significant threat to populations of Morro manzanita, particularly on private property. Habitat modification and destruction is caused by a variety of human activities including cultivation of land for agriculture; development of land for residential, commercial, or industrial use; development of utilities, roads, and other infrastructure; resource harvest and extraction; use of land for livestock; and recreational use of land. These activities often involve removing native vegetation, disturbing soil and the biological communities therein, and installing structures, impermeable surfaces, and other features that render areas incapable of supporting native species assemblages. Even if human activities do not result in the complete elimination of habitat in an area, the indirect effects from such activities can cause substantial changes to the environment, which can affect the abundance of native species. Indirect effects from development and other human activities include soil disturbance and compaction; introduction and spread of exotic and/or invasive species and pathogens; increased dust, pollution, runoff, and trash; artificial noise, light, and vibration; and use of herbicides, pesticides, and other chemicals. Destruction of even small amounts of functioning habitat represents a significant loss of ecological function when considered over very long timescales, and restoration of habitat to pre-disturbance levels is costly and not always possible.

Historical modification and destruction of Morro manzanita habitat from development have already resulted in the loss of a significant amount of occupied Morro manzanita habitat, with an estimated 50 to 76% of occupied habitat already lost, as discussed in the "Population Trend" section of this status review. A moratorium on wastewater discharge was implemented in the Baywood Park-Los Osos area in 1988, which slowed, but did not stop, modification and destruction of Morro manzanita habitat from development (John F. Rickenbach Consulting 2020). This wastewater discharge moratorium was enacted to prevent additional groundwater contamination from individual septic systems and resulted in most new development within Baywood Park and Los Osos being halted until community wastewater treatment services could be provided

(Tornatzky 2016; John F. Rickenbach Consulting 2020). The Los Osos Wastewater Treatment Plant was completed in 2016 and existing development was subsequently connected to the new wastewater system (Jodi McGraw Consulting 2022). In June 2024, the California Coastal Commission approved an amendment to the San Luis Obispo County Local Coastal Program that would allow development to resume in the Los Osos area (Kahn et al. 2024). Impacts to Morro manzanita habitat from development are anticipated to occur in the future as new development resumes in the area.

Department staff estimate that about 25% of the remaining occupied Morro manzanita habitat is on private property that may be subject to negative direct or indirect impacts from future development. Most of the private property that contains Morro manzanita is on land categorized as single family residential and is located outside of the Los Osos urban service line (Jodi McGraw Consulting 2022). A total of 39 undeveloped private parcels covering over 121 ha (300 ac) are outside of the Los Osos urban service line and eligible for single-family development (Jodi McGraw Consulting 2022). Scattered Morro manzanita plants also occur within the Los Osos urban service line with 534 undeveloped parcels covering 77 ha (191 ac) eligible for single-family development (Jodi McGraw Consulting 2022). It is unknown how many of these parcels will be developed in the future.

Department staff estimate about 40% of the remaining occupied Morro manzanita habitat is high density (50-100% cover of Morro manzanita). Of the remaining high-density Morro manzanita habitat, about 61% is on protected land owned mainly by State Parks, County of San Luis Obispo, and the Department, with the remaining 39% on private property that could be developed. The largest and densest stand of Morro manzanita remaining is in the area between Los Osos and Hazard Canyon and covers approximately 132 ha (326 ac) total, with 71 ha (175 ac) on protected land and 61 ha (151 ac) on private property (Figure 5). This area is important for conservation of the species as it represents one of only two known areas where Morro manzanita forms a large, nearly continuous, monospecific stand (Holland and Hazebrook 1993; USFWS 2013). This stand was once larger before residential development impacted about 28 ha (70 ac) of occupied Morro manzanita habitat with the construction of the Cabrillo Estates development beginning in the mid-1960s (Morro Group 1985; Mullany 1990). Immediately south of the Cabrillo Estates, residential development was proposed on 50 ha (124 ac) of high-density Morro manzanita habitat in the 1970s through 1990s (California Coastal Commission 2000a, b). Development in this area was approved by the San Luis Obispo County Board of Supervisors in 1998 but was denied by the California Coastal Commission in 2000 (California Coastal Commission 2000a). The proposed development would have removed or disturbed up to 20 ha (50 ac) of habitat for development of residential lots, roads, drainage basins, and recreation facilities with 17 ha (43 ac) of that 20 ha (50 ac) consisting of high-density Morro manzanita habitat

(The Morro Group 1996). The remaining 30 ha (74 ac) was to be left as permanent open space (Holland and Hazebrook 1993; The Morro Group 1996). In 2000, the California Coastal Commission staff noted that the proposed project would have removed and degraded stands of rare native vegetation that are critically important to the survival and recovery of Morro manzanita (California Coastal Commission 2000b). As of 2025, this area has not been developed, but this area of high-density Morro manzanita habitat is still potentially vulnerable to direct and indirect impacts from future residential development. See the "Existing Management" section of this status review for information on how development will be managed as part of the Los Osos HCP.

Morro manzanita also experiences direct impacts as a result of road construction and maintenance. The County of San Luis Obispo has proposed replacing the South Bay Boulevard Bridge spanning Los Osos Creek so that the bridge meets current seismic design and safety standards (County of San Luis Obispo 2024b). This bridge replacement project will cause temporary impacts to 23 Morro manzanita plants and permanent impacts to 30 plants (County of San Luis Obispo 2024b). As mitigation for these impacts, the County of San Luis Obispo will plant 113 Morro manzanita plants within mitigation and restoration areas on site (County of San Luis Obispo 2024b). At its October 8-9, 2025 meeting, the Commission adopted a regulation, pursuant to section 2084 of the Fish and Game Code, to authorize take of Morro manzanita during candidacy for the South Bay Boulevard Bridge project. The Department is not aware of any additional road construction projects that have recently impacted Morro manzanita, but the species grows immediately adjacent to roads in the Baywood Park-Los Osos area and road construction activities could impact the species in the future. While clearing or trimming of vegetation along roads and trails can be detrimental to Morro manzanita, this is not always the case. In 2025, Department staff observed many seedlings and young plants along the disturbed edges of trails in Montaña de Oro State Park, suggesting that trail construction and maintenance can stimulate germination of the species in some situations.

In addition to direct removal of occupied Morro manzanita habitat for development and roads, Morro manzanita can experience negative indirect effects from these activities. Any development in or adjacent to occupied Morro manzanita habitat may necessitate the creation of fuel breaks around the developed areas for fire safety that will result in further disturbances to occupied Morro manzanita habitat. While fuel breaks for fire safety can be done in a way to minimize impacts to Morro manzanita, when all vegetation is cleared from the fuel breaks, Morro manzanita does not resprout (like some manzanita species can) since it lacks a basal burl. Some Morro manzanita seeds may germinate, and seedlings establish after vegetation is cleared, but those plants may then be removed or trimmed during subsequent vegetation clearing as the fuel break is maintained over time. Fuel breaks also provide habitat for invasive species to become established and spread (Merriam et al. 2007). See the "Altered Fire Regime and Fuel

Reduction Activities" and "Competition" sections of this status review for additional information on how fire and fuel breaks threaten Morro manzanita.

Development and roads also contribute to the fragmentation of Morro manzanita populations. In the northern part of the range, the species distribution has already been fragmented by development and roads in the towns of Baywood Park and Los Osos, with just scattered Morro manzanita plants remaining in the developed areas of those towns. Fragmentation of populations may negatively affect the long-term health and viability of Morro manzanita, especially if pollinators have difficulty finding and visiting Morro manzanita plants that are further away from each other, resulting in a decreased seed set and inbreeding depression (reduction in the ability of offspring to survive and reproduce due to closely related parents mating) (see the "Vulnerability of Geographically Restricted Species" section of this status review for additional information) (Levin 1984; Byers and Meagher 1991; Ellstrand and Elam 1993; Tyler and Odion 1996; Allphin et al. 2002; Aguilar et al. 2006). While the scattered Morro manzanita plants that remain within developed areas may serve as a pathway for pollinators to more easily access different portions of Morro manzanita's fragmented distribution, there are often large expanses of development between the isolated plants, and some Morro manzanita plants are pruned in a way that removes the majority of inflorescences thereby reducing their usefulness to pollinators. In addition, there is little appropriate habitat for the scattered Morro manzanita plants remaining in Baywood Park and Los Osos to expand into within developed areas which creates a fragmented landscape of isolated plants with minimal reproductive potential and reduced probability of long-term survival.

As an obligate seeder, habitat fragmentation may be especially detrimental since Morro manzanita relies on the storage of seed in the soil to replenish the population after fire (Tyler et al. 2023). If fragmented Morro manzanita populations experience reduced pollination, resulting in reduced fruit and seed set, the seeds may not accumulate in sufficient quantities in the soil for the population to recover after fire or other disturbances. In addition, habitat fragmentation from development makes management of the species and habitat more difficult as natural processes important for the persistence of the species (i.e., periodic burning) will be challenging to implement given the proximity of the species to the adjacent residential community.

Other indirect effects from development and roads that could negatively impact Morro manzanita include: 1) erosion from road cuts and trails, 2) soil and water contamination from fertilizers, pesticides, and herbicides, 3) trash dumping, and 4) displacement by landscape plants (Mullany 1990). Some of these indirect effects have been observed at the wildland urban interface around the Los Osos Oaks State Natural Reserve and the Cabrillo Estates (Mullany 1990; The Morro Group 1996; Department observation 2025).

In summary, there has been significant loss of Morro manzanita habitat in the past, and future development and road construction and maintenance activities continue to threaten occupied habitat with modification and destruction, including areas with high density stands of Morro manzanita. Future development and road construction and maintenance activities should be minimized in the Baywood Park and Los Osos area by the Los Osos HCP which is discussed further in the "Existing Management" section of this status review. Preservation of areas with high densities of Morro manzanita is essential for the long-term persistence of the species and the Los Osos HCP does not guarantee that high density Morro manzanita stands will be preserved. Department staff estimate that about 25% of the remaining occupied habitat is on private property that may be subject to negative direct or indirect impacts from future development. Creation of fuel breaks and habitat fragmentation that occur as development proceeds are likely to have further negative effects on occupied Morro manzanita habitat quality and species viability. Additional indirect negative effects to occupied Morro manzanita habitat due to development and roads may include erosion, soil and water contamination, trash dumping, and displacement by landscape plants.

7.2 Vulnerability of Geographically Restricted Species

Morro manzanita has a narrow geographic range and is a habitat specialist making it particularly vulnerable to extinction (Rabinowitz 1981; Harnik et al. 2012; Staude et al. 2020; IUCN Standards and Petitions Committee 2024). Morro manzanita is known from nine documented occurrences with a total range of approximately 30 km^2 (12 mi^2) as shown in Figure 2 (CNDDB 2025). When a species has a restricted range, like Morro manzanita, the species becomes more vulnerable to extirpation since habitat loss and factors that affect population dynamics are more likely to impact the entire species distribution and there are fewer individuals and occupied habitat overall to compensate for any declines in survival or reproductive success.

Of particular concern for Morro manzanita are environmental and genetic chance events. Environmental chance events are random or unpredictable events related to year-to-year variation in temperature, rainfall, habitat, predators, parasites, etc., which then drive population-level fluctuations in survival and reproduction (Shaffer 1981, 1987; Menges 1991; Melbourne and Hastings 2008). Environmental chance events, such as drought, fire, and landslides, can substantially increase the risk of extinction in a species with a restricted range. Drought is an environmental chance event that may be affecting some Morro manzanita plants. Several large Morro manzanita plants were observed to be experiencing rapid die off or partial die off at the El Moro Elfin Forest Natural Area in 2021, presumably from recent drought conditions (P. Sarafian, personal communication, October 23, 2021). If too many Morro manzanita plants die-off from drought and natural recruitment doesn't follow, this can affect the species as a whole by reducing the species' genetic diversity and further fragmenting the species' distribution.

Fire is another environmental chance event that could have a significant impact on Morro manzanita in the future. While fire is a necessary part of Morro manzanita's life history, too frequent fire, or fire that is not frequent enough, may negatively impact the entire species distribution. See the "Altered Fire Regime and Fuel Reduction Activities" section of this status review for additional information on how fire and fuel reduction activities threaten Morro manzanita.

Genetic chance events are random or unpredictable events related to changes in genetic diversity and reproductive success (mainly due to genetic drift, inbreeding depression, and gene flow) (Shaffer 1987; Ellstrand and Elam 1993). Since Morro manzanita is self-incompatible and insect-pollinated, it is reliant on pollinators for gene flow. Small, isolated, and/or fragmented populations are less likely to be visited by pollinators who would normally be delivering pollen from distant, more genetically diverse relatives. This could result in a restriction in gene flow between populations and fertilization failing more often (Ellstrand and Elam 1993; Allphin et al. 2002). Morro manzanita plants that grow in and around the town of Baywood Park consist of widely spaced, scattered plants and pollinators may be unable to travel between more distant Morro manzanita plants to cross pollinate. Restricted gene flow could cause reduction in seed set and/or offspring with reduced ability to survive and reproduce, which could negatively affect the long-term health and viability of Morro manzanita (Levin 1984; Byers and Meagher 1991; Allphin et al. 2002). This may already be occurring at the Morro manzanita stand at the El Moro Elfin Forest Natural Area, which is hypothesized to be experiencing inbreeding depression after observations of low seed viability and high seed infertility but additional studies are needed to confirm this hypothesis (Tyler and Odion 1996, 2020).

In summary, a restricted range is an important factor to consider when assessing threats to the long-term persistence of Morro manzanita. Morro manzanita's restricted range can result in large portions of the species distribution being negatively impacted by human activities, natural catastrophes, or other chance events. Species with a wider geographic range are buffered from the effects of drought, fire, or random genetic events compared to a species with a restricted geographic range, such as Morro manzanita. As Morro manzanita plants continue to be removed and disturbed by development and environmental factors, issues related to the species' restricted range will continue to be a threat to the species.

7.3 Altered Fire Regime and Fuel Reduction Activities

Fire plays a critical role in the establishment and persistence of Morro manzanita (Tyler and Kofron 2024). Morro manzanita primarily occurs in maritime chaparral, which has historically been subject to disturbance by fire, and over time many chaparral plants have adapted to survive through fire-stimulated crown sprouting or seed germination.

As discussed in the "Life History" section of this status review, Morro manzanita is an obligate seeder so it relies on fire to increase germination of seeds in the soil seed bank and to create suitable conditions for the species to persist in the landscape after fire (Wells 1969; Parker 2007; Tyler et al. 2023). However, if a fire occurs over the range of Morro manzanita and conditions are not optimal for Morro manzanita seed germination, establishment, and survival, Morro manzanita could experience a significant population decline (Tyler and Odion 1996).

Pre-European colonization and settlement fire return intervals for chaparral ecosystems were estimated at between 30 and 90 years (Van de Water and Safford 2011). Since the coastal ranges of California experience a low frequency of lightning caused fire, maritime chaparral generally experiences fewer fires than chaparral types further inland (Keeley and Zedler 1978). It is likely that occasional long fire-free periods of 100 or more years are an important part of the maritime chaparral ecosystem (Wells 1962; Keeley and Zedler 1978; Van de Water and Safford 2011; Rundel 2018). Historically, Native Americans likely utilized fire in the central coast ranges of California to convert shrublands and woodlands to herbaceous associations which provided more food resources and reduced hazardous conditions for Native Americans (Keeley 2002). This habitat conversion was continued by Europeans after the area was colonized to create and maintain grasslands that were more suitable than shrublands and woodlands for livestock grazing (Keeley 2002). To this day, fire return intervals continue to be altered by humans through both an increase in the frequency of human-caused ignitions and an increase in fire suppression (Keeley et al. 1999).

Fire frequency is an important component in chaparral ecosystems with too short or too long of a fire return interval potentially having a negative effect on Morro manzanita. Too short of a fire return interval could result in Morro manzanita seedlings and young plants being killed by fire before they have an opportunity to flower, set seed, and contribute to the post-fire seed bank (Zedler et al. 1983; Keeley 2007). Short fire return intervals are more likely to occur in chaparral when non-native plant species have invaded an area, creating highly flammable vegetation (see the "Competition" section of this status review for additional information on how non-native, invasive plants threaten Morro manzanita). In contrast, too long of a fire return interval could result in senescent Morro manzanita individuals that have reduced reproductive potential (Ne'eman et al. 1999). In the 1990s, some individuals of Morro manzanita at older aged stands in the El Moro Elfin Forest Natural Area were observed to be dead, which may indicate that the older stands are reaching the age at which Morro manzanita plants start to naturally senesce (Tyler et al. 1998; Tyler and Odion 2020). In 2025, Department staff also observed many old, partially dead plants in El Moro Elfin Forest Natural Area, as well as at the south end of Morro Bay State Park, which may be indicative of old age.

There have been very few fires documented in areas occupied by Morro manzanita and no large-scale fires that have burned throughout its habitat have been recorded. The California Department of Forestry and Fire Protection (CAL FIRE) fire perimeter database tracks fires of at least 4 ha (10 ac) in size in California from as early as the late 1800s and does not have any documented fires that overlap with occurrences of Morro manzanita (CAL FIRE 2025b). This suggests that the majority of Morro manzanita stands have not burned in over 100 years, and some Morro manzanita stands may be experiencing negative effects from this prolonged lack of fire. Reintroducing fire into occupied Morro manzanita habitat may be difficult due to the risk fire poses to adjacent residential communities. Even within Montaña de Oro State Park, prescribed burns are challenging to implement due to the remote terrain and limited accessibility in parts of the park (USFWS 2013). While prescribed burns over larger areas are difficult to implement, the burning of brush piles has occurred recently at the Bayview unit of the Department's Morro Dunes Ecological Reserve and at Montaña de Oro State Park (KSBY staff 2020; Katie Drexhage, personal communication, February 12, 2025). The burning of brush piles can open up habitat and create conditions beneficial for Morro manzanita.

