

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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Habitat Conservation Planning Branch
P.O. Box 944209
Sacramento, CA 94244-2090
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
VALERIE TERMINI, Acting Director



February 12, 2026

Dr. Neil Havlik
Retired Natural Resource Manager
City of San Luis Obispo

Subject: PEER REVIEW OF THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE'S REPORT ON THE STATUS OF MORRO MANZANITA

Dear Dr. Neil Havlik,

Thank you for agreeing to serve as a scientific peer reviewer for the California Department of Fish and Wildlife's (Department) draft status review report for Morro manzanita (*Arctostaphylos morroensis*). The Department seeks your input regarding the assessments and conclusions in this draft status review report based on the best scientific information currently available. Please keep the enclosed report and your review of it confidential until the final report is made public upon receipt by the California Fish and Game Commission (Commission) as an agenda item at a public Commission meeting. Please note that your review will be appended to the final status review report and made public upon receipt by the Commission. **The Department requests your review on or before March 16th, 2026.**

The Department seeks your scientific peer review as part of formal proceedings pending before the Commission under the California Endangered Species Act (CESA). The Commission is a constitutionally established entity distinct from the Department, exercising exclusive statutory authority under CESA to add species to or remove species from the endangered or threatened species lists (Fish & G. Code, § 2070). The Department serves in an advisory capacity during CESA listing proceedings, directed by the Fish and Game Code to evaluate the status of the species based on the best scientific information available to the Department and make a recommendation to the Commission as to whether the petitioned action is warranted (Fish & G. Code, § 2074.6).

The Commission first received the petition to list Morro manzanita under CESA on July 20, 2024. After considering the Department's evaluation of the petition, the Commission formally accepted the petition for consideration on May 16, 2025, thereby designating Morro manzanita as a candidate for listing as endangered under CESA. As a candidate species, Morro manzanita currently receives the same protections under CESA as an endangered or threatened species. Formal acceptance of the petition triggered the Department's initiation of the status review.

The draft status review report forwarded to you today reflects the Department's effort to identify and analyze the best scientific information available regarding the status of Morro manzanita in California. This status review report is not intended to be an exhaustive review of

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all published literature relevant to the species. Rather, it is intended to summarize the best scientific information available relevant to the status of the species, to provide that information to the Commission, and to serve as the basis for the Department's recommendation to the Commission on whether the petitioned action is warranted.

The Department's preliminary recommendation is that the petitioned action to list Morro manzanita is warranted and Morro manzanita should be listed as threatened under CESA. However, we underscore that scientific peer review plays a critical role in the Department's analysis and effort to develop and finalize its recommendation to the Commission as required by the Fish and Game Code. Our analysis and expected recommendation to the Commission may change or be modified following peer review.

During your review, we ask that you assess whether the body of available information supports the Department's listing recommendation. We ask also that you consider CESA and its implementing regulations as summarized in the following paragraphs.

Under CESA, an endangered species is defined as "a native species or subspecies...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 & G. Code, § 2067).

CESA's implementing regulations state that a species shall be listed as endangered or threatened if the Commission determines that its continued existence is threatened by one or more of the following components: (1) present or threatened modification or destruction of its habitat, (2) overexploitation, (3) predation, (4) competition, (5) disease, or (6) other natural occurrences or human-related activities (Cal. Code Regs., tit. 14, § 670.1(i)(1)(A)).


Following receipt and consideration of peer review comments, the Department will prepare and submit its final status review report and related recommendation to the Commission. After at least a 30-day public review period, the Commission will consider the petition, the Department's status review, related recommendations including peer review comments, and public testimony during a regularly scheduled Commission meeting prior to making its decision.

For ease of review and for accessibility by the public, the Department would prefer to receive your comments in list form by report page and line number using the enclosed Excel file. Please submit your comments electronically to Kristi Lazar via email at Kristi.Lazar@wildlife.ca.gov. For questions, Kristi Lazar can be reached via email or by phone at 916-594-5425. If there is anything the Department can do to facilitate your review, please let us know.

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Thank you again for your contribution to the status review and this important step in the CESA listing process.

Sincerely,

DocuSigned by:

36A908313DB6442...

Isabel Baer
Manager, Habitat Conservation Planning Branch

Enclosures: Draft Morro manzanita status review_peer review.pdf, Morro manzanita status review comments_Havlik.xlsx

cc: California Department of Fish and Wildlife

Josh Grover
Deputy Director, Ecosystem Conservation Division

Cristin Walters
Acting Environmental Program Manager

Kristi Lazar
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Dr. David Keil
Professor Emeritus
California Polytechnic State University at San Luis Obispo

Subject: PEER REVIEW OF THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE'S REPORT ON THE STATUS OF MORRO MANZANITA

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CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

California Endangered Species Act



Draft Status Review for Morro Manzanita (*Arctostaphylos morroensis*)

Report to the Fish and Game Commission

[Month Year]



1 Cover page photo credit: Kristi Lazar (2025)

2 Suggested citation: California Department of Fish and Wildlife (CDFW). 2026. Status
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5

6 Table of Contents

7	List of Figures	iv
8	List of Tables	iv
9	List of Abbreviations, Acronyms, and Terms	v
10	Executive Summary.....	vi
11	1 Introduction.....	1
12	1.1 Status Review Overview	1
13	1.2 CESA Petition History	2
14	1.2.1 1991 Petition.....	2
15	1.2.2 2024 Petition.....	3
16	1.3 Federal Status	4
17	1.4 Additional Species Status Designations.....	4
18	1.4.1 NatureServe Conservation Status Ranks.....	4
19	1.4.2 California Rare Plant Rank.....	4
20	1.5 California Native People and Traditional Ecological Knowledge.....	5
21	1.6 Notifications, Information Received, and Peer Review.....	5
22	2 Species Description and Taxonomy	6
23	2.1 Species Taxonomy	6
24	2.2 Species Description	6
25	2.3 Similar Taxa.....	8
26	3 Life History	10
27	4 Range and Distribution	13
28	5 Habitat	18
29	5.1 Geology and Soils	18
30	5.2 Climate.....	20
31	5.3 Vegetation.....	20
32	5.3.1 Maritime Chaparral.....	21
33	5.3.2 Coastal Scrub.....	22
34	5.3.3 Other Vegetation	23
35	6 Abundance and Population Trend	23

36	6.1	Area of Occupied Habitat	24
37	6.2	Area of Morro Manzanita within Occupied Habitat	25
38	6.3	Number of Plants.....	27
39	6.4	Population Trend.....	27
40	7	Threats	31
41	7.1	Present or Threatened Modification or Destruction of Habitat	32
42	7.2	Vulnerability of Geographically Restricted Species.....	36
43	7.3	Altered Fire Regime and Fuel Reduction Activities.....	37
44	7.4	Climate Change.....	42
45	7.5	Competition	44
46	7.6	Recreation.....	48
47	7.7	Predation	49
48	7.8	Disease	50
49	7.9	Overexploitation.....	51
50	8	Existing Management.....	51
51	8.1	Los Osos Habitat Conservation Plan.....	53
52	8.1.1	Impacts from Covered Activities.....	54
53	8.1.2	Conservation Program	55
54	8.2	California Coastal Act.....	57
55	8.3	Montaña de Oro State Park.....	58
56	8.4	Morro Dunes Ecological Reserve	59
57	8.5	El Moro Elfin Forest Natural Area	61
58	8.6	Conservation Seed Banking.....	62
59	9	Recommendation to the Commission.....	62
60	10	Protection Afforded by Listing.....	63
61	11	Future Management.....	64
62		Acknowledgements	66
63		Literature Cited	66
64		Appendix A. Summary of Morro manzanita Occurrences	78
65		Appendix B. Tribal Engagement Summary	80
66		Appendix C. Public Comment Summary	81

67 Appendix D. Comments from Peer Reviewers83

68

69 **List of Figures**

70 Figure 1. Photographs of Morro manzanita 7
71 Figure 2. Morro manzanita distribution map 14
72 Figure 3. Map showing locations of Morro manzanita in relation to protected lands in
73 the Morro Bay area of San Luis Obispo County17
74 Figure 4. Aerial imagery from the vicinity of Baywood Park, San Luis Obispo County ..28
75 Figure 5. Aerial imagery from the south end of Los Osos in the vicinity of a high cover
76 stand of Morro manzanita.....30
77 Figure 6. Photos from along the Hazard Reef Trail and the East Rim Trail in Montaña de
78 Oro State Park showing Morro manzanita growing right up to the edge of Eucalyptus
79 stands..... 31
80 Figure 7. Photograph of the fuel break at the east end of the Cabrillo Estates 41
81 Figure 8. Photos of an open stand of Eucalyptus with Morro manzanita growing in the
82 understory 46
83 Figure 9. Photos of unofficial trails between the Cabrillo Estates development and
84 Montaña de Oro State Park.....49

85

86 **List of Tables**

87 Table 1. Distinguishing characteristics of select manzanita species in the vicinity of
88 Morro Bay 9
89 Table 2. Area of occupied Morro manzanita by land ownership..... 15
90 Table 3. Estimated area of occupied Morro manzanita habitat 26

91

92 **List of Abbreviations, Acronyms, and Terms**

- 93 CAL FIRE – California Department of Forestry and Fire Protection
94 CCVI – Climate Change Vulnerability Index
95 CEQA – California Environmental Quality Act
96 CESA – California Endangered Species Act
97 CNDDDB – California Natural Diversity Database
98 CNPS – California Native Plant Society
99 Commission – California Fish and Game Commission
100 CRPR – California Rare Plant Rank
101 Department – California Department of Fish and Wildlife
102 ESA – Federal Endangered Species Act
103 ESHA – Environmentally Sensitive Habitat Area
104 et al. – “and others”
105 GIS – Geographic Information System
106 HCP – Habitat Conservation Plan
107 NEPA – National Environmental Policy Act
108 NPPA – Native Plant Protection Act
109 PCA – Priority Conservation Area
110 PRISM – Parameter-elevation Regressions on Independent Slopes Model
111 RCP – Representative Concentration Pathway
112 sp. – species
113 spp. – multiple species
114 State Parks – California Department of Parks and Recreation
115 subsp. – subspecies
116 UCSC – University of California Santa Cruz
117 USFWS – United States Fish and Wildlife Service
118 var. – variety
119 VegCAMP- Vegetation Classification and Mapping Program

120 **Executive Summary**

121 This status review for Morro manzanita (*Arctostaphylos morroensis*) has been prepared
122 by the California Department of Fish and Wildlife (Department) for the California Fish
123 and Game Commission (Commission) pursuant to California Endangered Species Act
124 (CESA) requirements (Fish & G. Code, § 2050 et seq.). This status review is based on the
125 best scientific information currently available to the Department regarding each of the
126 components listed under section 2072.3 of the Fish and Game Code and section 670.1 of
127 title 14 of the California Code of Regulations. In addition, this status review includes a
128 preliminary identification of habitat that may be essential to the continued existence of
129 the species and the Department’s recommendations for management activities and
130 other recommendations for recovery of the species (Fish & G. Code, § 2074.6). This
131 status review has been independently reviewed by scientific peers (Fish & G. Code, §
132 2074.6).

133 Morro manzanita is an erect, evergreen shrub that is known from nine occurrences and
134 is restricted to the coastal areas around the towns of Baywood Park and Los Osos in the
135 Morro Bay region of San Luis Obispo County, California. Morro manzanita usually
136 grows in Baywood fine sand soil and primarily occurs in maritime chaparral and coastal
137 scrub habitat below 300 m (980 ft) in elevation. The amount of occupied Morro
138 manzanita habitat remaining is estimated at between 340 and 396 ha (840 and 979 ac).

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

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

158 in the foreseeable future in the absence of the special protection and management
159 efforts required by CESA. The Department further recommends implementation of the
160 management recommendations and recovery measures described in this status review.

161 1 Introduction

162 1.1 Status Review Overview

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

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

194 In addition to addressing each of the petition components and listing factors, the
195 Department must make a recommendation to the Commission as to whether the
196 petitioned action to list Morro manzanita as endangered is warranted. An endangered
197 species is defined under CESA as one “which is in serious danger of becoming extinct
198 throughout all, or a significant portion, of its range due to one or more causes, including

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201 presently threatened with extinction, is likely to become an endangered species in the
202 foreseeable future in the absence of the special protection and management efforts
203 required by [CESA]” (Fish & G. Code, § 2067).