Lack of fire could affect the ability of Morro manzanita to survive long-term as plants age and eventually die off with no new plants germinating after fire to take their place in the landscape. The ability of fire surrogates (such as vegetation management that mimics fire) to promote reproduction and regeneration in Morro manzanita needs further study and is difficult and expensive to implement over large areas. Mechanical clearing of vegetation can cause seed scarification, reduce vegetative competition, and increase light creating conditions suitable for the production of Morro manzanita seedlings; however, it has also been shown in some areas to convert Morro manzanita chaparral to coastal scrub vegetation with invasive species a common component of the vegetation (Tyler and Odion 1996; USFWS 1998). The role of fire within maritime chaparral communities may serve other purposes, such as nutrient cycling as a result of biomass combustion and ash deposition, that are not achieved through mechanical clearing of vegetation (Potts et al. 2010).

In addition to altered fire regimes, fuel reduction activities affect Morro manzanita. Fuel reduction activities, such as vegetation thinning and clearing, are common practices in communities that have a high probability of fire. CAL FIRE uses fire hazard severity zones to identify which areas of the state have a moderate, high, or very high fire hazard severity. These fire hazard severity zones reflect areas that have similar burn probabilities and fire behavior characteristics (CAL FIRE 2024). The majority of occupied Morro manzanita habitat is within very high fire severity zones and within the "State Responsibility Area", meaning CAL FIRE has primary responsibility for fire prevention and suppression in these areas. (CAL FIRE 2025a). California Government Code sections 51178-51182 require landowners to maintain a defensible space of 30 m

(100 ft) from structures on their property in very high fire severity zones which may result in fuel reduction activities being prioritized on and around properties with Morro manzanita.

As part of the Los Osos Community Wildfire Protection Plan, several potential fuel reduction areas have been identified in, or adjacent to, occupied Morro manzanita habitat (San Luis Obispo County Community Fire Safe Council 2009). These areas are around the wildland urban interface of the Morro Dunes Ecological Reserve, the Los Osos Oaks Nature Reserve, the El Moro Elfin Forest Natural Area, the south end of Morro Bay State Park, the north end of Montaña de Oro State Park, and around the Cabrillo Estates development (San Luis Obispo County Community Fire Safe Council 2009). In 2019, a shaded fuel break (where vegetation is thinned but not completely removed) was constructed along a portion of the northern end of the Bayview Unit of the Morro Dunes Ecological Reserve, but it has been reported that no Morro manzanita plants were directly impacted by this fuel break (Jodi McGraw Consulting 2020; CAL FIRE 2025c; Department observation). In 2011, fuel reduction activities were performed around the Cabrillo Estates development in Los Osos with substantial impacts to Morro manzanita within a 30 m (100 ft) wide fuel break on the east edge of the Cabrillo Estates (Ballek et al. 2024; CAL FIRE 2025c). In 2024, students from the California Polytechnic State University, San Luis Obispo, collected data within the Cabrillo Estates fuel break to assess the condition and vigor of Morro manzanita plants (Ballek et al. 2024). Students documented over 100 dead Morro manzanita plants and over 200 living but heavily pruned Morro manzanita plants within the Cabrillo Estates fuel break (Ballek et al. 2024). Open areas of the fuel break also contained young Morro manzanita plants with nearly 200 saplings recorded during the 2024 survey (Ballek et al. 2024). These 2024 observations agree with Department observations from a 2025 site visit to the Cabrillo Estates fuel break in which dead, heavily pruned, and young Morro manzanita plants were all present (Figure 7). The long-term persistence of the young plants within the Cabrillo Estates fuel break is uncertain as they may experience impacts from bush clearing, trimming, or other habitat modifications when the fuel break is maintained in the future although the severity of this impact should be reduced as a result of avoidance and minimization requirements in the Los Osos HCP.

Fuel reduction activities are essential for fire safety in the residential communities adjacent to occupied Morro manzanita habitat. While some of these activities have had, and will likely continue to have, negative impacts on Morro manzanita, the Los Osos HCP includes minimization measures for these fuel reduction activities by prohibiting the removal of any Morro manzanita plants and minimizing the amount of canopy thinning and lower branch removal for Morro manzanita (Jodi McGraw Consulting 2022). While canopy thinning and lower branch removal is preferable to complete removal of the plant, this type of fuel reduction treatment can still cause negative impacts to Morro manzanita plants and result in a severely degraded ecosystem. While

heavy pruning of Morro manzanita plants may be tolerable for some individuals, the Department observed mortality in heavily pruned plants in the fuel break on the east edge of the Cabrillo Estates (Figure 7). Pruning of Morro manzanita in the fuel breaks may also cause the plants additional stress thereby making them more susceptible to pathogen infection (see the "Disease" section of this status review) (Drake-Schultheis et al. 2022). In addition to direct negative impacts to Morro manzanita plants from fuel reduction activities, the large amount of vegetation pruned and removed from the fuel breaks creates areas of open habitat that can become heavily invaded by invasive plant species (Merriam et al. 2007; Jodi McGraw Consulting 2022). This has occurred within the Cabrillo Estates fuel break which has become invaded by perennial veldt grass, a species that forms a dense thatch of dead grass that is highly flammable and could leave this area more susceptible to fire in the future (D'Antonio and Vitousek 1992; Jodi McGraw Consulting 2022; Ballek et al. 2024). In addition, invasive plant species that become established in fuel breaks adjacent to occupied Morro manzanita habitat can make Morro manzanita habitat more susceptible to invasion, especially following a fire (see the "Competition" section of this status review for additional information) (Merriam et al. 2007).

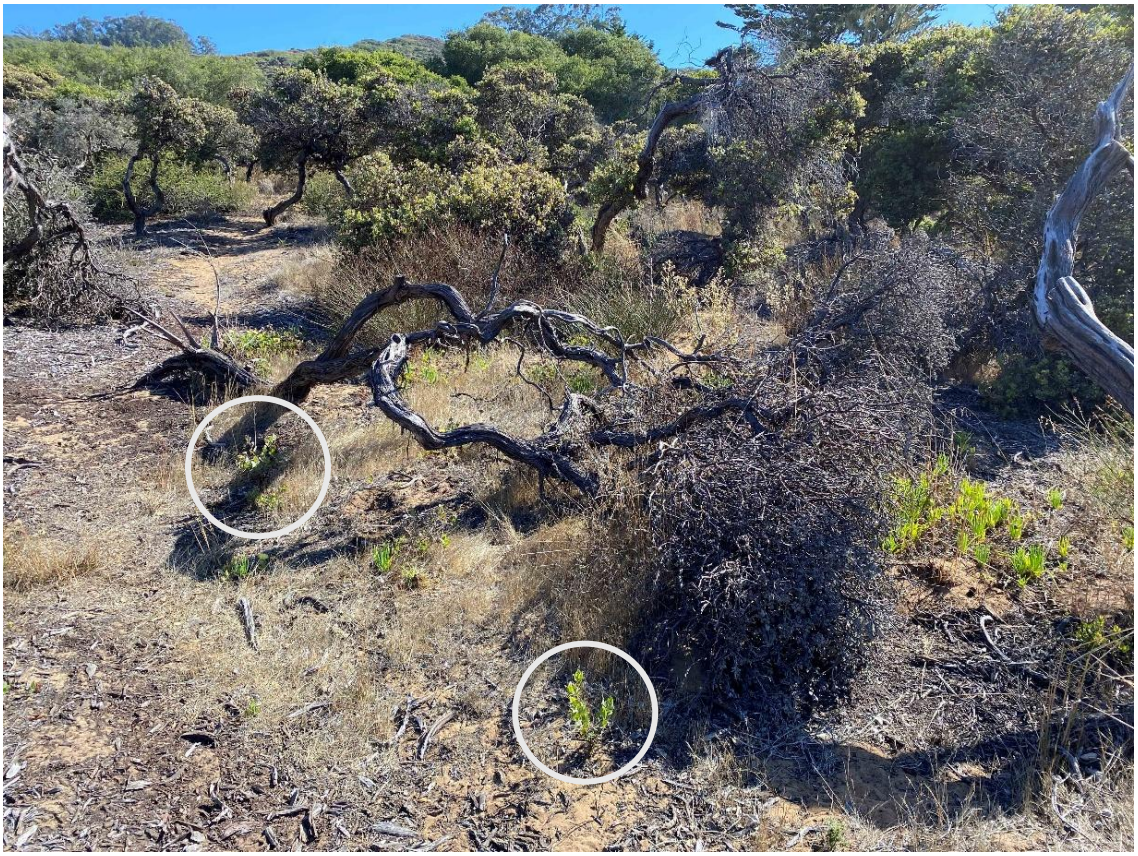

Figure 7. Photograph of the fuel break at the east end of the Cabrillo Estates showing a heavily pruned and dead Morro manzanita plant in the center of photo with two seedlings/young Morro manzanita plants circled in white. Photo credit: Kristi Lazar (2025).

Changes related to fire management and fuel reduction practices happen regularly and could influence the ability of Morro manzanita to survive long-term. A few examples of recent changes in California's fire management and fuel treatment policies include a 2018 executive order, the 2020 California Wildfire and Forest Resiliency Action Plan, and a 2025 State of Emergency proclamation. In 2018, former Governor Brown issued an executive order that directed the Natural Resources Agency to double their vegetation treatment activities to 500,000 acres per year (Governor's Executive Order No. B-52-18 (May 10, 2018)). In response to this executive order, the State Board of Forestry and Fire Protection certified the California Vegetation Treatment Program Programmatic Environmental Impact Report (CalVTP) to help expedite fuels reduction projects throughout the state (Board of Forestry and Fire Protection 2019). Concerns remain on whether CalVTP appropriately addresses the adverse environmental effects of type conversion of chaparral and coastal sage scrub to non-native annual plants that may occur as a result of vegetation treatments (unpublished decision Cal. Chaparral Institute v. Bd. of Forestry & Fire Protection (May 30, 2025) No. D083484). In 2025, Governor Newsom directed the Board of Forestry to expand the use of CalVTP to all non-federal acreage in California through his March 1, 2025, State of Emergency proclamation (further discussed below). This may result in additional impacts to Morro manzanita, with the potential of individual plants being removed, pruned, and/or sprayed with herbicide, and the potential of habitat degradation due to post-treatment maintenance and/or non-native plant invasions.

In 2020, the California Wildfire and Forest Resilience Action Plan was finalized and implemented (Forest Management Task Force 2021). This comprehensive statewide strategy defines specific goals and actions for significantly increasing the pace and scale of fuels reduction treatments. One of the largest actions is to reach a combined annual treatment goal of 1,000,000 acres treated on state-owned and privately owned land. The current action plan specifically calls out chaparral as a habitat type that requires different considerations but does not define those considerations beyond noting that potential type conversion increases fire risk and chaparral is burning too frequently.

In 2025, the Governor of California issued a Proclamation of State of Emergency that suspended environmental statues, rules, and regulations that are within the jurisdiction of the California Environmental Protection Agency and the California Natural Resources Agency to expedite critical fuels reduction projects (Governor's Proc. (March 1, 2025)). The impact that this proclamation will have on Morro manzanita is unknown but is unlikely to affect the avoidance and minimization requirements under the Los Osos HCP for creation and maintenance of fuel breaks.

In summary, Morro manzanita needs fire to persist in the landscape; however, too short or too long of fire return intervals are both threats to the species across its range. Too short of a fire return interval may not allow Morro manzanita seedlings to establish and

become reproductive before they are killed in the next fire. Too long of a fire return interval may result in older Morro manzanita stands with reduced reproductive output absent active management. Further studies are needed on the ability of fire surrogates (such as vegetation management that mimics fire) to promote reproduction and regeneration in Morro manzanita. Fuel reduction activities are considered necessary for the safety of residential communities adjacent to occupied Morro manzanita habitat but could nevertheless have negative effects on Morro manzanita. Fire management and fuel reduction activities could become bigger issues in the future depending on the types of legislation on fuel reduction activities that are enacted and whether any environmental regulations are suspended.

7.4 Climate Change

The Earth's surface has become successively warmer each of the last three decades which has resulted in atmospheric warming, reduction in the amount of snow and ice, rising sea levels, and other global impacts (IPCC 2014). Much of this global warming and subsequent change in climate is a result of increased anthropogenic greenhouse gas emissions directly caused by human activities (Hawkins et al. 2008; IPCC 2021). Climate change has been shown to be negatively impacting wildlife and plant taxa and ecosystems across the globe, with local extinctions related to climate change becoming widespread (Parmesan and Yohe 2003; Parmesan 2006; Warren et al. 2011; Scheffers et al. 2016; Wiens 2016; IPCC 2022).

The Department does not have any data on the extent to which predicted changes in the climate will specifically affect Morro manzanita; however, climate projections have been developed for California and information is available on how the climate is projected to change within the range of Morro manzanita (Langridge 2018; Pierce et al. 2018; Cal-Adapt 2024). These climate projections are part of California's Fourth Climate Change Assessment and were generated from a set of 32 global climate model simulations that have been bias corrected and downscaled. These climate projections are available for mid-century (2035-2064) and end-century (2070-2099) time periods under two greenhouse gas emission scenarios, a moderate emission scenario (Representative Concentration Pathway (RCP) 4.5) and a high emission scenario (RCP8.5) (Langridge 2018; Pierce et al. 2018; Cal-Adapt 2024). Projected changes to the climate within the range of Morro manzanita are available for temperature, precipitation, and area at risk from wildfires.

The high temperature for the range of Morro manzanita is projected to increase by 1.5 to 2°C (2.7 to 3.6°F) by the middle of the century (2035-2064) and increase by 1.9 to 3.6°C (3.5 to 6.5°F) by the end of the century (2070-2099) depending on the RCP emission scenario and location within the Morro Bay area (Cal-Adapt 2024). Since Morro manzanita occupies areas of San Luis Obispo County that are closer to the coast, coastal

fog helps buffer temperature extremes (Langridge 2018). However, coastal fog may decrease with climate change, and if that happens, temperature increases will likely be more significant (Moser and Ekstrom 2012).

Precipitation within the range of Morro manzanita is projected to either decrease by 2.5 mm (0.1 in) or increase by 5.1 mm (0.2 in) by the middle of the century (2035-2064) and increase by 7.6 to 20.3 mm (0.3 to 0.8 in) by the end of the century (2070-2099) depending on the RCP emission scenario and location within the Morro Bay area (Cal-Adapt 2024). As a whole, California is projected to have less frequent but more extreme daily precipitation, more volatile year-to-year precipitation, and an increase in the number of dry years (Bedsworth et al. 2018; Swain et al. 2018).

The area at risk of burning annually within the range of Morro manzanita is projected to increase by both the middle of the century (2035-2064) and the end of the century (2070-2099); however, the frequency, severity, and impacts of fires is highly dependent on a number of factors, including development patterns, vegetation, topography, and weather (Moser and Ekstrom 2012; Langridge 2018; County of San Luis Obispo 2019; Cal-Adapt 2024). Given the proximity of many of the Morro manzanita stands to development, it is likely that any wildfires in this area will be suppressed for the safety of nearby residential communities.

Morro manzanita is a species with a restricted range and is a habitat specialist, which are two factors that have been shown to make a species more susceptible to climate change (Damschen et al. 2012; Harnik et al. 2012; Rose et al. 2022). Since the area occupied by Morro manzanita is small, any effects the species may experience from climate change are more likely to impact the entire distribution of the species. As a habitat specialist, Morro manzanita has a strong preference for Baywood fine sand soil within its small range, so there are limited areas suitable for it to disperse to in the face of a warming climate. Plantings of Morro manzanita outside of its natural distribution may have benefits for the species, especially in the face of a warming climate, but consideration needs to be given to the genetic source of planted individuals, how isolated those individuals are from others, and how the area will be managed long-term.

Department staff assessed the vulnerability of Morro manzanita to projected climate change using the NatureServe Climate Change Vulnerability Index (CCVI) Version 4.0 (Lyons et al. 2024; CDFW 2026). The CCVI assesses a species' vulnerability to climate change by evaluating: 1) the species' exposure to projected climate change under a moderate emission scenario (RCP4.5) and a high emission scenario (RCP8.5), and 2) the species' ability to adapt to projected climate change. The CCVI uses a scoring system to separate species into one of four overall categories based on their vulnerability to projected climate change: less vulnerable, moderately vulnerable, highly vulnerable, and extremely vulnerable. Morro manzanita was assessed by Department staff to be

moderately vulnerable to climate change under the moderate emission scenario and extremely vulnerable to climate change under the high emission scenario. In addition, the CCVI results for Morro manzanita indicate that the species has a low adaptive capacity based on 37 species or population level factors used to assess adaptive capacity. This CCVI assessment for Morro manzanita was influenced by several species-specific factors including Morro manzanita's small range extent and area of occupancy, habitat specialization, high site fidelity, long life span, and association with Baywood fine sand soil and coastal areas which restricts the ability of Morro manzanita to shift its range in response to climate change. Based on available information, Morro manzanita may decline in the future in response to climate change.

7.5 Competition

Competition with non-native, invasive plants is a threat to Morro manzanita. *Eucalyptus* species, iceplant (*Carpobrotus* spp. and *Conocosia pugioniformis*), and perennial veldt grass (*Ehrharta calycina*) are the main non-native, invasive plants that threaten Morro manzanita.

Eucalyptus species are native to Australia but were widely planted in California in the late 1800s and early 1900s (Mullany 1990). The lumber from these trees was intended to be used for building materials and railroad ties but the wood was found to easily rot and was not suitable for the intended purposes (Tornatzky 2016). While *Eucalyptus* stands occur throughout the range of Morro manzanita, the extensive *Eucalyptus* stands in Montaña de Oro State Park are particularly relevant when considering Morro manzanita conservation. *Eucalyptus* plantations were first planted in the Hazard Canyon area of what is now Montaña de Oro State Park in the early 1900s and it is likely other *Eucalyptus* plantations in the Montaña de Oro State Park area were also planted around this time (Bicknell 1990; Mullany 1990). Eight species of *Eucalyptus*, covering an estimated 83 ha (206 ac), have been documented in Montaña de Oro State Park with most individuals belonging to the species blue gum eucalyptus (*E. globulus*) (Bicknell 1990; Mullany 1990; GIC 2024). When Morro manzanita is present surrounding the *Eucalyptus* stands, it generally stops growing right at the edge of the stands, which is a strong indicator that Morro manzanita plants were removed from the site when the *Eucalyptus* were initially planted or that as the *Eucalyptus* matured and expanded into occupied Morro manzanita habitat, Morro manzanita plants were not able to survive in the understory (Figure 6) (Mullany 1990). Over 40 ha (100 ac) of *Eucalyptus* within Montaña de Oro State Park grow immediately adjacent to Morro manzanita stands indicating that the *Eucalyptus* stands may have caused the extirpation of many acres of occupied Morro manzanita habitat (GIC 2024).

Eucalyptus stands have been documented to be spreading at Montaña de Oro State Park with an estimated expansion of over 50% between 1949 and 1986 and an additional

expansion of approximately 13% between 1986 and 2024 (Bicknell 1990; GIC 2024). While some of this expansion is due to an increase in *Eucalyptus* crown size, most of the expansion is a result of invasion of *Eucalyptus* into new areas (Bicknell 1990). In areas with *Eucalyptus* stands, growth of native vegetation (including Morro manzanita) is suppressed likely due to low light; accumulation of thick layers of leaf, bark, and fruit litter; changes in soil chemistry; and depletion of the amount of nutrients and/or water available for native vegetation (Poore and Fries 1985; Mullany 1990; USFWS 2013; McFadden 2021). Allelopathic (growth inhibiting) effects of *Eucalyptus* leaf litter have been suggested as another possible reason for lack of native vegetation under *Eucalyptus* trees; however, a recent study failed to detect an allelopathic effect of *Eucalyptus* leaf litter on native plant species (Nelson 2016). While most Morro manzanita stop growing right at the edge of *Eucalyptus* stands (Figure 6), Department staff observed an open area with scattered *Eucalyptus* that had Morro manzanita growing in the understory (Figure 8) (Department observation 2025). This area had thick *Eucalyptus* leaf litter in some areas further supporting the hypothesis that allelopathic effects from leaf litter are likely not the main reason Morro manzanita generally does not grow in the *Eucalyptus* understory. Based on Department staff observations within this open stand of *Eucalyptus*, it is more likely that low light under dense *Eucalyptus* canopies is the main factor restricting growth of Morro manzanita under the canopy. If this open *Eucalyptus* stand continues to grow and expand, Morro manzanita could be eliminated from this site as the canopy closes in and creates shady conditions unsuitable for Morro manzanita establishment and growth.

Figure 8. Photographs of an open stand of Eucalyptus *with Morro manzanita growing in the understory. Ground had abundant* Eucalyptus *leaf litter, but ample sunlight was able to penetrate the canopy. Photo credit: Kristi Lazar (2025).*

A 1990 study by Jennifer von Reis, referenced by Mullany (1990), also determined that there was a correlation between low embryo viability and soil seed banks for Morro manzanita stands that grew in close proximity to *Eucalyptus* stands; however, it is

unknown what mechanisms are causing those effects in Morro manzanita. *Eucalyptus* stands also threaten the reestablishment of Morro manzanita after a fire as *Eucalyptus* plants readily resprout from stumps and seedlings are fast growers (Tyler and Odion 1996; Wolf and DiTomaso 2016). These factors could cause *Eucalyptus* to outcompete the slower growing Morro manzanita seedlings after a fire and cause the displacement of Morro manzanita from the area (Tyler and Odion 1996; USFWS 1998). *Eucalyptus* stands could also contribute to an increased fire frequency, which would be detrimental to Morro manzanita, as *Eucalyptus* stands are considered a fire hazard due to the production of oily resins, abundant leaf litter under the tree canopy, and shedding bark that catches fire easily and can be carried into the canopy creating dangerous fire conditions (NPS 2006).

The ability of *Eucalyptus* to invade Morro manzanita habitat may also be affected by the presence of an established network of mycorrhizal fungi in the soil. Manzanita species have a root system that forms a mutually beneficial association with fungi (mycorrhizal fungi) whereby fungi colonize the roots of manzanita trading nutrients and water from the soil in exchange for carbon energy fixed by the plant (Kauffmann et al. 2021). Mycorrhizal fungi that associate with manzanita are generally not host specific and can form associations with both manzanita and nearby tree species (Molina and Trappe 1982). Studies have shown that mycorrhizal fungi associated with manzanita can colonize Douglas-fir (*Pseudotsuga menziesii*) seedlings and increase the survival and growth rate of the seedlings (Moeller et al. 2015). *Eucalyptus* species also utilize mycorrhizal fungi and the success of *Eucalyptus* invasions can be partially attributed to their compatibility with a broad range of mycorrhizal fungi (Malajczuk et al. 1982). No studies have specifically shown mycorrhizal fungi associated with Morro manzanita contributing to the establishment of *Eucalyptus* seedlings; however, the same genera of mycorrhizal fungi associated with manzanita have also been found to be associated with *Eucalyptus* (Largent et al. 1980; Malajczuk et al. 1982; Molina and Trappe 1982; Acsai and Largent 1983). If mycorrhizal fungi from Morro manzanita are able to colonize the roots of *Eucalyptus* seedlings, this may be enhancing the ability of *Eucalyptus* to invade Morro manzanita habitat by providing *Eucalyptus* seedlings with greater access to soil moisture and nutrients (Horton et al. 1999).

While *Eucalyptus* plants are the non-native, invasive species that pose the greatest threat to Morro manzanita, iceplant and perennial veldt grass are additional non-native, invasive plants that could have significant negative effects on Morro manzanita in the future. Iceplant is a well-known problem in maritime chaparral and has been shown to aggressively invade openings in occupied Morro manzanita habitat (USFWS 2013). Dense stands of iceplant can compete with surrounding native shrubs for water and nutrients thereby affecting the survivorship of nearby native vegetation (D'Antonio and Mahall 1991). If a fire were to occur, iceplant could outcompete Morro manzanita seedlings for establishment since its germination and growth is much faster than that of

Morro manzanita seedlings (Tyler and Odion 1996; USFWS 2013). After two fire cycles, iceplant can completely displace maritime chaparral if no control measures are implemented (Tyler and Odion 1996). Due to lack of recent fire in Morro manzanita stands, iceplant has not become a dominant feature of the plant community but it is currently present in sufficient quantities that if fire occurs, it could invade the area and outcompete native vegetation, including Morro manzanita, for establishment (Zedler and Scheid 1988; Tyler and Odion 1996).

Perennial veldt grass is a highly invasive species that is wind-dispersed and known to spread rapidly in disturbed or open areas (Pickart 2000). Since it has roots that can penetrate the soil deeply, it is especially adapted to growing in sandy soil like the Baywood fine sand soil Morro manzanita is typically found in (Pickart 2000). Perennial veldt grass competes for limited soil resources and creates a dense thatch that inhibits native plant establishment and is highly flammable (D'Antonio and Vitousek 1992; Jodi McGraw Consulting 2022). In 1990, Mullany noted that perennial veldt grass was well established in the sandy soil in the Los Osos area and in openings around Morro manzanita plants (Mullany 1990). At the Morro Dunes Ecological Reserve, perennial veldt grass was noted to occur in dense patches in areas where the soil has been disturbed from land clearing or recreational use and may be impeding the recolonization of Morro manzanita into historically farmed areas at Morro Dunes Ecological Reserve (Jodi McGraw Consulting 2020; John Chesnut, personal communication, January 26, 2026). Within the Cabrillo Estates fuel break, perennial veldt grass is abundant and likely became abundant after the fuel break was created in 2011 and conditions became suitable for the species to invade the site (Ballek et al. 2024; Department observation). While invasion of perennial veldt grass does not currently appear to be a threat to established stands of Morro manzanita, it is abundant in adjacent open dune scrub vegetation and disturbed areas across the range of Morro manzanita (Tyler and Odion 1996).

Perennial veldt grass may become a significant threat to Morro manzanita after fire. If a fire burns through a stand of Morro manzanita, the wind-dispersed seeds of perennial veldt grass could be blown to the burned areas and become established. As perennial veldt grass colonizes an area after fire, it provides more fuel for future fires and contributes to an increase in the frequency and intensity of fires (D'Antonio and Vitousek 1992). This would be detrimental to Morro manzanita which may need a longer fire return interval to persist in the landscape.

In summary, Morro manzanita is currently threatened by non-native, invasive plant species and that threat may increase in the future. *Eucalyptus* stands were planted in areas that likely once contained Morro manzanita, and those *Eucalyptus* stands are continuing to encroach into occupied Morro manzanita habitat thereby threatening the species (see the “Existing Management” section of this status review for discussion of

current *Eucalyptus* management and habitat restoration projects occurring on protected lands). Iceplant and perennial veldt grass are present near Morro manzanita but will likely only become serious threats to the persistence of the species if a fire burns through the area and kills Morro manzanita plants giving these non-native, invasive plants a chance to rapidly spread and dominate the habitat.

7.6 Recreation

Recreational use within occupied Morro manzanita habitat occurs across the species range. The Bayview unit of the Morro Dunes Ecological Reserve (just west of Bayview Heights Drive in Los Osos) faces significant threats from recreation. As an ecological reserve, the primary purpose of the property is for protection of sensitive plants, animals, and habitat; however, the reserve experiences trespass recreational use from off-road vehicles, bicycles, and horseback riding (Cal. Code Regs., tit. 14, § 630) (CDFW 2024). These activities are prohibited on the Bayview unit of the Morro Dunes Ecological Reserve (Cal. Code Regs., tit. 14, § 630, subd. (g)), but enforcement of these restrictions has been limited and has resulted in impacts to the sensitive habitat on the reserve (CDFW 2024). Horseback riding in particular has led to removal of some of the established vegetation, soil erosion, and trail destabilization, resulting in the formation of deep gullies in the Baywood fine sand soil and the introduction and spread of non-native species (Jodi McGraw Consulting 2022; CDFW 2024). However, it has been reported that equestrian use of the Bayview unit of the Morro Dunes Ecological Reserve was effectively eliminated by mid-2024 (Department observation). Restoration and management of these recreational impacts at Morro Dunes Ecological Reserve is a component of the Los Osos HCP (see the "Existing Management" section of this status review for additional information) (Jodi McGraw Consulting 2022).

The El Moro Elfin Forest Natural Area has experienced disturbance from off-trail activities which have impacted vegetation and contributed to destabilization of the soil (Terra Verde Environmental Consulting 2019). In addition, Morro manzanita plants were reportedly damaged (leveled to the ground in some areas) by vandals over an area of about 0.4 ha (1 ac) within the El Moro Elfin Forest Natural Area in 2009 (P. Sarafian, personal communication, May 25, 2009; USFWS 2013). Before the El Moro Elfin Forest Natural Area was established, off-road vehicle use damaged the native vegetation at the site, but the area appears to have recovered and off-road vehicle use is no longer considered a threat on the property (McGuire and Morey 1992; Keeley 2007). Other reserves and parks that contain Morro manzanita experience some disturbance from recreational use, but the impacts are typically limited to authorized trail use and maintenance.

Private property south of the Cabrillo Estates experiences recreational impacts from a network of unofficial trails that have been created through an area of dense, high cover

Morro manzanita. Portions of these trails may have originated as dirt roads created for a potential development in the 1970s but are now being used as trails for local residents (California Coastal Commission 2000a). The trails cut through dense stands of Morro manzanita resulting in direct negative impacts to the species. These trails connect the Cabrillo Estates development with the East Rim Trail within Montaña de Oro State Park and to trails within the Morro Dunes Ecological Reserve. Soil erosion is also evident along portions of the trails and the trail sides in this area had very little Morro manzanita regrowth, likely due to the low light conditions and eroding soil (Figure 9) (Department observation 2025).

Figure 9. Photographs of unofficial trails between the Cabrillo Estates development and Montaña de Oro State Park. Left photograph shows a trail through dense Morro manzanita. Right photograph shows severe erosion along a trail with Morro manzanita roots exposed. Photo credit: Kristi Lazar 2025.

7.7 Predation

Manzanita fruits and seeds are an important source of food for rodents, rabbits, and coyotes within chaparral communities (Keeley and Hays 1976). These animals can serve as both seed predators and seed dispersers. While seed predation is discussed in this section as a potential threat, manzanita species have a mutualistic relationship with seed predators and dispersers whereby scatter hoarding animals feed on nutrient-rich manzanita seed embryos and other nutrient rich tissue but also bury excess seeds in other areas and contribute to seed dispersal (Moore and Vander Wall 2015).

The main seed predators and short distance seed dispersers for Morro manzanita are thought to be woodrats, while other animals, such as coyotes, bears, and foxes, may serve as long distance seed dispersers (Keeley and Hays 1976; Moore and Vander Wall

2015; Parker 2015; Tyler and Odion 2020; Tyler et al. 2023). Fruit and seed predation has been shown to be a likely cause of seed loss in studies of more common manzanita species (Keeley and Hays 1976; Keeley 1987b; Kelly and Parker 1990). A study specific to Morro manzanita found between 60 and 70% of fruits produced were lost to animal predation within a month and half of falling from the plant (Tyler et al. 2023). While some of the fruits and seeds removed from the area by animals may survive if they are moved to or buried at another suitable location (seed caching) or may survive through animal scat, it is also likely that many of the fruits and seeds were consumed by animals and the seeds killed (Keeley and Hays 1976; Tyler et al. 2023). In addition, some of those fruits and seeds may have been moved by animals to areas with unsuitable conditions and this would also result in potentially viable seeds being removed from the soil seedbank (Tyler et al. 2023). The highest fruit and seed predation rates for Morro manzanita were documented in a Morro manzanita stand in the El Moro Elfin Forest Natural Area, which consists of older Morro manzanita individuals (50+ years old in 1999 at the time of the study) (Tyler et al. 2023). This area may be particularly vulnerable to the negative effects of seed predation since it has also been shown to have low seed viability when compared to other Morro manzanita sites (Tyler et al. 2023).

The presence and population size of local rodent populations are important considerations when managing Morro manzanita long-term as they can have both beneficial and detrimental effects on the species. Seed predation on its own is likely not a significant threat to the persistence of Morro manzanita but if a Morro manzanita population is already struggling (due to old age or environmental factors such as drought), then seed predation may become a threat to the long-term persistence of the population.

7.8 Disease

Disease has not been documented in Morro manzanita, but pathogens may pose a threat to the species in the future, especially pathogens in the genus *Phytophthora*. The sudden oak death pathogen (*Phytophthora ramorum*) is an oomycete (fungal-like water mold) that spreads through spores dispersed by wind, water, litter, or soil (Peterson et al. 2014; Grünwald et al. 2019). In California, the sudden oak death pathogen infects and kills oaks (especially coast live oak) and California tanoak (*Notholithocarpus densiflorus*) and can non-lethally infect the leaves of over 100 host species (Rizzo et al. 2002; Rizzo and Garbelotto 2003; Peterson et al. 2014). The sudden oak death pathogen has been detected in a single Morro manzanita individual planted at the University of California Santa Cruz (UCSC) Arboretum but has not yet been observed to infect Morro manzanita in the wild (Garbelotto et al. 2020). Based on a study of several manzanita species at the UCSC Arboretum that were artificially inoculated with the sudden oak death pathogen, it is likely that manzanita are not an ideal host of sudden oak death pathogen as the infected manzanita had just a few sporangia (structures that house

spores) detected (Garbelotto et al. 2020). While sudden oak death pathogen has not yet been documented within wild Morro manzanita stands, the pathogen has been documented to occur in several streams in coastal San Luis Obispo County so spread of the pathogen to areas with Morro manzanita is a possibility in the future (Peterson et al. 2014; Grünwald et al. 2019; Kofron and Tyler 2024).