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

208 **1.2 CESA Petition History**

209 *1.2.1 1991 Petition*

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

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

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

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

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

233 On June 17, 1993, the Commission postponed its listing decision until August 5,
234 1993 while regional planning efforts were underway (Cochrane 1996).

235 On August 5, 1993, the Commission found that listing Morro manzanita was not
236 warranted based on regional planning efforts that had been initiated, ratified findings
237 with conditions, and removed Morro manzanita from the list of candidate species
238 (Cochrane 1996). Results of these regional planning efforts are discussed in the
239 “Existing Management” section of this status review.

240 1.2.2 2024 Petition

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

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

246 On August 9, 2024, the Commission published its notice of receipt of the petition in the
247 California Regulatory Notice Register (Fish & G. Code, § 2073.3; Cal. Code Regs., tit. 14,
248 § 670.1, subd. (c); Cal. Reg. Notice Register 2024, No. 32-Z, p. 1016).

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

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

258 On February 12, 2025, and April 16, 2025, at its public meetings, the Commission
259 considered the petition, the Department’s petition evaluation and recommendation,
260 comments received, and oral testimony (Fish & G. Code, §§ 2074 & 2074.2). At its April
261 16, 2025 meeting, the Commission found that sufficient information exists to indicate
262 the petitioned action may be warranted and accepted the petition for consideration
263 (Fish & G. Code, § 2074.2; Cal. Code Regs., tit. 14, § 670.1, subd. (e)).

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

267 2025, No. 20-Z, p. 635). The Department subsequently initiated this status review (Fish
268 & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)).

269 **1.3 Federal Status**

270 On December 15, 1994, Morro manzanita was listed as a threatened species under the
271 Federal Endangered Species Act (ESA) (16 U.S.C. § 1531 et seq.; 59 FR 64613). In 2008,
272 2013, and 2022, the United States Fish and Wildlife Service (USFWS) conducted 5-year
273 reviews for Morro manzanita to ensure that its classification as a threatened species
274 under the ESA provided the appropriate level of protection (USFWS 2008, 2013, 2022).
275 All three USFWS 5-year reviews concluded that Morro manzanita still met the definition
276 of a threatened species under the ESA.

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

285 **1.4 Additional Species Status Designations**

286 *1.4.1 NatureServe Conservation Status Ranks*

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

296 *1.4.2 California Rare Plant Rank*

297 The California Native Plant Society works in collaboration with botanical experts
298 throughout the state, including Department biologists, to assign rare plants a California
299 Rare Plant Rank (CRPR) reflective of their rarity status (CNDDDB and CNPS 2020).
300 Morro manzanita has been assigned a CRPR of 1B.1 (CNPS 2024). Plants with a CRPR
301 of “1B” are considered rare, threatened, or endangered throughout their range with the

302 majority endemic to California (CNDDDB and CNPS 2020). The threat code extension of
303 “.1” indicates that the species is seriously threatened in California, with over 80% of
304 occurrences threatened and a high degree and immediacy of threat (CNDDDB and CNPS
305 2020)

306 **1.5 California Native People and Traditional Ecological** 307 **Knowledge**

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

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

323 **1.6 Notifications, Information Received, and Peer Review**

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

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

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

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

341 **2 Species Description and Taxonomy**

342 **2.1 Species Taxonomy**

343 Morro manzanita was first described by Wieslander and Schreiber in 1939 (Wieslander
344 and Schreiber 1939). The original description was based on collections from 1936 and
345 1938 from the vicinity of Hazard Canyon in what is now Montaña de Oro State Park in
346 San Luis Obispo County (Wieslander and Schreiber 1939). Morro manzanita has been
347 recognized as a species in all relevant floras since it was originally described, including
348 the Jepson eFlora and the Flora of North America (Parker et al. 2009, 2023).

349 **2.2 Species Description**

350 Morro manzanita is an erect, evergreen shrub in the heath family (Ericaceae) (Parker et
351 al. 2023). Morro manzanita typically grows from 1 to 4 m (3.2 to 13.1 ft) tall, with more
352 prostrate plants on west-facing slopes that are exposed to high winds and taller, tree-
353 like plants growing further inland (Mullany 1990; Parker et al. 2023). Leaves are
354 covered with matted hairs on the lower leaf surface (especially when leaves are young)
355 and generally without hairs on the upper leaf surface (Wieslander and Schreiber 1939;
356 Mullany 1990; Parker et al. 2023). Leaf blades are oblong-ovate to elliptic, 1.5 to 3.5 cm
357 (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
358 al. 2023). The leaf base is truncate and sometimes cordate but it does not clasp the stem
359 (Figure 1) (Kauffmann et al. 2021). Stomata (pores) are present on the lower leaf surface
360 but generally absent or sparse on the upper leaf surface (Mullany 1990).

361



362



363 *Figure 1. Photographs of Morro manzanita leaves (top left), flowers (top right), fruits (bottom*
364 *left), and base of trunk showing no basal burl (bottom right). Photo credit: Kristi Lazar*
365 *(2025).*

366 Like all manzanita species, Morro manzanita flowers have petals fused into an urn-
367 shape that are white to pink in color (Figure 1). There are five sepals (outermost whorl of
368 flower parts) below the fused petals (Parker et al. 2023). Flowers are arranged in
369 clusters called inflorescences, and inflorescences hang down when they are young
370 (Parker et al. 2023). At the base of the inflorescences are bracts that are leaf-like,
371 lanceolate to linear in shape, and minutely hairy (Wieslander and Schreiber 1939;
372 Parker et al. 2023). Fruits are 7 to 10 mm (0.3 to 0.4 in) wide, berry-like, and shaped as
373 spheres that have been flattened on the top and bottom (Figure 1) (Parker et al. 2023).
374 Each Morro manzanita fruit typically has 8 to 10 seeds (Mullany 1990; Tyler and Odion
375 1996).