In addition to the sudden oak death pathogen, manzanita species can experience root and crown decay, branch dieback, and mortality from other *Phytophthora* species. In other parts of California, the federally threatened Ione manzanita (*Arctostaphylos myrtifolia*), the federally threatened and state endangered pallid manzanita (*A. pallida*), and the more common whiteleaf manzanita (*A. viscida*) have experienced extensive mortality from *P. cinnamomi* (Swiecki and Bernhardt 2003; Swiecki et al. 2011). *P. cinnamomi* is a soil-borne oomycete pathogen that was introduced to California through the horticultural trade (Swiecki and Bernhardt 2003; Swiecki et al. 2011). The pathogen causes root decay and is very persistent in soils; eradication of the pathogen from infected sites is generally not possible (Swiecki et al. 2011). While not yet documented in Morro manzanita, *P. cinnamomi* may be a concern in the future since Morro manzanita grows adjacent to horticultural landscaping which could be infected with the pathogen. If *P. cinnamomi* infects the Morro manzanita population, it would likely cause widespread mortality of Morro manzanita as it has in other manzanita species.

Other pathogens known to infect manzanita species include stem canker fungi in the genus *Fusicoccum*, the name given to the asexual stage of several fungi responsible for stem canker, and fungi in the Botryophaeriaceae family (Swiecki and Bernhardt 2003; Drake-Schultheis et al. 2022). *Fusicoccum* species have been documented in both Ione manzanita and whiteleaf manzanita and were responsible for stem cankers and branch dieback that sometimes led to mortality (Swiecki and Bernhardt 2003). Fungi in the Botryophaeriaceae family are commonly associated with disease in plants that are experiencing environmental stress (such as heat, drought, or physical damage) (Slippers and Wingfield 2007; Drake-Schultheis et al. 2022). These fungi have been shown to infect manzanita species and cause dieback of branches and mortality in young plants (Drake-Schultheis et al. 2022). While these fungi have not been specifically looked for in Morro manzanita, taxa in the Botryophaeriaceae are known to use *Eucalyptus* as host plants and Morro manzanita often grows immediately adjacent to *Eucalyptus* stands (Slippers et al. 2004; Slippers and Wingfield 2007). Fungi in the Botryophaeriaceae family may become a threat in the future if Morro manzanita is subjected to additional or increased environmental stressors from climate change and fuel reduction activities (Slippers and Wingfield 2007; Drake-Schultheis et al. 2022).

The Department considers the threat to Morro manzanita from pathogens to be low at this time, but Morro manzanita stands should be monitored for the presence of disease so early intervention and management can occur.

7.9 Overexploitation

The Department does not have any information on overexploitation affecting Morro manzanita. While Morro manzanita is available for purchase at select plant nurseries, overcollection of Morro manzanita from wild populations is not currently considered a threat (Calscape 2024). Morro manzanita can be propagated from seed or stem cuttings which can be done without negatively affecting the parent plant or population. The Department does not currently consider overexploitation to be a significant threat to the continued existence of Morro manzanita.

8 Existing Management

When Morro manzanita was initially petitioned for CESA listing in 1991, the Commission ultimately decided not to list Morro manzanita under CESA based on regional planning efforts that were initiated in 1993 and that would ideally make CESA listing of Morro manzanita unnecessary (Cochrane 1996). A condition of the 1993 Commission finding was that a conservation plan, with secure funding sources for implementation, would be in place by January of 1995 (Cochrane 1996). A conservation plan was not finalized by 1995 and by the end of 1996 the Department had concerns that the regional planning efforts would not result in adequate protection of Morro manzanita habitat (Cochrane 1996). A key property owner whose land had large, dense stands of Morro manzanita was opposed to the conservation planning effort which meant that only small, fragmented areas were being considered for potential conservation easements (Cochrane 1996). While the regional planning efforts in the 1990s were unsuccessful in creating a conservation plan, the increased attention on Morro manzanita resulted in funding being allocated for additional research on the species.

While Morro manzanita was not listed under CESA in the 1990s, it was listed as a threatened species under the ESA in 1994. In 1998, the USFWS published a recovery plan that delineated reasonable actions that were important for the recovery and protection of the Morro shoulderband snail and four plant species, including Morro manzanita (USFWS 1998). The 1998 recovery plan provided delisting criteria for Morro manzanita that required: 1) 90% of existing high and medium cover stands and 85 to 90% of low cover stands be preserved, 2) evidence that the acreage and cover classes of Morro manzanita in preserves can be maintained over time, and 3) site-specific management plans to have been successfully implemented for the preserves (USFWS 1998). As of 2022, the first recovery criterion was close to being met with 70% of existing high and medium cover Morro manzanita stands and 89% of low cover stands protected in preserves (USFWS 2022). The second and third criteria have not been met as there are no monitoring programs in place to track the maintenance of Morro

manzanita stands over time and site-specific management plans have only been developed for two of the five relevant preserves (USFWS 2022).

The remaining discussion in this section considers the impact of existing management efforts on the species (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)). The Department estimates that about 25% of the remaining occupied Morro manzanita habitat is on private land with no current management. About 75% of occupied Morro manzanita habitat occurs on public lands owned by the State of California (mainly State Parks and the Department), the County of San Luis Obispo, and the U.S. Department of the Interior's Bureau of Land Management (Table 2). Public ownership of lands with occupied Morro manzanita habitat does not guarantee the long-term survival of the species. Morro manzanita plants growing on public lands are generally safeguarded from development, but most of these lands do not have site-specific management plans that consider long-term preservation and management of Morro manzanita. In addition, these lands are subject to a variety of land uses that are not always compatible with species conservation, such as recreational use (McGuire and Morey 1992). Managing occupied Morro manzanita habitat for long-term persistence is challenging since many of the protected lands with Morro manzanita, such as the El Moro Elfin Forest Natural Area, Morro Dunes Ecological Reserve, and the Los Osos Oaks Natural Reserve, are immediately adjacent to development. Healthy Morro manzanita populations have historically needed periodic fire to stimulate reproduction and promote regeneration but use of fire as a management action has challenges due to the proximity of the habitat to adjacent residential communities. Mechanical clearing of vegetation may simulate the effects of fire for Morro manzanita and appears to be especially useful when clearing *Eucalyptus* from areas with Morro manzanita to restore native habitat, but additional studies are needed on the long-term success of mechanical clearing in occupied Morro manzanita habitat as a surrogate for fire.

The following subsections are not a comprehensive discussion of all management activities within the range of Morro manzanita. The existing management discussed below covers management activities that Department staff think could directly impact large portions of occupied Morro manzanita habitat. Seed collections are also an important component of managing Morro manzanita, so a discussion of the status of Morro manzanita seed collections for conservation is included at the end of this section.

8.1 Los Osos Habitat Conservation Plan

HCPs are planning documents required as part of an application for an incidental take permit under the ESA (16 U.S.C. § 1539(a)(2)(B)). The Los Osos HCP was approved in February 2024 as part of an incidental take permit issued by the USFWS to the County of San Luis Obispo (Kahn et al. 2024). The Los Osos HCP covers a 1,475 ha (3,644 ac) area centered on the unincorporated community of Los Osos (Figure 10) with the purpose of identifying the activities and species covered under the plan, as well as the steps that the County of San Luis Obispo and plan participants will take to avoid, minimize, and mitigate impacts of the covered activities on the covered species (Jodi McGraw Consulting 2022). Covered activities include residential and commercial development of vacant parcels, redevelopments, capital improvement projects, facilities operations, road and trail creation, park expansion and creation, water system upgrades, maintenance activities, fuel reduction and fire hazard abatement treatments, and other activities. The Los Osos HCP identifies four federally listed species that are covered under the plan: Morro Bay kangaroo rat (*Dipodomys heermanni morroensis*), Morro shoulderband snail (*Helminthoglypta walkeriana*), Indian Knob mountainbalm (*Eriodicyton altissimum*), and Morro manzanita. While the USFWS incidental take permit provides take coverage for the Morro shoulderband snail, as a federally listed plant, Morro manzanita is not subject to the take prohibition in the ESA outside of federal lands and is thus not eligible for take authorization in this instance.

Within the Los Osos HCP area, there are about 223 ha (550 ac) of occupied Morro manzanita habitat based on acreage estimates from Department staff; this accounts for 56% of the remaining occupied Morro manzanita habitat. Nearly all of the remaining Morro manzanita plants on private property are within the area covered by the Los Osos HCP. Activities covered by the Los Osos HCP will impact Morro manzanita, such as when individuals occur in project footprints and cannot be avoided. As a federal plan, the Los Osos HCP does not provide state take coverage, and since Morro manzanita was not state listed at the time the Los Osos HCP was approved, the Department did not need to issue state take coverage for the activities covered by the Los Osos HCP. Therefore, the Department has not previously had the opportunity to consider whether the measures in the Los Osos HCP satisfy the requirements of CESA or the Natural Community Conservation Planning Act. Impacts to Morro manzanita from the covered activities in the Los Osos HCP and the related conservation measures for the species are summarized below. Additional information on the Los Osos HCP can be found in the full document prepared by Jodi McGraw Consulting (2022).

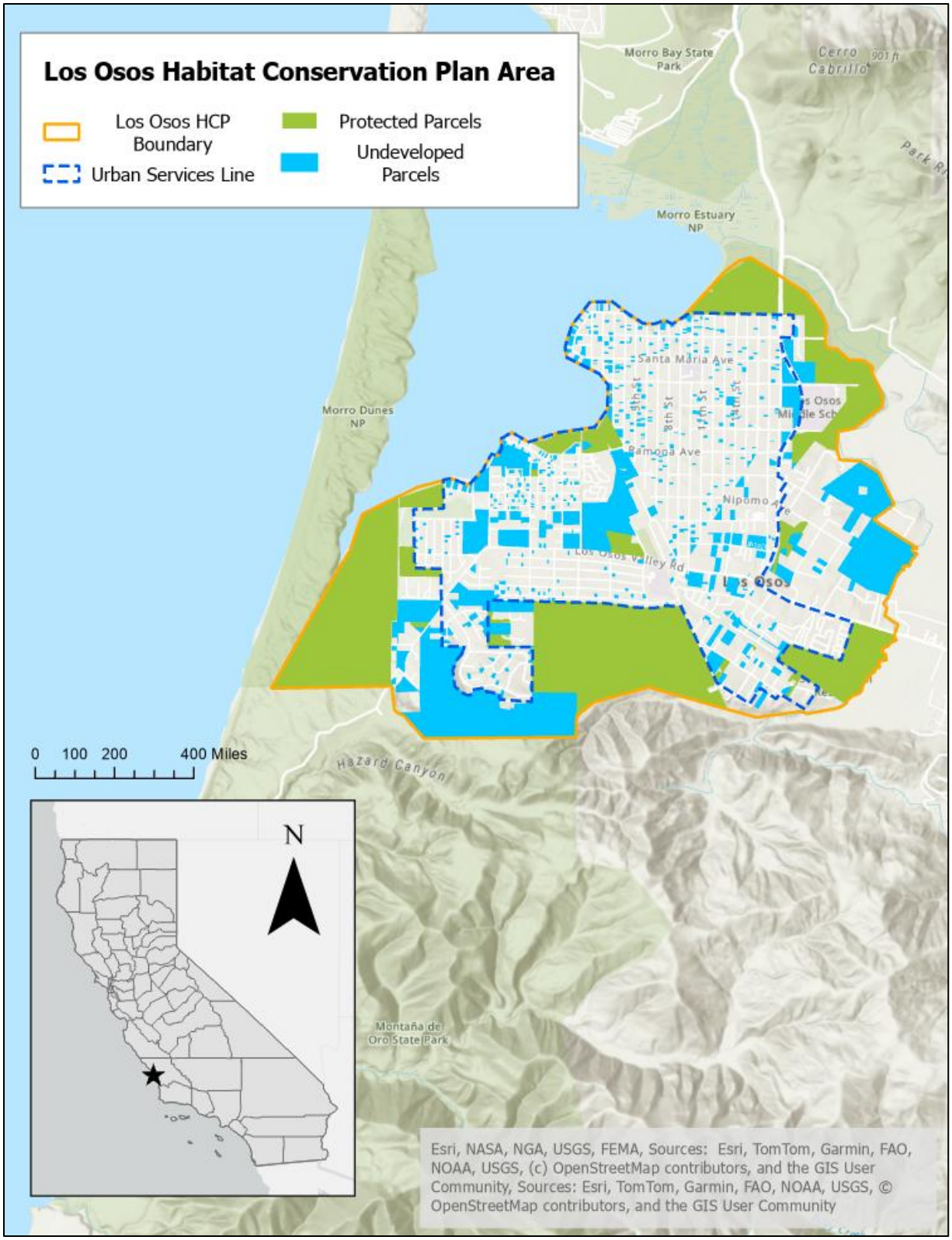

Figure 10. Area covered under the Los Osos Habitat Conservation Plan. Key boundaries referenced in this status review are shown on the map and are based on information in the Los Osos Habitat Conservation Plan (Jodi McGraw Consulting 2022).

8.1.1 Impacts from Covered Activities

Direct impacts to Morro manzanita from implementation of the Los Osos HCP include removal of plants and habitat loss, whereas indirect impacts include habitat fragmentation, habitat degradation due to spread of non-native plants, impacts from herbicides, increased fire frequency or complete exclusion of fire, and hybridization. The Los Osos HCP defines Morro manzanita habitat as areas with vegetation classified as central maritime chaparral and native woodlands; this includes vegetation identified in the Los Osos HCP as Morro manzanita California sagebrush, Morro manzanita, Morro manzanita wedgeleaf ceanothus, wedgeleaf ceanothus-California sagebrush, bishop pine woodland, and coast live oak woodland. As such, Morro manzanita habitat identified in the Los Osos HCP is actually referring to suitable Morro manzanita habitat (habitat that may or may not contain Morro manzanita) and not necessarily occupied Morro manzanita habitat. For the purposes of determining the amount of occupied Morro manzanita habitat that may be impacted through the Los Osos HCP, the Department used habitat classified in the Los Osos HCP as Morro manzanita California sagebrush, Morro manzanita, and Morro manzanita wedgeleaf ceanothus which better aligns with previous calculations in this status review regarding occupied Morro manzanita habitat. The Los Osos HCP indicates that 7.3 ha (18.1 ac) of habitat classified in the Los Osos HCP as Morro manzanita California sagebrush, Morro manzanita, and Morro manzanita wedgeleaf ceanothus is anticipated to be impacted by activities covered under the Los Osos HCP. This represents less than 2% of total extant occupied Morro manzanita habitat as estimated by Department staff. The 7.3 ha (18.1 ac) of occupied Morro manzanita habitat to be impacted consists of 6.2 ha (15.2 ac) of permanent impacts and 1.2 ha (3 ac) of temporary impacts. In addition, the Los Osos Community Wildfire Protection Plan is anticipated to impact additional Morro manzanita habitat for fuel reduction and fire hazard abatement treatments. The Los Osos HCP anticipates these fuel reduction and fire hazard abatement treatments will have negligible effects on Morro manzanita, so it does not include these impacts in its total calculations for amount of Morro manzanita habitat impacted by activities covered under the Los Osos HCP. See the "Altered Fire Regime and Fuel Reduction Activities" section of this status review for further discussion on the impacts of fuel reduction and fire hazard abatement treatments on Morro manzanita.

As discussed in the "Present or Threatened Modification or Destruction of Habitat" section of this status review, some of the habitat that may be developed is concentrated in areas of high-density Morro manzanita between the Cabrillo Estates and Montaña de Oro State Park. These high-density areas of Morro manzanita are within the Priority Conservation Area (PCA) outlined in the Los Osos HCP. The PCA encompasses the area outside of the urban services line but inside of the Los Osos HCP area (see Figure 10) and consists of relatively intact habitat that is considered of greater conservation value

than more disturbed habitat outside of the PCA. Development of intact Morro manzanita habitat on private property within the PCA will contribute to fragmentation of one of the last remaining high cover stands of the species although the Los Osos HCP sets forth avoidance and mitigation measures for development within the PCA. Development of disturbed Morro manzanita habitat on private property outside of the PCA (within the urban areas of Baywood Park and Los Osos) will also result in the removal of Morro manzanita plants. Morro manzanita plants within the urban area may play a role in creating a pathway for pollinators to more easily access different portions of Morro manzanita's fragmented distribution. While protection of Morro manzanita plants within the urban area is a lower priority for conservation of the species as a whole, removing those plants will nevertheless negatively impact the species.

8.1.2 Conservation Program

The Los Osos HCP conservation program includes measures designed to avoid, minimize, and mitigate the impacts of covered activities on covered species and their habitat. The Los Osos HCP indicates that there will be a net positive impact to Morro manzanita through: 1) protection of 20.9 ha (51.7 ac) of suitable Morro manzanita habitat through acquisition of fee title or conservation easements, 2) restoration and management of 9 ha (22.3 ac) of suitable Morro manzanita habitat on existing protected lands, and 3) management (no restoration) of 76.3 ha (188.6 ac) of suitable Morro manzanita habitat on existing protected lands. The Los Osos HCP also sets forth avoidance and mitigation measures that may limit impacts to Morro manzanita, including 1) avoiding and minimizing impacts of project activities on Morro manzanita with a 10-foot buffer (wherever possible), 2) avoiding removal and minimizing trimming of Morro manzanita during vegetation management activities, and 3) avoiding planting other manzanita species to reduce the likelihood of hybridization.