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

381 **2.3 Similar Taxa**

382 The genus *Arctostaphylos*, commonly known as manzanita, is widespread and abundant
383 throughout much of California with over 90 taxa currently recognized (Parker et al.
384 2023). Manzanita species diversity is the highest along the coast of California with
385 several manzanita species, including Morro manzanita, endemic to the central coast. In
386 the Morro Bay area of San Luis Obispo County, Morro manzanita can grow adjacent to,
387 and occasionally with, Oso manzanita (*A. osoensis*), dacite manzanita (*A. tomentosa*
388 subsp. *daciticola*), and Pecho manzanita (*A. pechoensis*) but these species generally do
389 not occur in intermixed stands as they grow in different types of soil and habitats
390 (Kauffmann et al. 2021; CCH 2024). Generally, Morro manzanita occurs on sandy and
391 sandstone soils, Oso manzanita and dacite manzanita occur on volcanic soils, and Pecho
392 manzanita occurs on siliceous shale soils (Parker et al. 2009; Kauffmann et al. 2021). At
393 Montaña de Oro State Park, Morro manzanita can grow intermixed with Pecho
394 manzanita and brittle leaf manzanita (*A. crustacea* subsp. *crustacea*), which is a more
395 widespread species that can occur in a variety of soil types (Mullany 1990; CCH 2024; K.
396 Drexhage, personal communication, May 7, 2025).

397 Possible hybrids between Morro manzanita and Oso manzanita, as well as Morro
398 manzanita, Pecho manzanita, and Arroyo de la Cruz manzanita (*A. cruzensis*), have
399 been mentioned on herbarium collections and in the literature (Mullany 1990; CCH
400 2024). A 1990 study by Mullany found that the purported hybrid plants were likely just
401 a reflection of the variation in leaf morphology present in Morro manzanita; however,
402 genetic analyses are needed to confirm this finding (Mullany 1990).

403 Morro manzanita can be distinguished from other species of manzanita in the Morro
404 Bay area through a combination of characters including the presence/absence of a basal
405 burl and leaf characteristics (Table 1). Dacite manzanita and brittle leaf manzanita have
406 basal burls, which Morro manzanita does not have. Oso manzanita and Pecho
407 manzanita have leaf bases that clasp the stem whereas Morro manzanita does not have
408 clasping leaf bases (Kauffmann et al. 2021). In addition, Morro manzanita has leaves
409 with densely matted, short, woolly hairs on the lower surface whereas Oso manzanita
410 and Pecho manzanita have either sparse hairs or no hairs on the lower leaf surface
411 (Parker et al. 2009; Kauffmann et al. 2021; Parker et al. 2023). Bark and twig
412 characteristics, length of the nascent inflorescence (inflorescence present before

413 blooming), and soil preferences can also be helpful characters to use when
 414 distinguishing between species.

415 *Table 1. Distinguishing characteristics of select manzanita species in the vicinity of Morro Bay*
 416 *(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	<i>morroensis</i>	<i>osoensis</i>	<i>tomentosa</i> subsp. <i>daciticola</i>	<i>pechoensis</i>	<i>crustacea</i> subsp. <i>crustacea</i>
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

417

418 **3 Life History**

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

425 Morro manzanita has been observed flowering from October through June, with peak
426 flowering in December and January (Mullany 1990; iNaturalist 2025). Since Morro
427 manzanita is self-incompatible and dependent on pollinators to reproduce, it produces
428 abundant flowers in order to attract pollinators (Tyler et al. 2023). A study that looked
429 at Morro manzanita flower production during a two year period in 1998 and 1999 found
430 an average of 52 to 135 flowers produced per stem (Tyler et al. 2023). Flower production
431 in Morro manzanita was found to be especially high in wet years, with nearly twice as
432 many flowers produced in a year of above average rainfall compared to a year of below
433 average rainfall (Tyler et al. 2023). A variety of pollinators have been observed visiting
434 Morro manzanita flowers, including honeybees (*Apis mellifera*), digger bees
435 (*Anthophora urbana*), halictid/sweat bees (family Halictidae), bee flies (family
436 Bombyliidae), a syrphid fly (*Colletes* sp.), a monarch butterfly (*Danaus plexippus*), and
437 Anna's hummingbirds (*Calypte anna*), with the most frequently observed pollinator
438 being yellow-faced bumble bees (*Bombus vosnesenskii*) (Mullany 1990; Tyler et al.
439 2023). While a variety of pollinators have been documented to visit Morro manzanita
440 flowers, insect activity is lower than expected given the large number of flowers. In 1998
441 and 1999, pollinators visiting Morro manzanita were recorded in 39 observation periods
442 over 13 days and approximately half of those observation periods had no pollinator visits
443 despite abundant flowers (Tyler et al. 2023). This may indicate a pollinator limitation
444 that could be negatively affecting fertilization and subsequent fruit production in Morro
445 manzanita, but further studies are needed to confirm whether pollinator limitation is
446 contributing to low fruit set in the species.

447 If fertilized, flowers produce fruits which ripen on the stem and drop from the plant
448 (generally in summer) (Tyler et al. 2023). Morro manzanita fruits are called drupes,
449 which consist of a mealy outer layer surrounding a hard inner layer that encases
450 multiple seeds (Baldwin et al. 2012; Tyler et al. 2023). While flower production is high,
451 only 10 to 18% of Morro manzanita flowers were found to produce fruit in a study from
452 1998 and 1999 (Tyler et al. 2023). This indicates that Morro manzanita likely has low
453 fruit production compared with related species; other manzanitas and species within the
454 heath family have been documented to have up to 73% of flowers produce fruit (Tyler et
455 al. 2023). In addition, Morro manzanita, like many other manzanita species,

456 experiences high fruit predation from animals, with an estimated 60 to 70% of fruits
457 removed within a few months of dropping to the ground (Keeley and Hays 1976; Keeley
458 1987b; Tyler et al. 2023). While no studies have been done to identify the animals that
459 predate on Morro manzanita fruits and seeds, rodents (particularly woodrats (*Neotoma*
460 *fuscipes*)) are thought to be the primary fruit and seed predators for Morro manzanita
461 (Tyler and Odion 2020; Tyler et al. 2023). For common species of manzanita, rodents
462 and birds have been shown to serve as short distance seed dispersers as a result of seed
463 caching behavior while coyotes can serve as long-distance seed dispersers since
464 manzanita seeds pass through their digestive tract unharmed (Keeley and Hays 1976;
465 Parker 2015).

466 After fruits drop to the ground, they are removed from the area by animals (either
467 through predation or dispersal) or remain under the shrub with seeds incorporated into
468 the soil seed bank. The amount of Morro manzanita seeds in the soil seed bank is ten
469 times higher under the shrub canopy than away from the shrub canopy, suggesting that
470 most Morro manzanita seeds do not disperse far from the parent plant (Tyler and Odion
471 2020). A 1998 study conducted by Tyler et al. found that a middle-aged stand of Morro
472 manzanita (47 years) had significantly higher soil seed bank densities than both a
473 younger stand (35 to 38 years) and an older stand (47+ years) but the soil seed bank
474 densities within each stand was highly variable (Tyler et al. 1998; Tyler and Odion
475 2020). In addition to the number of seeds in the soil seed bank, viability of those seeds
476 is also an important factor when evaluating the ability of a species to persist long-term.
477 Overall, Morro manzanita seed viability is low, with an average of 4% of Morro
478 manzanita seeds in the soil seed bank being viable (Tyler et al. 1998; Tyler and Odion
479 2020). Of the inviable Morro manzanita seeds, an average of 43% were infertile with no
480 embryo development (Tyler et al. 1998; Tyler and Odion 2020).

481 Manzanita species have developed different reproductive strategies to survive in
482 chaparral ecosystems that experience high intensity fire. Some manzanita species
483 survive fire through the presence of a basal burl which allows them to resprout asexually
484 after fire, but Morro manzanita is lacking a basal burl (Parker 2007). Morro manzanita
485 is considered an obligate seeder since it is generally killed by fire and depends on viable
486 seed in the soil seed bank to persist in the landscape after fire (Wells 1969; Parker 2007;
487 Tyler et al. 2023). If a fire return interval is too frequent, obligate seeding manzanitas
488 may not reach sexual maturity or may not have time to produce a large enough soil seed
489 bank to prevent population decline. Seeds of obligate seeder manzanita species are long-
490 lived and can survive for decades in the soil (Jepson 1922). A specific mechanism is
491 generally required for these seeds to break dormancy so that they can germinate (Keeley
492 1987a; Tyler and Odion 1996). Like other manzanita species, Morro manzanita seed
493 germination is increased when stimulated by fire-related cues. Morro manzanita seeds
494 achieve the highest germination when exposed to a combination of heat and chemical
495 cues from charred wood, but experience reduced germination with exposure to heat

496 alone or charred wood alone (Tyler et al. 1998; Tyler and Odion 2020). Morro
497 manzanita seeds are able to germinate without these fire cues, but seedlings and young
498 individuals are not as common in areas that have not recently burned (Tyler and Odion
499 1996; Tyler et al. 1998). In addition to the breaking of seed dormancy, fire may be
500 needed to create suitable habitat conditions for seedling emergence and survival such as
501 reduced leaf litter, increased light, and reduced competition (Keeley and Zedler 1978;
502 Tyler et al. 1998). Even after fire, Morro manzanita seedling mortality is high. A 2002
503 study found that only 4% of Morro manzanita seedlings survived the first year after a
504 prescribed burn and 21% of seedlings that germinated in the second year after a
505 prescribed burn survived to the third year (Odion and Tyler 2002). In areas with
506 *Eucalyptus* trees growing adjacent to Morro manzanita, mechanical removal of trees
507 and duff (without the use of fire) as part of habitat restoration projects was sufficient to
508 allow Morro manzanita seeds to germinate and seedlings to emerge (Department
509 observation).

510 Morro manzanita stands generally consist of even aged plants due to the species'
511 reproductive strategy (Tyler and Odion 1996, 2020). When a fire burns through an area,
512 all Morro manzanita plants are generally killed and the seeds in the soil seed bank
513 germinate to produce a new stand of Morro manzanita plants that are all the same age.
514 As of 2025, the youngest stand of Morro manzanita is 27 years old (the result of a small
515 prescribed burn in 1998) and the oldest stand is estimated to be at least 88 years old
516 based on historical aerial photos from 1937 (USDA 1937a; Tyler and Odion 1996; Tyler
517 et al. 2023). However, the oldest stand may be much older than 88 years since wildfires
518 over 4 ha (10 ac) have not been documented in the range of Morro manzanita since this
519 information began being collected in the late 1800s (Tyler and Odion 1996; Kofron and
520 Tyler 2024; CAL FIRE 2025b). In the 1990s, some of the Morro manzanitas in older
521 stands were observed to be dead, which may be an indication that some older shrubs are
522 reaching the age when they naturally senesce (Tyler et al. 1998; Tyler and Odion 2020).

523 Recovery of Morro manzanita was examined after a 2.3 ha (5.7 ac) prescribed burn of a
524 40-year-old Morro manzanita stand at Montaña de Oro State Park in 1998 (Odion and
525 Tyler 2002). Prior to the prescribed burn, the area had approximately 40% cover of
526 Morro manzanita (Odion and Tyler 2002). Post-burn, mortality of seeds and young
527 seedlings was high, and three years after the burn, the density of Morro manzanita
528 seedlings was less than half the density of the plants before the fire (Odion and Tyler
529 2002). Based on the results of this prescribed burn, it was concluded that the 40-year-
530 old Morro manzanita stand may not have had an adequate seed bank to replenish the
531 population after fire, and the fire return interval was too frequent (Odion and Tyler
532 2002). However, the prescribed burn area was revisited in 2023 and Morro manzanita
533 was observed to have high shrub cover, ranging from 30 to 100%, with most Morro
534 manzanita shrubs flowering, fruiting, and contributing to the post-fire seed bank (Tyler
535 and Kofron 2024). This suggested that the prescribed burn did not have a negative effect

536 on the species within the 40-year-old stand, contrary to how it appeared the first few
537 years after the prescribed burn.