The Los Osos HCP indicates that 14.1 ha (35 ac) of suitable Morro manzanita habitat is anticipated to be permanently impacted by covered activities while 20.9 ha (51.7 ac) of suitable Morro manzanita habitat is anticipated to be permanently protected via fee title acquisitions or conservation easements. This represents a mitigation ratio of permanently protecting 0.6 ha (1.48 ac) of suitable Morro manzanita habitat for every 0.4 ha (1 ac) of suitable Morro manzanita habitat destroyed. An additional 2.1 ha (5 ac) of temporary impacts and 11.7 ha (28.9 ac) of impacts related to fuel reduction and fire hazard abatement activities are anticipated in suitable Morro manzanita habitat, but these impacts may not be as significant as the 14.1 ha (35 ac) of permanent impacts that are anticipated as the result of development. Since these impacts mentioned in the Los Osos HCP are for suitable Morro manzanita habitat (whether or not the habitat is occupied by the species), it is unclear how these impacts will directly affect Morro manzanita.

Protection of 20.9 ha (51.7 ac) of newly acquired suitable Morro manzanita habitat will be accomplished by: 1) project proponents setting aside habitat on site primarily through recordation of a conservation easement, and 2) project proponents paying a habitat protection fee. Proponents of any development project within the PCA will need to protect habitat via conservation easements at a ratio of 3 to 1 within the parcel being developed (3 square feet of habitat protected for every square foot of habitat impacted) and the disturbance envelope for the development cannot exceed 2,787 square meters (30,000 square feet) unless the County of San Luis Obispo approves a larger disturbance footprint for defensible space. Outside of the PCA, development can occur without protecting habitat onsite, but a habitat protection fee must be paid which goes toward acquiring fee title or conservation easements from willing sellers. Any land acquired through fee title or conservation easements will become part of the Los Osos HCP preserve system and is to be managed in perpetuity. Habitat to be acquired is from willing sellers and will vary in quality and size based on what is available.

Restoration, management, and monitoring of habitat within the Los Osos HCP preserve system is funded through a restoration, management and administration fee which project proponents within and outside the PCA must pay. Habitat restoration and management within the area covered under the Los Osos HCP are important for the continued persistence of Morro manzanita and other sensitive resources. Implementation of the Los Osos HCP will fund habitat restoration and management activities which otherwise may not be prioritized due to lack of funding and staffing on public lands. Morro manzanita habitat restoration and management activities will occur mainly within the Department's Morro Dunes Ecological Reserve, which currently has dense stands of Morro manzanita. The Los Osos HCP indicates that 9 ha (22.3 ac) of highly degraded suitable Morro manzanita habitat will be restored, and 76.3 ha (188.6 ac) of suitable Morro manzanita habitat will be managed. Habitat restoration and management activities will focus on *Eucalyptus* removal, control of perennial veldt grass and other invasive plants, and restoration of habitat disturbed by unauthorized trails. These activities will be beneficial for the coastal scrub and maritime chaparral habitats within the Morro Dunes Ecological Reserve and should result in some increase in the number of Morro manzanita plants. However, the criteria for successful implementation of these activities have not yet been determined so it is uncertain what the outcome of the restoration and management activities at Morro Dunes Ecological Reserve will be in relation to the permanent removal of Morro manzanita plants and habitat from development elsewhere in its range (see the "Present or Threatened Modification or Destruction of Habitat" section of this status review for additional information).

In summary, the Los Osos HCP offers benefits to Morro manzanita, particularly within the Department's Morro Dunes Ecological Reserve. However, the Los Osos HCP does not guarantee permanent protection for any of the high-density intact stands of Morro

manzanita that are currently vulnerable to development. If the Commission lists Morro manzanita as threatened or endangered pursuant to CESA, the Department's Central Region will be responsible for determining whether to issue one or more permits consistent with the Los Osos HCP or whether additional mitigation is required to satisfy CESA's full mitigation requirement.

8.2 California Coastal Act

The California Coastal Act was passed in 1976 with goals to protect, maintain, enhance, and restore the overall quality of the coastal zone environment and its natural and artificial resources (Pub. Resources Code, § 30001.5). The California Coastal Act includes special protections for Environmentally Sensitive Habitat Areas (ESHA) to protect these areas against significant disruptions of their habitat values (Pub. Resources Code, § 30240). Central maritime chaparral dominated by Morro manzanita is considered an ESHA in the Los Osos Community Plan and this designation has provided Morro manzanita with some protections from development as described below (County of San Luis Obispo 2024a).

The San Luis Obispo County Local Coastal Program provides guidelines for implementing the California Coastal Act in San Luis Obispo County (County of San Luis Obispo 2007). Some important policies related to ESHAs and terrestrial environments in the San Luis Obispo County Local Coastal Program include: new development within or adjacent to ESHAs should not significantly disrupt the resource, permit applicants must demonstrate that there will be no significant impact on sensitive habitats from the proposed development, subdivision of parcels with ESHAs is restricted, native trees and plant cover shall be protected wherever possible, and vegetation that is rare or endangered shall be protected against any significant disruption of habitat value (California Coastal Commission 2000b; County of San Luis Obispo 2007). While the California Coastal Act and San Luis Obispo County Local Coastal Program lay out these policies for protecting ESHAs from development, a 2024 amendment to the Los Osos Community Plan will allow development of ESHAs as long as project proponents participate in the Los Osos HCP. This amendment may result in reduced protections for ESHAs (and subsequently Morro manzanita) since restrictions on disturbance of these areas in the Los Osos HCP are not as strict as those outlined in the San Luis Obispo County Local Coastal Program.

8.3 Montaña de Oro State Park

Montaña de Oro State Park consists of about 3,359 ha (8,300 ac) and is owned and managed by State Parks. Morro manzanita is generally restricted to the north end of the park but scattered individuals may occur further south in the Valencia Peak area of the park (CNDDB 2025). Department staff estimate 178 ha (441 ac) of Morro manzanita

habitat within the park; however, this is a rough estimate since there has not been a comprehensive survey (see Table 2). Over 20 ha (50 ac) of occupied Morro manzanita habitat within the park has been documented to consist of dense stands of the species (50-75% cover of Morro manzanita) (Katie Drexhage, personal communication, May 7, 2025). Morro manzanita also co-occurs with brittleleaf manzanita and Pecho manzanita within the park. Montaña de Oro State Park has a general plan from 1988 which states that the policy of the park is to protect and manage rare and endangered plants and to restore native vegetation and endangered species habitat, but does not specifically discuss the protection or management of Morro manzanita (Hook et al. 1988). While there is not an updated management plan specifically for Morro manzanita at Montaña de Oro State Park, some activities have been done within the park to benefit the species, including *Eucalyptus* removal and management, habitat restoration, and prescribed burns.

Morro manzanita plants were historically removed, within what is now Montaña de Oro State Park, for the planting of *Eucalyptus* trees in the early 1900s, and *Eucalyptus* have expanded within the park since the initial planting (see the "Competition" section of this status review for additional information). In 1989, Montaña de Oro State Park staff initiated a stand containment project which removed *Eucalyptus* seedlings that were establishing beyond the perimeter of the original groves in an effort to prevent the spread of *Eucalyptus* (USFWS 1994, 1998). Current management in Montaña de Oro State Park is focused on reducing fuels by removing *Eucalyptus*, burning the understory, allowing natural recruitment of native plants, and planting Morro manzanita (California Department of Parks and Recreation, personal communication, January 30, 2025). In the restoration plantings at Montaña de Oro State Park, Morro manzanita plants are grown from seed collected within the park to maintain the genetic integrity of the species (California Department of Parks and Recreation 2025).

In 1992, a service corridor was constructed for a telephone cable line in Montaña de Oro State Park which resulted in the removal of approximately 300 Morro manzanita plants (McGuire and Morey 1992; USFWS 1994). Mitigation measures for this project included revegetation of open areas along the disturbance corridor with Morro manzanita seedlings and removal of 0.2 ha (0.5 ac) of *Eucalyptus* and revegetation of the area with a mixture of native species including Morro manzanita (McGuire and Morey 1992). These revegetated areas were to be monitored for two years (McGuire and Morey 1992). In 2008, State Parks staff considered the Morro manzanita mitigation plantings for this project a success, but no additional details were provided (Doug Barker, personal communication, August 13, 2025).

Two prescribed burns in Morro manzanita habitat have been documented at Montaña de Oro State Park. In 1987, a prescribed burn of about 0.2 ha (0.5 ac) was conducted in dune scrub and resulted in the fire consuming about a dozen Morro manzanita plants

(McGuire and Morey 1992). There was no recruitment of Morro manzanita plants immediately after the 1987 burn which may have been due to it being a cool burn in October after the first rain of the season (McGuire and Morey 1992). In 1998, a prescribed burn of about 2.3 ha (5.7 ac) was conducted in a 40-year-old Morro manzanita stand at Montaña de Oro State Park to evaluate fire effects on Morro manzanita. While the Morro manzanita stand did not appear to recover in the first few years after the prescribed burn, a revisit to the area in 2023 documented a recovered Morro manzanita stand that had high shrub cover with plants flowering, fruiting, and contributing to the post-fire seed bank (Tyler and Kofron 2024). See the "Life History" section of this status review for additional information about these prescribed burns and the "Altered Fire Regime and Fuel Reduction Activities" section for additional information on the effect of fire on Morro manzanita.

In addition to the activities discussed above, Montaña de Oro State Park staff maintain roads and trails for visitor use. While mechanical clearing of vegetation to maintain roads and trails can be detrimental to Morro manzanita, that is not always the case. In 2025, Department staff observed many seedlings and young plants along the disturbed edges of several trails in Montaña de Oro State Park. While large, dead Morro manzanita plants were also observed along some of these trails (possibly from when the trails were first created), the disturbance appeared to also stimulate germination of Morro manzanita in some areas.

8.4 Morro Dunes Ecological Reserve

The Morro Dunes Ecological Reserve is a 113-ha (279-ac) property that is owned and managed by the Department (Figure 3). It is composed of two units: the 19-ha (48-ac) Pecho Unit, and the 93-ha (231-ac) Bayview unit. The Pecho unit, located mostly west of Pecho Valley Road, was purchased in 1978 and designated as part of the Morro Dunes Ecological Reserve in 1983 (McGuire and Morey 1992; CDFW 2024). It contains coastal sage scrub and central maritime chaparral with generally low densities of Morro manzanita covering about 15 ha (36 ac), although dense patches have been reported in the southeast corner of the Pecho Unit (McGuire and Morey 1992; Jodi McGraw Consulting 2020; CDFW 2024; Department observation). The Pecho unit may have once had more Morro manzanita on the property prior to the use of a bulldozer to remove unexploded military ordnances in the 1950s which cleared some of the native vegetation (Jodi McGraw Consulting 2020). The Bayview unit, located just west of Bayview Heights Drive, was acquired by the Department in 2000 and 2003 and contains coastal sage scrub, central maritime chaparral, and coast live oak woodland (Jodi McGraw Consulting 2020). The Bayview unit has medium to high densities of Morro manzanita covering approximately 70 ha (174 ac) (Jodi McGraw Consulting 2020; CDFW 2024). Based on aerial imagery, much of the Bayview unit was cleared of vegetation in the 1940s and was reportedly farmed for many years before being

disturbed again for unexploded ordnance removal (USDA 1937a, b; ESRI 2024; Department observation). Areas of the Bayview unit that were historically farmed are reportedly being recolonized by Morro manzanita and much of the vegetation across the Bayview unit appears to have recovered from these historical disturbances (USDA 1937a, 1949; ESRI 2024; John Chesnut, personal communication, January 26, 2026).

The primary purpose of an ecological reserve, such as Morro Dunes Ecological Reserve, is to protect rare, threatened, or endangered native plants, wildlife, aquatic organisms, and specialized terrestrial or aquatic habitat types (Cal. Code Regs., tit. 14, § 630). A management plan was prepared for the Morro Dunes Ecological Reserve in 1982 when the reserve consisted of just the Pecho unit, but this management plan has not been updated since that time and does not include the larger Bayview unit (Jodi McGraw Consulting 2020). Limited funding and resources have impacted the ability of the Department to enforce regulations on the reserve resulting in the creation of many unauthorized trails and illegal recreational use, primarily from horseback riding (Jodi McGraw Consulting 2020; CDFW 2024). These activities have primarily occurred on the Bayview unit and have resulted in trail destabilization, erosion, and the introduction and spread of non-native invasive species. The Department is working to address management of the reserve by adding signage, designating authorized walking trails, and closing unauthorized trails (CDFW 2024). As of 2025, equestrian trespass has reportedly been virtually eliminated and trails have become more vegetated (Department observation). Maintaining restrictions on recreational use will help protect Morro manzanita and other sensitive resources on the property from further degradation.

As part of the 2009 Los Osos Community Wildfire Protection Plan, a fuel break was proposed on the northern and eastern sides of the Bayview Unit of the Morro Dunes Ecological Reserve (San Luis Obispo County Community Fire Safe Council 2009). In 2019, a shaded fuel break (where vegetation is thinned but not completely removed) was constructed along a portion of the northern end of the Bayview Unit of the Morro Dunes Ecological Reserve but it has been reported that no Morro manzanita plants were impacted (Jodi McGraw Consulting 2020; CAL FIRE 2025c; Department observation). If a fuel break is constructed on the eastern side of the Bayview Unit of the Morro Dunes Ecological Reserve in the future, this may impact some Morro manzanita plants depending on the placement of the fuel break.

Morro manzanita chaparral within the Pecho unit of the Morro Dunes Ecological Reserve contains a 0.34-ha (0.84-ac) stand of *Eucalyptus* and these trees have likely resulted in the reduction of Morro manzanita (Jodi McGraw Consulting 2020). Morro manzanita skeletons are present in the shaded understory of the *Eucalyptus* trees (Hacker 2025). In 2023, *Eucalyptus* trees were illegally cut at the Pecho unit by an unknown assailant and the downed trees subsequently removed by the Department in

2024 (Hacker 2025). After the downed *Eucalyptus* trees were removed, abundant Morro manzanita seedlings were observed and Morro manzanita seeds from surrounding mature shrubs were visible on the open substrate that resulted from the *Eucalyptus* removal (Hacker 2025). Complete removal of the *Eucalyptus* trees at the Pecho unit is reportedly being implemented as of December 2025 in order to improve the habitat for Morro manzanita as part of mitigation and restoration activities associated with the Los Osos HCP (Jodi McGraw Consulting 2022; Department observation). The Los Osos HCP also proposes invasive species control, trail closures, and trail restoration within Morro Dunes Ecological Reserve as additional mitigation for impacts to Morro manzanita elsewhere in its range (Jodi McGraw Consulting 2020, 2022). The Los Osos HCP requires that these mitigation and restoration activities occur ahead of future permitted impacts to Morro manzanita (Jodi McGraw Consulting 2022).

8.5 El Moro Elfin Forest Natural Area

The El Moro Elfin Forest Natural Area is a 36-ha (90-ac) area that is owned by the County of San Luis Obispo, State Parks, and California State Lands Commission, and managed by the Los Osos-Morro Bay Chapter of the Small Wilderness Area Preservation (Morro Group 2003; Jodi McGraw Consulting 2022). The El Moro Elfin Forest Natural Area contains oak woodland, maritime chaparral, and coastal scrub with more than 500 Morro manzanita plants documented in 2018 (Morro Group 2003; Terra Verde Environmental Consulting 2019). Morro manzanita plants at this location have become relatively isolated from adjacent Morro manzanita plants by the development of the towns of Baywood Park and Los Osos. Management at the El Moro Elfin Forest Natural Area has primarily focused on erosion control, trail and sign improvements, installation of fencing to reduce visitor impacts to sensitive habitat, invasive species removal, and restoration of disturbed areas (Morro Group 2003; Terra Verde Environmental Consulting 2019).

In 2009, Morro manzanita plants were reportedly damaged (leveled to the ground in some areas) by vandals over an area of about 0.4 ha (1 ac) within the El Moro Elfin Forest Natural Area (P. Sarafian, personal communication, May 25, 2009; USFWS 2013). In 2011, 100 Morro manzanita seedlings were planted at the El Moro Elfin Forest Natural Area in the area previously damaged by vandals to try to mitigate for impacts to Morro manzanita (Sarafian 2011; USFWS 2013). All but one of the 100 Morro manzanita seedlings survived the first six months, but the Department does not have any information on how long the plants were monitored after 2011. In 2018, a small patch of dead Morro manzanita plants that were young at the time of death were observed in the vicinity of the 2011 restoration plantings suggesting that the restoration attempt in 2011 was not successful as of 2018 (Terra Verde Environmental Consulting 2019). Since the plantings were not formally monitored, the Department does not have

any additional information on whether all the planted seedlings died or if some were able to survive.

While the El Moro Elfin Forest Natural Area protects Morro manzanita from development, plants at this location are thought to be some of the oldest Morro manzanita individuals and have low seed production, low seed viability, and low seed density in the soil (Tyler and Odion 2020; Tyler et al. 2023). It has been hypothesized that low seed production and low seed viability may be a sign that this relatively isolated population is experiencing genetic effects from its isolation but further studies are needed (Tyler and Odion 2020). Small, fragmented populations, like that at the El Moro Elfin Forest Natural Area, are prone to decreased gene flow which can affect seed viability (Tyler and Odion 2020). Morro manzanita seeds at the El Moro Elfin Forest Natural Area also have high seed predation which further reduces the number of seeds stored in the soil (Tyler et al. 2023).

Tyler and Kofron (2024) indicate that prescribed fire may be the most effective tool to ensure aging stands of Morro manzanita regenerate; however, the proximity of El Moro Elfin Forest Natural Area to development may prevent the use of fire as a management tool. Alternative treatments to stimulate germination of Morro manzanita that do not involve fire may be useful at the El Moro Elfin Forest Natural Area, but further research is needed.