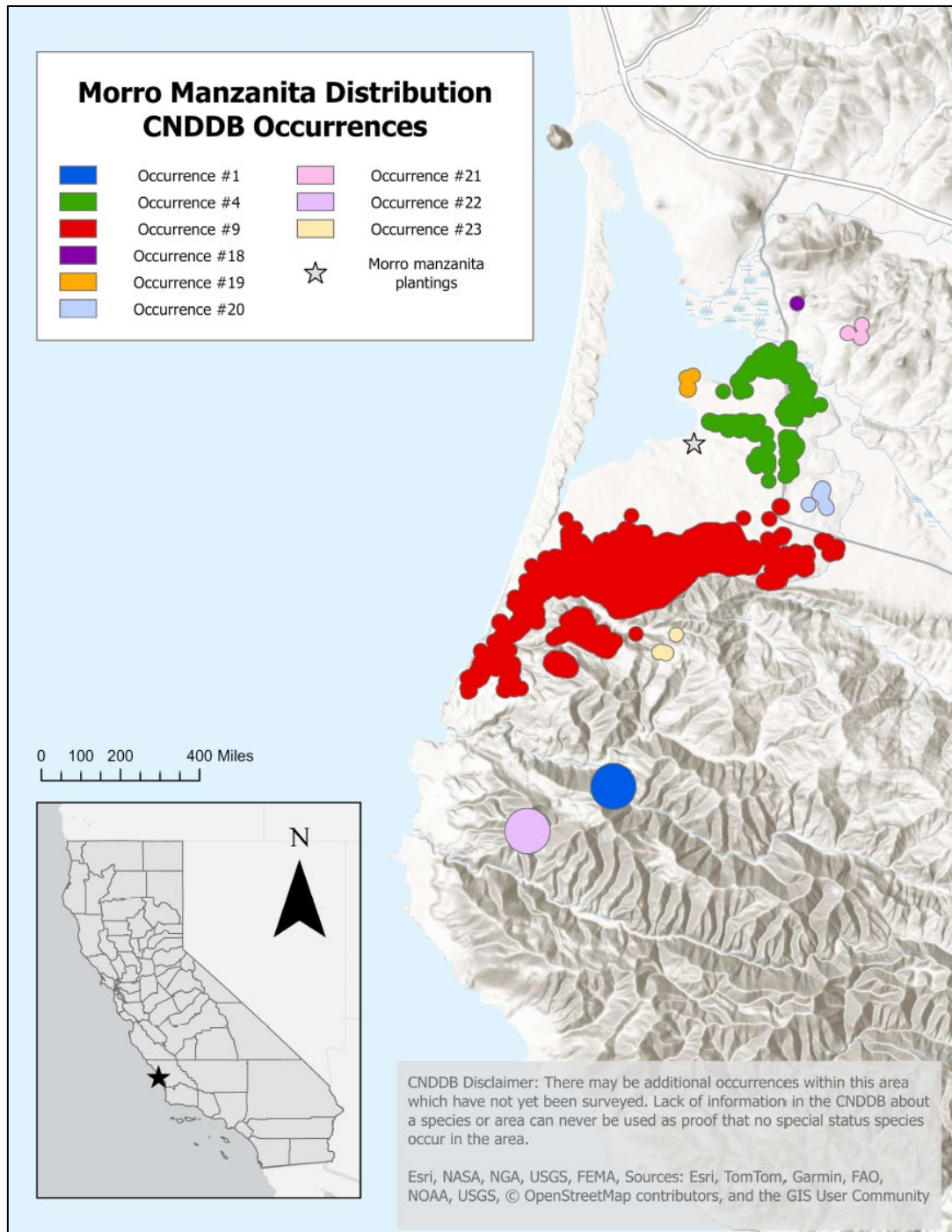
538 **4 Range and Distribution**

539 This section considers the species' range and distribution and provides a detailed
540 distribution map (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd.
541 (d)(1)). A species' range for the purposes of CESA and this status review is the species'
542 California range (Cal. Forestry Assn. v. Cal. Fish and Game Com. (2007) 156 Cal.App.4th
543 1535, 1551). Range describes the general geographical area in which a species occurs.
544 Distribution describes the actual sites where individuals and populations of the species
545 occur within the species' range.

546 Morro manzanita is a localized endemic that is restricted to coastal areas around the
547 towns of Baywood Park and Los Osos in the Morro Bay region of San Luis Obispo
548 County, California (CNDDDB 2025). Morro manzanita occurs within the Morro Bay, Los
549 Osos Creek, and Islay Creek watersheds (USGS 2023). It is a lower elevation species that
550 occurs below 300 m (980 ft) in elevation, with most populations below 122 m (400 ft) in
551 elevation. The total range of Morro manzanita is approximately 30 km² (12 mi²) with
552 dense stands of Morro manzanita present in the center of the range that thin out to
553 scattered plants at the edges of the range. Historically, Morro manzanita likely had a
554 similar range to what it has now which coincided with the distribution of Baywood fine
555 sand soil; however, not all Baywood fine sand soil contains Morro manzanita. While
556 Morro manzanita's current range is likely similar to its historical range, within that
557 range, the amount of habitat that contains Morro manzanita has declined due to
558 development of the towns of Baywood Park and Los Osos.

559 The distribution of Morro manzanita is based mainly on data documented in the
560 California Natural Diversity Database (CNDDDB). The CNDDDB is an inventory of the
561 status and locations of plants, animals, and natural communities that are of
562 conservation concern in California. The CNDDDB assigns occurrence numbers to
563 represent specific locations where a species has been known to occur (CNDDDB 2020).
564 Populations, individuals, or colonies of the same species that are located within 0.40 km
565 (0.25 mi) of each other generally constitute a single CNDDDB occurrence (CNDDDB 2020).
566 CNDDDB occurrence numbers are initially assigned in sequential order but can be
567 merged over time as more information becomes available giving the appearance of
568 skipped numbers. CNDDDB occurrences include data on both extant and extirpated
569 populations, so occurrences reflect both historical and current data. A distribution map
570 showing CNDDDB occurrences for Morro manzanita is included as Figure 2 (CNDDDB
571 2025). Specific occurrence locations for Morro manzanita are available at the CNDDDB;
572 the figures in this status review show occurrences with larger buffers and have reduced

573 map detail to adhere to the CNDDDB license agreement and protect the species from
574 harm (CNDDDB 2018).