8.6 Conservation Seed Banking

In 2020, 15,699 seeds were collected from 34 maternal lines at Montaña de Oro State Park (CNDDB occurrence #9) (California Plant Rescue 2021). These seeds are currently in long-term seed storage at UCSC with back-up seed stored at the National Laboratory for Genetic Resources Preservation in Fort Collins, Colorado (California Plant Rescue 2021). Living collections are also present at the Santa Barbara Botanic Garden, Regional Parks Botanic Garden, California Botanic Garden, and University of California Botanical Garden (California Plant Rescue 2025).

9 Recommendation to the Commission

CESA requires the Department to prepare this status review to 1) assess the status of Morro manzanita in California based on the best scientific information available to the Department and 2) indicate whether the petitioned action is warranted (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)).

Under CESA, an endangered species is defined as “a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes,

including loss of habitat, change in habitat, overexploitation, predation, competition, or disease" (Fish & G. Code, § 2062). A threatened species is defined as "a native species or subspecies…that although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by [CESA]" (Fish and G. Code § 2067).

The petitioned action was to list Morro manzanita as endangered under CESA. Based on the criteria described above and the best scientific information available, the Department has determined that listing Morro manzanita as threatened under CESA is warranted at this time (Fish & G. Code, § 2075.5, subd. (e)(2): the Commission may find that "the petitioned action is not warranted but listing the petitioned species at a different status than that requested by the petitioner is warranted"). Although not presently threatened with extinction, Morro manzanita is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by CESA.

10 Protection Afforded by Listing

It is the policy of the state to conserve, protect, restore, and enhance any endangered or any threatened species and its habitat (Fish & G. Code, § 2052). If listed as an endangered or threatened species, unauthorized "take" of Morro manzanita will be prohibited, making the conservation, protection, and enhancement of the species and its habitat a statewide concern. "Take" is defined under CESA as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill" (Fish & G. Code, § 86). Any violation of the "take" prohibition would be punishable under state law. The Fish and Game Code provides the Department with related authority to permit "take" under certain circumstances (Fish & G. Code, §§ 2081, 2081.1, 2086, 2089.6, 2089.10, & 2835).

While Morro manzanita is federally listed under the ESA, CESA listing will provide extra protection for Morro manzanita plants on private and other unprotected properties. Since the federal prohibition on take of plants listed under the ESA applies only to individuals of a listed species that occur on lands under federal jurisdiction, CESA listing would provide stronger protections for Morro manzanita by making the species subject to CESA's take prohibition throughout California and by requiring full mitigation of take and related impacts as a requirement of incidental take permits pursuant to Fish and Game Code section 2081(b). CESA incidental take permits would also require that adequate funding is ensured for the full mitigation to be achieved. The Department could also authorize taking of a CESA-listed species whose conservation and management is provided for in an approved Natural Community Conservation Plan (Fish & G. Code, § 2800 et seq.).

While Morro manzanita is currently a covered species under the Los Oso HCP because of its federal listing status, the Los Osos HCP doesn't provide the same legal protection that CESA listing provides. The Los Osos HCP is a planning document designed to accommodate development while also providing long-term benefits to the covered species. CESA listing provides legal protections for the species that are independent of any federal protections or regional conservation plans which could change or be amended in the future.

Both federally and state listed species receive additional considerations during environmental review under the California Environmental Quality Act (CEQA). CEQA requires public agencies to analyze and disclose project-related environmental effects before discretionary approval of a project. CEQA requires adoption of mitigation measures to reduce or eliminate any significant environmental impacts. As a federally listed species, Morro manzanita is already considered during CEQA review, but state listing would allow CEQA protections for the species to continue if it were to be delisted from the ESA.

CESA listing may prompt increased interagency coordination specific to Morro manzanita conservation and protection. Listing may also increase the likelihood that state and federal land and resource management agencies will allocate additional resources toward monitoring, research, protection, and recovery actions. Currently, none of the Morro manzanita populations on protected lands have species-specific management plans in place but some have general habitat management plans. CESA listing may make specifically addressing the health and protection of Morro manzanita on protected lands an increased priority.

11 Future Management

This section considers suggestions for future management and other recommendations for recovery of the species (Fish & G. Code, §§ 2072.3 & 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1) & (f)(1)). The following actions, generated by the Department, are not a detailed conservation strategy; however, they outline the major steps needed to prevent the extinction of the species. The Department recommends that the following actions be conducted in coordination with partners and interested parties, consistent with California's goals of preventing the extinction of rare, threatened, and endangered species.

- Protect remaining occupied Morro manzanita habitat via acquisition of fee titles and/or recordation of conservation easements, prioritizing high-density, contiguous stands. Preservation of high-density, intact stands of Morro manzanita that are not fragmented by development, particularly the stand of

Morro manzanita between Montaña de Oro State Park and the Cabrillo Estates, is essential for the long-term persistence of the species.

- Continue with removal of *Eucalyptus* that are growing adjacent to Morro manzanita stands at Montaña de Oro State Park. Monitor the success of *Eucalyptus* stand removal and recolonization of Morro manzanita into the habitat at Montaña de Oro State Park and at the Pecho unit of the Morro Dunes Ecological Reserve. Planting of native vegetation (including Morro manzanita) may be needed after *Eucalyptus* removal. Any *Eucalyptus* removal plans should consider the use of the trees for Monarch butterfly roost sites and wind breaks before removal.
- Conduct a detailed survey for Morro manzanita to determine the current distribution and abundance of the species. Work with agencies and organizations, such as the USFWS, State Parks, the County of San Luis Obispo, and CNPS, to conduct surveys. Submit all findings to the CNDDB.
- Monitor Morro manzanita on conserved lands. Monitoring should include regular site visits to monitor the health of the Morro manzanita stands, detect pathogens (e.g., *Phytophthora* infection), and track invasive species.
- Manage all conserved occupied Morro manzanita habitat for the persistence of the species. Management recommendations should be based on the characteristics of the Morro manzanita stand on the site (i.e., age of stand, proximity to development, recreational impacts on the site, level of invasion by non-native plants, etc.). Management recommendations should include success criteria to evaluate the effectiveness of implemented management.
- Determine the need, feasibility, and timing of prescribed burns at Morro manzanita stands on protected lands. Identify which Morro manzanita stands may benefit from a prescribed burn and work with Morro manzanita experts and land managers to properly implement prescribed burns, if needed.
- Conduct experimental studies on which types of treatments may best serve as fire surrogates for use in areas where prescribed burning of Morro manzanita stands may not be a realistic option.
- Work with CAL FIRE to verify the implementation of appropriate fuel break procedures and practices for use in occupied Morro manzanita habitat. Emphasis should be placed on practices that maintain ecosystem function and do not directly impact Morro manzanita individuals.
- Continue research on Morro manzanita biology and ecology to help guide management, restoration, and recovery efforts. Additional research is needed across Morro manzanita's range on seed viability, dispersal, and germination rates; genetic diversity of the species; and factors affecting reproductive success.

- Collect seeds across the range of Morro manzanita to make sure the full genetic diversity of the species is seed banked at an accredited institution for long-term conservation storage.
- Model the projected effects of climate change on the distribution of Morro manzanita. Consider these results when developing management strategies for the species.
- Educate the public on the unique and sensitive species in the Morro Bay area, including Morro manzanita. Discourage the planting of other manzanita species in landscaping due to the risk of hybridization.

Acknowledgements

This status review was prepared by Kristi Lazar in the Department's Habitat Conservation Planning Branch, Native Plant Program.

The Department would like to thank Dr. Neil Havlik, Dr. David Keil, and Dr. V. Thomas Parker for providing scientific peer review for this status review.

Literature Cited

Literature

Acsai, J., and D. Largent. 1983. Fungi associated with *Arbutus menziesii*, *Arctostaphylos manzanita*, and *Arctostaphylos uva-ursi* in Central and Northern California. Mycologia 75(3):544–547.

Aguilar, R., L. Ashworth, L. Galetto, and M. Aizen. 2006. Plant reproductive susceptibility to habitat fragmentation: review and synthesis through a meta-analysis. Ecology Letters 9:968–980.

Allphin, L., D. Wiens, and K. Harper. 2002. The relative effects of resources and genetics on reproductive success in the rare Kachina daisy, *Erigeron kachinensis* (Asteraceae). International Journal of Plant Sciences 163:599–612.

Ballek, C., A. Burke, K. Dartnell, A. Goode, E. Leinius, Z. Moore, D. Ortega, S. Santitoro, and B. Slosberg. 2024. An analysis of the effects of clearcutting and firebreaks on Morro manzanita in Los Osos, CA. Unpublished report. California Polytechnic State University, San Luis Obispo, CA.

Barbour, M., and J. Major. 1988. Terrestrial vegetation of California, new expanded edition, 1988. California Native Plant Society, Sacramento, CA, USA.

Bedsworth, L., D. Cayan, G. Franco, L. Fisher, and S. Ziaja. 2018. Statewide summary report. California's fourth climate change assessment. Publication number: SUM-CCCA4-2018-013. Available from: https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf (Accessed: 15 February 2023).

Bicknell, S. 1990. Montaña de Oro State Park presettlement vegetation mapping and ecological status of E*ucalyptus:* final report. Prepared in fulfillment of an interagency agreement between the California Department of Parks and Recreation and Humboldt State University.

Board of Forestry and Fire Protection. 2019. California Vegetation Treatment Program Final Program Environmental Impact Report, State Clearinghouse #2019012052. Prepared by Ascent Environmental. Available from: https://bof.fire.ca.gov/projects-and-programs/calvtp-homepage-and-storymap/#d9499eb8-3766-44bc-95f9-8aa760b81b10 (Accessed 24 April 2026).

Byers, D., and T. Meagher. 1991. Mate availability in small populations of plant species with homomorphic sporophytic self-incompatibility. Heredity 68:353–359.

Cal-Adapt. 2024. Local climate change snapshot for the vicinity of Morro Bay, California. Available from: https://cal-adapt.org/tools/local-climate-change-snapshot (Accessed: 24 October 2024).

CAL FIRE (California Department of Forestry and Fire Protection). 2024. Frequently asked questions about: 2024 fire hazard severity zones. Available from: https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones (Accessed: 23 April 2026).

CAL FIRE (California Department of Forestry and Fire Protection). 2025a. Fire Hazard Severity Zones and local public contacts. Available from: https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones (Accessed: 4 June 2025).

CAL FIRE (California Department of Forestry and Fire Protection). 2025b. Fire perimeters dataset (GIS). Available from: https://www.fire.ca.gov/what-we-do/fire-resource-assessment-program/fire-perimeters (Accessed: 4 June 2025).

CAL FIRE (California Department of Forestry and Fire Protection). 2025c. Fuel reduction projects viewer. Available from: https://www.fire.ca.gov/what-we-do/natural-resource-management/fuels-reduction (Accessed: 18 June 2025).

California Coastal Commission. 1995. Staff report and recommendation on consistency determination, removal of unexploded ordnance and ordnance waste. Available from: https://documents.coastal.ca.gov/reports/1995/12/Th5c-12-1995.pdf (Accessed: 2026 March 13).

California Coastal Commission. 2000a. Claimed of vested rights, staff report and recommendation, 3-99-048-VRC. Available from: https://documents.coastal.ca.gov/reports/2000/5/Th11a-5-2000.pdf (Accessed: 16 May 2025).

California Coastal Commission. 2000b. Staff report: Regular calendar, coastal development permit for Cabrillo Associates/Central Coast Engineering (Charles Pratt and Ben Maddalena), A-3-SLO-98-087. Available from: https://documents.coastal.ca.gov/reports/2000/6/Th14a-6-2000.pdf (Accessed: 16 May 2025).

California Department of Parks and Recreation. 2025. Restoration permit application for Morro manzanita within Montaña de Oro State Park, dated 9/5/2025. Submitted to the California Department of Fish and Wildlife, Sacramento, CA, USA.

California Plant Rescue. 2021. Extract of seed collection database for Morro manzanita. Available from the California Natural Diversity Database, Sacramento, CA, USA.

California Plant Rescue. 2025. Seed collection search for *Arctostaphylos morroensis*. Available from: https://www.caplantrescue.org/caseedbanks.html#publicsearch (Accessed: 8 January 2025).
Calscape. 2024. Plant profile for Morro manzanita (*Arctostaphylos morroensis*). Available from: https://calscape.org/Arctostaphylos-morroensis-(Morro-Manzanita) (Accessed: 25 October 2024).
CCH (Consortium of California Herbaria). 2024. Consortium of California Herbaria portal 2. Queries for herbarium specimens of *Arctostaphylos* in the Morro Bay area of San Luis Obispo County. Available from: https://cch2.org/portal/ (Accessed: 1 October 2024).
CDFW (California Department of Fish and Wildlife). 2024. Department response to Regulation Change Petition No. 2023-17: request amendment to title 14, CCR to allow the use of horses on designated trails on the Bayview Unit of Morro Dunes Ecological Reserve.
CDFW (California Department of Fish and Wildlife). 2026. Climate change vulnerability assessment for Morro manzanita (*Arctostaphylos morroensis*). The NatureServe Climate Change Vulnerability Index, release 4.0.
CNDDB (California Natural Diversity Database). 2020. California Natural Diversity Database (CNDDB) Management Framework. California Department of Fish and Wildlife, Sacramento, CA, USA.
CNDDB (California Natural Diversity Database). 2025. RareFind 5 [internet]. Government version- dated July 2025. California Department of Fish and Wildlife, Sacramento, CA, USA.
CNDDB (California Natural Diversity Database), and CNPS (California Native Plant Society). 2020. The CNDDB and CNPS cooperative relationship and rare plant status review process. Sacramento, CA, USA. Available from: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=175695&inline (Accessed: 2 August 2024).
CNPS (California Native Plant Society). 2024a. CNPS inventory of rare and endangered plants of California: *Arctostaphylos morroensis*. Available from: https://rareplants.cnps.org/Plants/Details/27 (Accessed: 2 August 2024).
CNPS (California Native Plant Society). 2024b. A manual of California vegetation, online edition. Available from: http://www.cnps.org/cnps/vegetation (Accessed: 26 July 2024).
Cochrane, S. 1996. Chronology of Morro manzanita (*Arctostaphylos morroensis*) activities. Unpublished report available from the California Department of Fish and Wildlife's Native Plant Program.
County of San Luis Obispo. 2007. Coastal plan policies: Local Coastal Program policy document, a portion of the San Luis Obispo County Land Use Element of the General Plan. Adopted by the San Luis Obispo County Board of Supervisors, March 1, 1988-Resolution 88-115. Program certified by the California Coastal Commission, February 25, 1988. Revised April 2007. Available from: https://www.slocounty.ca.gov/departments/planning-building/forms-documents/plans-and-elements/elements/coastal-plan-policy (Accessed: 16 June 2025).

County of San Luis Obispo. 2019. San Luis Obispo County multi-jurisdictional hazard mitigation plan. Available from: https://www.slocounty.ca.gov/departments/planning-building/forms-documents/plans-and-elements/elements/local-hazard-mitigation-plan (Accessed: 29 August 2024).
County of San Luis Obispo. 2024a. Los Osos Community Plan. Available from: https://www.slocounty.ca.gov/departments/planning-building/forms-documents/plans-and-elements/community-plans/los-osos-community-plan/cert-los-osos-community-plan (Accessed: 16 June 2025).
County of San Luis Obispo. 2024b. South Bay Boulevard bridge replacement project, habitat mitigation and monitoring plan, February 5, 2024, San Luis Obispo County, Federal Project BRLS-5949(137). Prepared by San Luis Obispo County Public Works Department, Environmental Programs Division.
CSUN (California State University Northridge), and CDFW (California Department of Fish and Wildlife). 2014. A shared vision for the survey of California vegetation. Available from: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=114778&inline (Accessed: 26 July 2024).
D'Antonio, C., and B. Mahall. 1991. Root profiles and competition between the invasive, exotic perennial, *Carpobrotus edulis*, and two native shrub species in California coastal scrub. American Journal of Botany 78(7):885–894.
D'Antonio, C., and P. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics 23:63–87.
Daly, C., M. Halbleib, J. Smith, W. Gibson, M. Doggett, G. Taylor, J. Curtis, and P. Pasteris. 2008. Physiographically sensitive mapping of climatological temperature and precipitation across the conterminous United States. International Journal of Climatology 28:2031–2064.
Daly, C., R. Neilson, and D. Phillips. 1994. A statistical-topographic model for mapping climatological precipitation over mountainous terrain. Journal of Applied Meteorology 33:140–158.
Damschen, E., S. Harrison, D. Ackerly, B. Fernandez-Going, and B. Anacker. 2012. Endemic plant communities on special soils: early victims or hardy survivors of climate change? Journal of Ecology 100:1122–1130.
Drake-Schultheis, L., C. D'Antonio, and R. Oono. 2022. Patterns and distribution of Botryosphaeriaceae fungi related to dieback in big berry manzanita. Phytopathology 112:2341–2350.
Ellstrand, N., and D. Elam. 1993. Population genetic consequences of small population size: implications for plant conservation. Annu. Rev. Ecol. Syst. 24:217–242.
ESRI (Environmental Systems Research Institute). 2024. World imagery [basemap]. Scale not given. World Imagery Map. February 25, 2024. Available from: https://www.arcgis.com/home/item.html?id=10df2279f9684e4a9f6a7f08febac2a9 (Accessed: 60 June 2025).
Estero Bay News. 2026, January 14. WW2 Baywood Park Training Area. Estero Bay News. Available from: https://esterobaynews.com/history/ww2-baywood-park-training-area/ (Accessed: 2026 March 13).