575
576 *Figure 2. Morro manzanita distribution map (CNDDDB 2025). Polygons represent CNDDB*
577 *Morro manzanita occurrences as of July 2025; a buffer was added to the features to make*
578 *them more visible on the map. The gray star represents planted Morro manzanita individuals*
579 *at Sweet Springs Nature Preserve; these plantings are not represented in the CNDDB (John*
580 *Chesnut, personal communication, January 11, 2026).*

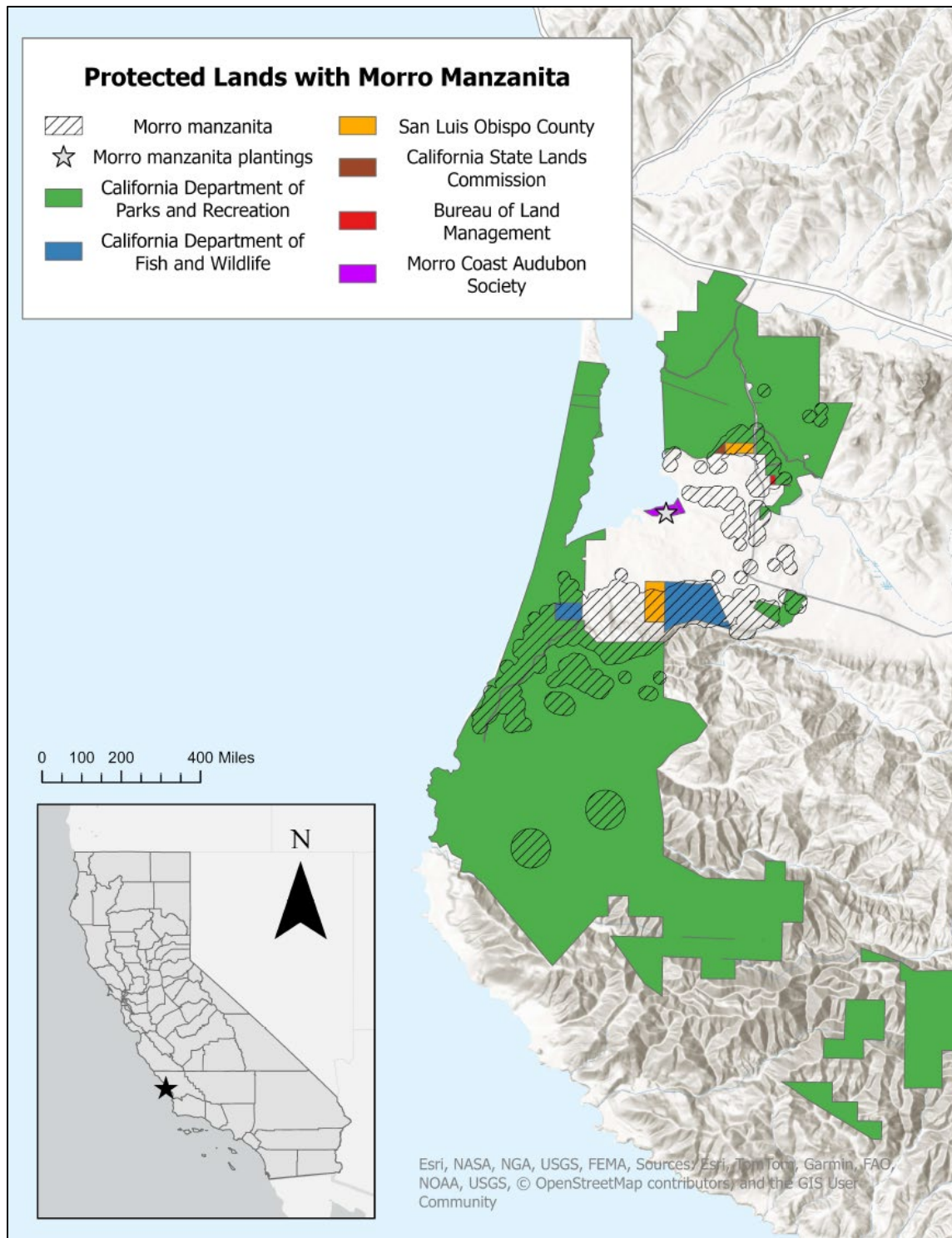
581 CNDDDB last updated its information for Morro manzanita in July 2025 (CNDDDB 2025).
 582 There are nine CNDDDB occurrences of Morro manzanita with all occurrences presumed
 583 extant (see Appendix A). Morro manzanita is concentrated in and near the towns of
 584 Baywood Park and Los Osos in the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

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

601 *Table 2. Area of occupied Morro manzanita by land ownership. Area estimates are based on*
 602 *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%

Property	Ownership	Estimated Area of Occupied Morro Manzanita Habitat (Acres)	Percent of Total
Part of El Moro Elfin Forest Natural Area	County of San Luis Obispo	17	2%
Broderson site	County of San Luis Obispo	17	2%
South Bay Bridge Right of Way	County of San Luis Obispo	1	<1%
	County of San Luis Obispo (total)	35	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 (contains Morro manzanita plantings)	Morro Coast Audubon Society (total)	<1	<1%
Private, undeveloped property surrounding the Cabrillo Estates	Private	181	19%
Miscellaneous private property in Baywood Park/Los Osos	Private	56	6%
Conservation easements	Private	8	<1%
	Private (total)	245	25%
	Total	979	100%



603

604 *Figure 3. Map showing locations of Morro manzanita in relation to protected lands in the*
 605 *Morro Bay area of San Luis Obispo County. Morro manzanita locations based on CNDDB*
 606 *(black crosshatched polygons) and information on plantings at Sweet Springs Nature Reserve*
 607 *(gray star). CNDDB disclaimer: There may be additional occurrences within this area which*
 608 *have not yet been surveyed. Lack of information in the CNDDB about a species or area can*
 609 *never be used as proof that no special status species occur in the area.*