Forest Management Task Force. 2021. California's wildfire and forest resilience action plan: A comprehensive strategy of the Governor's forest management task force. Available from: https://wildfiretaskforce.org/action-plan/ (Accessed: 20 April 2026).
Garbelotto, M., T. Popenuck, B. Hall, W. Schweigkofler, F. Dovana, R. Goldstein de Salazar, D. Schmidt, and L. Sims. 2020. Citizen science uncovers *Phytophthora ramorum* as a threat to several rare or endangered California manzanita species. Plant Disease 104:3173–3182.
GIC (Geographic Information Center). 2024. Vegetation classification and mapping for Montaña de Oro State Park. Prepared for California Department of Parks and Recreation by North State Planning and Development Collective, Chico, CA, USA.
Gowen, D., and L. Johnson. 2020. On the taxonomic status of the varieties of *Chorizanthe angustifolia* (Polygonaceae). Phytotaxa 455(1):001–008.
Grünwald, N., J. LeBoldus, and R. Hamelin. 2019. Ecology and evolution of the sudden oak death pathogen *Phytophthora ramorum*. Annual Review of Phytopathology 57:301–321.
Hacker, D. 2025. Memorandum on Morro Bay kangaroo rat visual survey for Pecho unit Eucalyptus removal. California Department of Fish and Wildlife, CA, USA.
Hall, C., W. Ernst, S. Prior, and J. Wiese. 1979. Geologic map of the San Luis Obispo-San Simeon region, California. U.S. Geological Survey, Miscellaneous Investigations Series, Map I-1097.
Harnik, P., C. Simpson, and J. Payne. 2012. Long-term differences in extinction risk among the seven forms of rarity. Proceedings of the Royal Society B 279:4969–4976.
Hawkins, B., S. Sharrock, and K. Havens. 2008. Plants and climate change: which future? Botanic Gardens Conservation International, Richmond, UK.
Holland, R. 1986. Preliminary descriptions of the terrestrial natural communities of California. California Department of Fish and Game, Sacramento, CA.
Holland, V., and A. Hazebrook. 1993. Botanical survey of Tract 1873, Los Osos, San Luis Obispo County, California. Prepared for The Morro Group, San Luis Obispo, CA, USA.
Hook, D., J. Vanneman, K. Gray, M. Showers, M. Helmich, M. Burford, D. Sears, R. Ueltzen, G. Cave, G. Caplener, and J. Cohen. 1988. Montaña de Oro State Park general plan. California Department of Parks and Recreation, Sacramento, CA, USA.
Horton, T., T. Bruns, and V. Parker. 1999. Ectomycorrhizal fungi associated with *Arctostaphylos* contribute to *Pseudotsuga menziesii* establishment. Canadian Journal of Botany 77:93–102.
iNaturalist. 2025. iNaturalist observations of *Arctostaphylos morroensis*. Available from: https://www.inaturalist.org/observations?subview=map&taxon_id=75525 (Accessed: 12 May 2025).
IPCC. 2014. Climate change 2014: synthesis report. Contribution of working groups I, II and III to the fifth assessment report of the intergovernmental panel on climate change [core writing team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland. 151 pp.

IPCC. 2021. Climate change 2021: the physical science basis. Contribution of working group I to the sixth assessment report of the intergovernmental panel on climate change. V. Masson-Delmotte, P. Zhai, A. Pirani, S. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. Matthews, T. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou, editors. Cambridge University Press, Cambridge, UK and New York, NY, USA.

IPCC. 2022. Climate change 2022: impacts, adaptation, and vulnerability. Contributions of working group II to the sixth assessment report of the intergovernmental panel on climate change. H. Pörtner, D. Roberts, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, and B. Rama, editors. Cambridge University Press, Cambridge, UK and New York, NY, USA.

IUCN Standards and Petitions Committee. 2024. Guidelines for using the IUCN red list categories and criteria. Version 16. Prepared by the Standards and Petitions Committee. Available from: https://www.iucnredlist.org/documents/RedListGuidelines.pdf (Accessed: 06 January 2026).

Jepson, W. 1922. Revision of the California species of the genus *Arctostaphylos*. Madroño 1(4):76–86.

Jodi McGraw Consulting. 2020. Interim adaptive management and monitoring plan for the Los Osos Habitat Conservation Plan Preserve System. Prepared for the County of San Luis Obispo, California Department of Fish and Wildlife, and United States Fish and Wildlife Service. Available from: https://www.slocounty.ca.gov/departments/planning-building/forms-documents/communities-villages-forms-and-documents/los-osos-planning-documents/los-osos-habitat-conservation-plan (Accessed: 15 July 2025).

Jodi McGraw Consulting. 2022. Los Osos Habitat Conservation Plan. Prepared for the County of San Luis Obispo. Available from: https://www.slocounty.ca.gov/departments/planning-building/grid-items/community-engagement/active-planning-projects/los-osos-habitat-conservation-plan-(hcp) (Accessed: 5 August 2024).

John F. Rickenbach Consulting. 2020. Final environmental impact report for the Los Osos Community Plan. Prepared for the County of San Luis Obispo. Available from: https://www.slocounty.ca.gov/departments/planning-building/forms-documents/plans-and-elements/community-plans/los-osos-community-plan-update-files/final-environmental-impact-report-(feir)-for-the-l (Accessed: 17 October 2024).

Kahn, K., R. Moroney, and D. Jackson. 2024. San Luis Obispo County Local Coastal Program amendment number LCP-3-SLO-21-0028-1-Part G (Los Osos Community Plan). Memo to the coastal commissioners and interested parties.

Kauffmann, M., T. Parker, and M. Vasey. 2021. Field guide of manzanitas. California, North America, and Mexico. Second edition. Backcountry Press, Kneeland, California, USA.

Keeley, J. 1987a. Role of fire in seed germination of woody taxa in California chaparral. Ecology 68(2):434–443.

Keeley, J. 1987b. Ten years of change in seed banks of the chaparral shrubs, *Arctostaphylos glauca* and *A. glandulosa*. The American Midland Naturalist 117(2):446–448.
Keeley, J. 2002. Native American impacts on fire regimes of the California coastal ranges. Journal of Biogeography 29:303–320.
Keeley, J. 2007. Chaparral and fire. Fremontia 35(4):16–21.
Keeley, J., C. Fotheringham, and M. Morais. 1999. Reexamining fire suppression impacts on brushland fire regimes. Science 284:1829–1832.
Keeley, J., and R. Hays. 1976. Differential seed predation on two species of *Arctostaphylos* (Ericaceae). Oecologia 24:71–81.
Keeley, J., and P. Zedler. 1978. Reproduction of chaparral shrubs after fire: A comparison of sprouting and seeding strategies. The American Midland Naturalist 99:142–161.
Kelly, V., and V. Parker. 1990. Seed bank survival and dynamics in sprouting and nonsprouting *Arctostaphylos* species. The American Midland Naturalist 124(1):114–123.
Kofron, C., and C. Tyler. 2024. A petition to the State of California Fish and Game Commission to list Morro manzanita (*Arctostaphylos morroensis*). Available from: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=225156&inline (Accessed: 20 July 2024).
KSBY staff. 2020. Pile burning of hazardous vegetation to be conducted within Morro Dunes Ecological Reserve. Available from: https://www.ksby.com/news/local-news/pile-burning-of-hazardous-vegetation-to-be-conducted-within-morro-dunes-ecological-reserve (Accessed: 24 December 2025).
Langridge, R. 2018. Central coast summary report. California's fourth climate change assessment. Publication number: SUM-CCCA4-2018-006. Available from: https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-006_CentralCoast_ADA.pdf (Accessed: 3 September 2024).
Largent, D., N. Sugihara, and A. Brinitzer. 1980. *Amanita gemmata*, a non-host-specific mycorrhizal fungus of *Arctostaphylos manzanita*. Mycologia 72(2):435–439.
Levin, D. 1984. Inbreeding depression and proximity-dependent crossing success in *Phlox drummondii*. Evolution 38:116–127.
LSA Associates, Inc. 1992. An assessment of the status of the Morro manzanita (*Arctostaphylos morroensis*). Prepared for Central Coast Engineering, San Luis Obispo, CA, USA.
Lyons, M., J. Stevenson, L. Thurman, and B. Young. 2024. Guidelines for using the NatureServe Climate Change Vulnerability Index, release 4.0. NatureServe, Arlington, VA, USA.
Malajczuk, N., R. Molina, and J. Trappe. 1982. Ectomycorrhiza formation in *Eucalyptus*. I. Pure culture synthesis, host specificity and mycorrhizal compatibility with *Pinus radiata*. New Phytologist 91:467–482.
Master, L., D. Faber-Langendoen, R. Bittman, G. Hammerson, B. Heidel, L. Ramsay, K. Snow, A. Teucher, and A. Tomaino. 2012. NatureServe conservation status assessments: factors for evaluating species and ecosystem risk. NatureServe, Arlington, VA, USA.

MCAS (Morro Coast Audubon Society). Undated. Brochure on the Sweet Springs Nature Preserve. Available from: https://www.morrocoastaudubon.org/p/sweet-springs-nature-preserve.html (Accessed: 29 January 2026).
McFadden, K. 2021. Understory vegetation composition and small mammal abundance in an exotic *Eucalyptus* forest vs adjacent native habitat. Master of Science, California Polytechnic State University, San Luis Obispo.
McGuire, T., and S. Morey. 1992. Report to the Fish and Game Commission on the status of Morro Bay manzanita (*Arctostaphylos morroensis*). Natural Heritage Division status report 92-4. California Department of Fish and Game, Sacramento, CA, USA.
McLeod, M. 1991. A petition to the State of California Fish and Game Commission to list Morro Bay manzanita (*Arctostaphylos morroensis*). Unpublished report.
Melbourne, B., and A. Hastings. 2008. Extinction risk depends strongly on factors contributing to stochasticity. Nature 454:100–103.
Menges, E. 1991. The application of minimum viable population theory to plants. Pages 45-61 in D. Falk and K. Holsinger, editors. Genetics and conservation of rare plants. Oxford University Press, Inc., New York, NY, USA.
Merriam, K., J. Keeley, and J. Beyers. 2007. The role of fuel breaks in the invasion of nonnative plants. U.S. Geological Survey Scientific Investigations Report 2006-5185. U.S. Geological Survey, Reston, VA, USA.
Moeller, H., I. Dickie, D. Peltzer, and T. Fukami. 2015. Mycorrhizal co-invasion and novel interactions depend on neighborhood context. Ecology 96(9):2336–2347.
Molina, R., and J. Trappe. 1982. Lack of mycorrhizal specificity by the Ericaceous hosts *Arbutus menziesii* and *Arctostaphylos uva-ursi*. New Phytologist 90:495–509.
Moore, C., and S. Vander Wall. 2015. Scatter-hoarding rodents disperse seeds to safe sites in a fire-prone ecosystem. Plant Ecology 216(8):1137–1153.
Morro Group, Inc. 1985. Supplemental environmental impact report for proposed Cabrillo Estates subdivision, tentative tract 308. Prepared for Office of Environmental Coordinator, County of San Luis Obispo, CA, USA.
Morro Group, Inc. 2003. Draft recovery action plan for the El Moro Elfin Forest, Los Osos, CA. Prepared for County Government Center, Department of General Services, Parks Division. San Luis Obispo, CA, USA.
Moser, S., and J. Ekstrom. 2012. Developing adaptation strategies for San Luis Obispo County: preliminary climate change vulnerability assessment for social systems. California Energy Commission. Publication number: CEC-500-2012-054.
Mullany, M. 1990. The distribution and variation of *Arctostaphylos morroensis* (Ericaceae). Master of Science in Biological Sciences, California Polytechnic State University, San Luis Obispo, CA, USA.
NatureServe. 2025. NatureServe Explorer [web application] NatureServe, Arlington, Virginia, USA. Available from: https://explorer.natureserve.org/ (Accessed: 18 December 2025).
Ne'eman, G., C. Fotheringham, and J. Keeley. 1999. Patch to landscape patterns in post fire recruitment of a serotinous conifer. Plant Ecology 145(2):235–242.
Nelson, K. 2016. Evaluating the myth of allelopathy in California blue gum plantations Master of Science in Biology, California Polytechnic State University, San Luis Obispo, CA, USA.

NPS (National Park Service). 2006. Brochure on *Eucalyptus* for the Golden Gate National Recreation Area/Point Reyes National Seashore. U.S. Government Printing Office, Washington, D.C., USA. Available from: https://www.nps.gov/pore/learn/nature/upload/firemanagement_fireeducation_newsletter_eucalyptus.pdf (Accessed: 10 June 2025).
Odion, D., and C. Tyler. 2002. Are long fire-free periods needed to maintain the endangered, fire-recruiting shrub *Arctostaphylos morroensis* (Ericaceae)? Conservation Ecology 6(2):4.
Parker, V. 2007. Diversity and evolution of *Arctostaphylos* and *Ceanothus*. Fremontia 35(4):8–11.
Parker, V. 2015. Seed bank divergence between *Arctostaphylos* Adans. (Ericaceae) and *Ceanothus* L. (Rhamnaceae) suggests different seed predator interactions. Ecologia mediterranea 41(2):5–13.
Parker, V., M. Vasey, and J. Keeley. 2009. *Arctostaphylos* in Flora of North America Editorial Committee, editors. Flora of North America North of Mexico [online]. 25+ vols. New York and Oxford. Available from: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250092374. (Accessed: 6 November 2025).
Parker, V., M. Vasey, and J. Keeley. 2023. *Arctostaphylos* in Jepson Flora Project, editors. Jepson eFlora, Revision 12. Available from: https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=9173 (Accessed: 6 November 2025).
Parmesan, C. 2006. Ecological and evolutionary responses to recent climate change. Annual Reviews of Ecology, Evolution, and Systematics 37:637–669.
Parmesan, C., and G. Yohe. 2003. A globally coherent fingerprint of climate change impacts across natural systems. Nature 421:37–42.
Peterson, E., E. Hansen, and J. Hulbert. 2014. Source or sink? The role of soil and water borne inoculum in the dispersal of *Phytophthora ramorum* in Oregon tanoak forests. Forest Ecology and Management 322:48–57.
Peterson, N., and V. Parker. 2016. Dispersal by rodent caching increases seed survival in multiple ways in canopy-fire ecosystems. Ecology and Evolution 6(13):4298–4306.
Pickart, A. 2000. *Ehrharta calycina*, *Ehrharta erecta*, and *Ehrharta longiflora*. Pages 164-170 in C. Bossard, J. Randall, and M. Hoshovsky, editors. Invasive plants of California's wildlands. University of California Press, Berkeley, Los Angeles, London.
Pierce, D., J. Kalansky, and D. Cayan. 2018. Climate, drought, and sea level rise scenarios for the fourth California Climate Assessment. California's Fourth Climate Change Assessment, California Energy Commission. Publication Number: CCCA4-CEC-2018-006. Available from: https://www.energy.ca.gov/sites/default/files/2019-11/Projections_CCCA4-CEC-2018-006_ADA.pdf (Accessed: 15 December 2022).
Poore, M., and C. Fries. 1985. The ecological effects of *Eucalyptus*. FAO forestry paper 59, Food and Agriculture Organization of the United Nations, Rome, Italy. Available from: https://www.fao.org/4/an793e/an793e00.pdf (Accessed: 18 October 2024).

Potts, J., E. Marino, and S. Stephens. 2010. Chaparral shrub recovery after fuel reduction: a comparison of prescribed fire and mastication techniques. Plant Ecology 210(2):303–315.
Prism Climate Group. 2024. PRISM climate data for the Morro Bay area. Oregon State University. Available from: https://prism.oregonstate.edu (Accessed: 4 October 2024).
Rabinowitz, D. 1981. Seven forms of rarity. Pages 205-217 in Hugh Synge, editor. The biological aspects of rare plant conservation. John Wiley & Sons, Chichester, UK.
Rizzo, D., and M. Garbelotto. 2003. Sudden oak death: endangering California and Oregon forest ecosystems. Frontiers in Ecology and the Environment 1(5):197–204.
Rizzo, D., M. Garbelotto, J. Davidson, G. Slaughter, and S. Koike. 2002. *Phytophthora ramorum* as the cause of extensive mortality of *Quercus* spp. and *Lithocarpus densiflorus* in California. Plant Disease 86:205–214.
Roest, A. 1982. The Morro Bay kangaroo rat recovery plan. Prepared by the U.S. Fish and Wildlife Service in cooperation with Dr. Aryan I. Roest, California Polytechnic State University, San Luis Obispo, CA, USA.
Rose, M., S. Velazco, H. Regan, and J. Franklin. 2022. Rarity, geography, and plant exposure to global change in the California Floristic Province. Global Ecology and Biogeography 32:218–232.
Rundel, P. 2018. Chapter 1: California chaparral and its global significance. Pages 1-27 in E. Underwood, H. Safford, N. Molinari, and J. Keeley, editors. Valuing chaparral. Springer series on environmental management. Springer, Cham.
San Luis Obispo Council of Governments. 2004. 2004 regional profile. Available at: https://www.slocog.org/sites/default/files/documents/Chap%202%20Population_0.pdf (Accessed: 16 October 2024).
San Luis Obispo County Community Fire Safe Council. 2009. Los Osos Community Wildfire Protection Plan. Prepared for the Los Osos Community Services District, San Luis Obispo County, CA.
Sarafian, P. 2011. First semi-annual report for endangered species permit TE-101462-2. Unpublished report submitted to the U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, CA, USA.
Sawyer, J., T. Keeler-Wolf, and J. Evens. 2009. A manual of California vegetation, second edition. California Native Plant Society Press, Sacramento, CA.
Scheffers, B., L. de Meester, T. Bridge, A. Hoffmann, J. Pandolfi, R. Corlett, S. Butchart, P. Pearce-Kelly, K. Kovacs, D. Dudgeon, M. Pacifici, C. Rondinini, W. Foden, T. Martin, C. Mora, D. Bickford, and J. Watson. 2016. The broad footprint of climate change from genes to biomes to people. Science 354:aaf7671.
Shaffer, M. 1981. Minimum population sizes for species conservation. BioScience 31:131–134.
Shaffer, M. 1987. Minimum viable populations: coping with uncertainty. Pages 69-86 in M. Soule, editor. Viable populations for conservation. Cambridge University Press, Cambridge.
Slippers, B., G. Fourie, P. Crous, T. Coutinho, B. Wingfield, A. Carnegie, and M. Wingfield. 2004. Speciation and distribution of *Botryosphaeria* spp. on native and introduced *Eucalyptus* trees in Australia and South Africa. Studies in Mycology 50:343–358.

Slippers, B., and M. Wingfield. 2007. Botryosphaeriaceae as endophytes and latent pathogens of woody plants: diversity, ecology and impact. Fungal Biology Reviews 21:90–106.
Soil Conservation Service. 1984. Soil survey of San Luis Obispo County, California, coastal part. United States Department of Agriculture in cooperation with University of California Agricultural Experiment Station.
Soil Survey Staff. 2024. Web Soil Survey. Natural Resources Conservation Service, United States Department of Agriculture. Available from: http://websoilsurvey.nrcs.usda.gov/ (Accessed: 12 July 2024).
Staude, I., L. Navarro, and H. Pereira. 2020. Range size predicts the risk of local extinction from habitat loss. Global Ecology and Biogeography 29:16–25.
Stillman, M., P. Wall, K. Whelan, and C. Tyler. 2025. Seed germination for restoration in a challenging species: case study with rare Morro manzanita. Ecological Restoration 43(2):126–135.
Swain, D., B. Langenbrunner, J. Neelin, and A. Hall. 2018. Increasing precipitation volatility in twenty-frst-century California. Nature Climate Change 8:427–433.
Swiecki, T., and E. Bernhardt. 2003. Diseases threaten the survival of Ione manzanita (*Arctostaphylos myrtifolia*). Prepared for Barbara Holzman, Ph.D. at San Francisco State University in fulfillment of subcontract for Conservation and Recovery of Ione Endemic Plants. Available from: https://phytosphere.com/publications/Ionemanzfinal.pdf (Accessed: 29 August 2025).
Swiecki, T., E. Bernhardt, M. Garbelotto, and E. Fichtner. 2011. The exotic plant pathogen *Phytophthora cinnamomi*: a major threat to rare *Arctostaphylos* and much more. Proceedings of the CNPS Conservation Conference, 17-19 Jan 2009:367–371.
Terra Verde Environmental Consulting, L. 2019. El Moro Elfin Forest final biological assessment report. Prepared for Los Osos-Morro Bay Chapter of Small Wilderness Preservation Area. San Luis Obispo County, CA, USA.
The Morro Group. 1996. Final supplemental environmental impact report, Cabrillo Associates Tract 1873, Los Osos, California. Prepared for the Office of the Environmental Coordinator, County of San Luis Obispo. San Luis Obispo, CA, USA.
Tornatzky, L. 2016. Images of America: Los Osos/Baywood Park. Arcadia Publishing, Charleston, SC, USA.
Tyler, C., and C. Kofron. 2024. Ecology and conservation status of Morro manzanita *Arctostaphylos morroensis:* a threatened plant endemic to Los Osos, San Luis Obispo County, California. Bull. Southern California Acad. Sci. 123(1):25–52.
Tyler, C., D. Meade, and D. Odion. 2023. Flowering, fruit set, and seed predation in *Arctostaphylos morroensis*, a rare obligate-seeding shrub. Madroño 70(4):197–209.
Tyler, C., and D. Odion. 1996. Ecological studies of Morro Manzanita (*Arctostaphylos morroensis*). Report prepared for the California Department of Fish and Game, Endangered Plant Program.
Tyler, C., and D. Odion. 2020. Seed banks, seed germination, and implications for conservation of the endangered, fire-dependent shrub, *Arctostaphylos morroensis*. Natural Areas Journal 40(2):155–167.

Tyler, C., D. Odion, and D. Meade. 1998. Ecological studies of Morro manzanita (*Arctostaphylos morroensis*): seed ecology, and reproductive biology. Report prepared for the California Department of Fish and Game, Species Conservation and Recovery Program.

U.S. Army Corps of Engineers. 2017. Baywood Park Training Area fact sheet. Available from: https://www.spl.usace.army.mil/Portals/17/docs/FUDS/BPTA_FactSheet_2017.pdf?ver=2018-01-25-125131-733 (Accessed: 2026 March 13).

USDA (United States Department of Agriculture). 1937a. Aerial photo of the Baywood Park area, Flight AXH-1937, Frame 104. Courtesy of UCSB Library Geospatial Collection, University of California, Santa Barbara. Available from: https://mil.library.ucsb.edu/ap_indexes/FrameFinder/ (Accessed: 13 June 2025).

USDA (United States Department of Agriculture). 1937b. Aerial photo of the Los Osos area, Flight AXH-1937, Frame 76. Courtesy of UCSB Library Geospatial Collection, University of California, Santa Barbara. Available from: https://mil.library.ucsb.edu/ap_indexes/FrameFinder/ (Accessed: 13 June 2025).

USDA (United States Department of Agriculture). 1949. Aerial photo of the Los Osos area, Flight AXH-1949, Frame 88. Courtesy of UCSB Library Geospatial Collection, University of California, Santa Barbara. Available from: https://mil.library.ucsb.edu/ap_indexes/FrameFinder/ (Accessed: 13 June 2025).

USFWS (United States Fish and Wildlife Service). 1994. Endangered and threatened wildlife and plants; endangered or threatened status for five plants and the Morro shoulderband snail from western San Luis Obispo County, California. Federal Register 59:64613–64623.

USFWS (United States Fish and Wildlife Service). 1998. Recovery plan for the Morro shoulderband snail and four plants from western San Luis Obispo County, California. United States Fish and Wildlife Service, Portland, OR, USA.

USFWS (United States Fish and Wildlife Service). 2008. *Arctostaphylos morroensis* (Morro manzanita). 5-year review: summary and evaluation. United States Fish and Wildlife Service, Ventura, CA, USA.

USFWS (United States Fish and Wildlife Service). 2013. *Arctostaphylos morroensis* (Morro manzanita). 5-year review: summary and evaluation. United States Fish and Wildlife Service, Ventura, CA, USA.

USFWS (United States Fish and Wildlife Service). 2022. Morro manzanita (*Arctostaphylos morroensis*) 5-year review: Summary and evaluation. United States Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, California. 15 pp.

USGS (United States Geological Survey). 2023. USGS Watershed Boundary Dataset (WBD) for 2-digit Hydrologic Unit-18. Available from: https://www.usgs.gov/national-hydrography/access-national-hydrography-products (Accessed: 15 October 2024).

Van de Water, K., and H. Safford. 2011. A summary of fire frequency estimates for California vegetation before Euro-American settlement. Fire Ecology 7(3):26–58.

Vasey, M., V. Parker, K. Holl, M. Loik, and S. Hiatt. 2014. Maritime climate influence on chaparral composition and diversity in the coast range of central California. Ecology and Evolution 4(18):3662–3674.
Warren, R., J. Price, A. Fischlin, S. de la Nava Santos, and G. Midgley. 2011. Increasing impacts of climate change upon ecosystems with increasing global mean temperature rise. Climatic Change 106:141–177.
Wells, P. 1962. Vegetation in relation to geological substratum and fire in the San Luis Obispo Quadrangle, California. Ecological Monographs 32:79–103.
Wells, P. 1969. The relation between mode of reproduction and extent of speciation in the woody genera of the California chaparral. Evolution 23:264–267.
Wiegers, M. 2021. Preliminary geologic map of the west half of the San Luis Obispo 30' x 60' quadrangle, California, version 2.0: California Geological Survey, scale 1:100,000. Available from: https://www.conservation.ca.gov/cgs/rgm/preliminary (Accessed: 20 June 2024).
Wiens, J. 2016. Climate-related local extinctions are already widespread among plant and animal species. PLoS Biol 14:1–18.
Wieslander, A., and B. Schreiber. 1939. Notes on the genus *Arctostaphylos*. Madroño 5(1):38–47.
Wolf, K., and J. DiTomaso. 2016. Management of blue gum eucalyptus in California requires region-specific consideration. California Agriculture 70:39–47.
Zedler, P., C. Gautier, and G. McMaster. 1983. Vegetation change in response to extreme events: the effect of a short interval between fires in California chaparral and coastal scrub. Ecology 64(4):809–818.
Zedler, P., and G. Scheid. 1988. Invasion of *Carpobrotus edulis* and *Salix lasiolepis* after fire in a coastal chaparral site in Santa Barbara County, California. Madroño 35(3):196–201.

Personal Communications

Barker, D. 2025. Email about the WorldCom/AT&T cable landing project and Morro manzanita. [13 August 2025].
California Department of Parks and Recreation. 2025. Virtual meeting with Katie Drexhage and Mike Walgreen with California Department of Parks and Recreation to discuss Morro manzanita in Montaña de Oro State Park. [30 January 2025].
Chesnut, J. 2026a. Email about Morro manzanita at Sweet Springs Nature Preserve. [11 January 2026].
Chesnut, J. 2026b. Email about Morro manzanita at Sweet Springs Nature Preserve. [26 January 2026].
Chesnut, J. 2026c. Email about Morro manzanita at Sweet Springs Nature Preserve. [29 January 2026].
Drexhage, K. 2025a. Email about recruitment of Morro manzanita after treatment of *Eucalyptus* at Montaña de Oro State Park [12 February 2025].
Drexhage, K. 2025b. Emails about bioblitz for Morro manzanita on April 8 at Montaña de Oro State Park. [7 May 2025].
Keil, D. 2026. External peer review comments for CDFW's draft Morro manzanita status review. [12 March 2026].

Parker, T. 2026. External peer review comments for CDFW's draft Morro manzanita status review. [13 March 2026].
Sarafian, P. 2009. Email about destruction of federally listed Morro manzanita on over an acre in Elfin Forest. [25 May 2009].
Sarafian, P. 2021. Email to Chris Kofron about die-off of Morro manzanita plants at the El Moro Elfin Forest Natural Area. [23 October 2021].
VegCAMP (Vegetation Classification and Mapping Program). 2025. Comments made during internal review of the draft Morro manzanita status review. [17 December 2025].

Appendix A. Summary of Morro manzanita Occurrences

Table A1. Summary of CNDDB occurrence information and population estimates for Morro manzanita as of July 2025. Estimated population sizes are from information in LSA Associates, Inc. (1992), McGuire and Morey (1992), and the CNDDB (2025).

CNDDB occurrence number*	Location	Status	Year last seen	Estimated population size	Notes
1	1 mile east-northeast of Valencia Peak	Presumed extant	1936	Unknown	Possibly erroneous
4	Baywood Park, from near mouth of Los Osos Creek extending south to Santa Ynez Avenue, Morro Bay	Presumed extant	2025	900-3200	Population estimate is from the vicinity of Los Osos Creek only
9	From Los Osos Valley Road south nearly to Islay Canyon in Montaña de Oro State Park, south of Morro Bay	Presumed extant	2025	76,000-152,200+	Population estimate is for the Hazard Canyon area only.
18	0.6 air miles north-northeast of the South Bay Blvd bridge over Los Osos Creek, Morro Bay State Park	Presumed extant	2023	~12	
19	Northwest edge of Baywood Park near West end of Santa Ysabel Ave.	Presumed extant	2025	Few	

20	Between Eto Lake and Los Osos Valley Road, east of Willow Drive, Los Osos	Presumed extant	2025	Fewer than 30	
21	Along northern fork of the Crespi Loop Trail, south slope of Park Ridge, Morro Bay State Park	Presumed extant	2023	~20	
22	Ridgetop approximately 0.25 mile south of Valencia Peak, Montaña de Oro State Park	Presumed Extant	1989	1	No plants seen in the area in 2023.
23	Near junction of Manzanita Trail and Hazard Peak Trail, as well as along East Boundary Trail, Montaña de Oro State Park	Presumed extant	2025	Fewer than 10	

*CNDDB occurrence numbers are assigned in sequential order. As more information becomes available, occurrences are sometimes merged giving the appearance of skipped occurrence numbers.

Appendix B. Tribal Engagement Summary

The Department communicated with tribes throughout the status review process for Morro manzanita. The Department reached out to tribes identified by the Native American Heritage Commission as having a cultural or traditional affiliation with the geographic area of Morro manzanita. Initial outreach was in the form of a tribal notification letter sent to tribes to notify them that Morro manzanita is a candidate for listing as endangered under CESA and to explain the status review and listing process. Additionally, the tribal notification letter outlined opportunities for engagement with the Department in the form of direct communication with Department staff and formal government-to-government consultation. Additional details on the tribal outreach conducted for Morro manzanita and a summary of the responses received are listed below.

- On May 20, 2025, the Department distributed by mail and email the attached tribal notification letter to 21 contacts from 11 tribes. On August 4, 2025, follow-up emails were sent to tribes that had not yet responded to the tribal notification letter.
- In response to tribal notification, the Department received comments from three tribes. Two tribes expressed support for the preservation and conservation of Morro manzanita. One tribe provided information on traditional tribal uses of manzanita.

Appendix C. Public Comment Summary

A public notification letter was distributed to affected and interested parties to notify them that Morro manzanita is a candidate for listing as endangered under CESA. The letter requested data and comments on the species, explained that take authorizations are required now that the species is a candidate for listing, and explained the upcoming steps in the listing process. Additional details on the public outreach conducted for Morro manzanita and a summary of the responses received are listed below.

- On May 20, 2025, the Department distributed the attached public notification letter to approximately 50 affected or interested parties, including the County of San Luis Obispo, California Native Plant Society, State Parks, United States Fish and Wildlife Service, Bureau of Land Management, Caltrans, and the Cabrillo Estates property owners association.
- On May 20, 2025, the Department distributed the attached press release to a CDFW list serve for recipients interested in CESA listing. On May 23, 2025, the Department distributed the press release to an email distribution list maintained by the Department's Office of Communication, Education and Outreach, and posted the attached press release to the Department's Newsroom website.
- The Department received a total of seven responses. Three comments supported listing, two comments did not support listing, and one comment did not indicate if they supported or did not support listing.
    - Two comments were from the general public supporting the listing of Morro manzanita as endangered under CESA.
    - One comment was from the general public and discussed manzanita outside of Morro manzanita's range and was encouraging the planting of manzanita on hillsides along freeways.
    - One comment was from the Friends of El Moro Elfin Forest supporting the listing of Morro manzanita as endangered under CESA.
    - Comments provided by the County of San Luis Obispo indicate that they do not support listing of Morro manzanita as endangered under CESA since the Los Osos Habitat Conservation Plan provides permanent conservation, restoration, and effective management of Morro manzanita.
    - Comments from CAL FIRE do not support listing Morro manzanita as endangered under CESA as listing may create regulatory restrictions that undermine wildfire risk mitigation in Los Osos and the long-term ecological health of the species. CAL FIRE encourages CDFW to collaborate with local fire agencies, land managers, and conservation organizations to develop a management strategy that balances species protection with wildfire risk reduction.

All communications are on file with the Department and can be provided on request by emailing NativePlants@wildlife.ca.gov.

Appendix D. Peer Reviewer Summary

Pursuant to Fish and Game Code section 2074.6 and California Code of Regulations, title 14, section 670.1, subdivision (f)(2), the status review process included independent peer review by experts on Morro manzanita (Table D1). Reviewers were asked to evaluate the assessments and conclusions in the draft status review.

Table D1. Status review peer reviewers.

Name	Title and Affiliation
Neil Havlik, Ph.D.	• Retired Natural Resources Manager for the City of San Luis Obispo (1996-2012) • Board President for the Carrizo Plain Conservancy • Board member for the Coastal San Luis Resource Conservation District
David J. Keil, Ph.D.	• Professor Emeritus, California Polytechnic State University, San Luis Obispo • Co-author of the second edition of the "Vascular Plants of San Luis Obispo County, California"
V. Thomas Parker, Ph.D.	• Professor of Biology Emeritus, San Francisco State University • Editor-in-Chief of Madroño

Documents related to peer review are available as a supplemental document here: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=243919. The supplemental document includes the peer reviewer invitation letter, the draft version of this status review sent by the Department to peer reviewers, and a table of consolidated peer reviewer comments (arranged by page and line number) with Department responses to those comments.