610 Morro manzanita has been planted at the Sweet Springs Nature Preserve in Los Osos
611 (Table 2, Figure 3). The Sweet Springs Nature Preserve is a 32 acre preserve owned and
612 managed by the Morro Coast Audubon Society (MCAS undated). Morro manzanita
613 plants were grown from seed collected near the Sweet Springs Nature Preserve and an
614 unknown number were planted at the west end of the preserve in 1991 (John Chesnut,
615 personal communication, January 11, 2026). Additional Morro manzanita individuals
616 have been planted at the east end of the preserve in 2013/2014 (several plants), 2017
617 (four plants), and 2025 (eight plants) (John Chesnut, personal communication, January
618 11, 2026). These plantings are reportedly doing well, and it has been noted that
619 plantings of Morro manzanita at Sweet Springs Nature Preserve are in soil that is typical
620 for Morro manzanita elsewhere in its range (John Chesnut, personal communication,
621 January 26, 2026). Morro manzanita individuals have also been reported in the
622 immediate areas surrounding Sweet Springs Nature Preserve with these individuals
623 possibly representing relict Morro manzanita shrubs that survived the land being
624 cleared of vegetation in the early 1900s (John Chesnut, personal communication,
625 January 29, 2026). However, Marilyn Mullany searched for Morro manzanita plants
626 throughout the range in 1989 in an effort to document the full distribution of the species
627 and did not find any Morro manzanita individuals in the Cuesta-by-the-Sea area of Los
628 Osos (which is near Sweet Springs Nature Preserve) (Mullany 1990). The Department
629 has included the Morro manzanita plantings at Sweet Springs Nature Preserve in its
630 assessment of the range and distribution of Morro manzanita in this status review since
631 the individuals are close to populations of Morro manzanita that are known to be
632 natural and the plantings appear to be doing well. Further surveys and documentation
633 are needed to determine if there are any relict Morro manzanita individuals in the area
634 surrounding Sweet Springs Nature Preserve.

635 **5 Habitat**

636 This section considers the best available scientific information regarding the kind of
637 habitat necessary for the species survival (Fish & G. Code, § 2072.3; Cal. Code Regs., tit.
638 14, § 670.1, subd. (d)(1)), and a preliminary identification of the habitat that may be
639 essential to the continued existence of the species (Fish & G. Code, § 2074.6; Cal. Code
640 Regs., tit. 14, § 670.1, subd. (f)(1)).

641 **5.1 Geology and Soils**

642 Morro manzanita is restricted to coastal areas in the Morro Bay region of San Luis
643 Obispo County, California. Morro Bay is surrounded by Quaternary alluvial and sand
644 dune deposits underlain by rock of the Franciscan complex, which consists of a mixture
645 of sedimentary, igneous, and metamorphic rocks from the Cretaceous to Jurassic period
646 (201 to 66 million years ago) (Hall et al. 1979; Wiegers 2021; Jodi McGraw Consulting
647 2022). Further inland from the Quaternary deposits are Tertiary deposits, primarily of

648 the Pismo and Obispo formations, and exposed rock from the Franciscan complex.
649 Morro manzanita mainly occurs on stabilized sand dune deposits of moderately
650 consolidated windblown sand from the late to middle Pleistocene (2.6 million to 11,700
651 years ago) but can also occur on the Pismo Formation (Miguelito member; siltstone and
652 claystone) from the early Pliocene (5.3 to 2.6 million years ago) to late Miocene (23 to
653 5.3 million years ago) at the south end of its range and on volcanic rocks from the
654 Oligocene (34 to 23 million years ago) at the north end of its range (Hall et al. 1979;
655 Wiegers 2021).

656 Morro manzanita usually grows on soil formed from old sand dune deposits called
657 Baywood fine sand by the Natural Resource Conservation Service (Soil Conservation
658 Service 1984; Mullany 1990; Wiegers 2021). Baywood fine sand soil is somewhat
659 excessively drained with a soil profile that is fine sand throughout (Soil Conservation
660 Service 1984; Soil Survey Staff 2024). The surface layer is about 91 cm (36 in) thick with
661 very dark grayish-brown and dark brown fine sand (Soil Conservation Service 1984).
662 The underlying material extends to a depth of 152 cm (60 in) or more and is composed
663 of dark grayish brown and brown fine sand (Soil Conservation Service 1984). The
664 surface layer is slightly acidic, becoming more acidic as depth increases (Soil
665 Conservation Service 1984). Baywood fine sand soil is very permeable meaning the soil
666 has a low water-holding capacity (Soil Conservation Service 1984). This soil can also
667 include areas with small amounts of sandy loam, silt, and clay components (Mullany
668 1990; Soil Survey Staff 2024). Baywood fine sand soil covers approximately 2,219 ha
669 (5,483 ac) in the Morro Bay region and is subdivided into three units based on percent
670 slope: 2-9% slope (1,326 ha/3,276 ac), 9-15% slope (624 ha/1,542 ac), and 15-30% slope
671 (269 ha/665 ac) (Soil Conservation Service 1984; McGuire and Morey 1992). On
672 Baywood fine sand soil, Morro manzanita has the highest shrub cover on slopes of 9-
673 30%, with fewer plants and less cover on 2-9% slopes (McGuire and Morey 1992; Tyler
674 and Odion 1996).

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

681 McGuire and Morey (1992) discuss observations from D. Chipping and D. Asquith that
682 suggest moisture retention and soil nutrient levels of the Baywood fine sand soil may
683 influence the distribution and density of Morro manzanita. Chipping observed that
684 areas with high concentrations of Morro manzanita appear to have a hard, nutrient-poor
685 soil horizon just below the loose sand. This nutrient-poor soil may allow Morro
686 manzanita to outcompete surrounding plants that are less-suited to the soil. Areas with

687 lower density of Morro manzanita do not appear to have this nutrient-poor soil horizon.
688 Asquith also observed that areas with high density of Morro manzanita may hold
689 moisture for longer periods. A dense stand of Morro manzanita surveyed by Asquith was
690 found to have non-marine sedimentary deposits at shallow soil depths that tend to hold
691 moisture longer than areas without the deposits.

692 **5.2 Climate**

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

700 The Parameter-elevation Regressions on Independent Slopes Model (PRISM) provides a
701 localized estimate of climate using point measurements of climate data, a digital
702 elevation model, and other spatial datasets to generate 4 km cell gridded estimates of
703 climatic variables (primarily precipitation and temperature) (Daly et al. 1994; Daly et al.
704 2008). According to PRISM output from 1991 through 2020 across Morro manzanita's
705 range, daily maximum temperature averaged over all days in each month was 18.7°C
706 (65.6°F) and was warmest in September (Prism Climate Group 2024). Daily minimum
707 temperature averaged over all days in each month was 9.1°C (48.3°F) and was coldest in
708 December (Prism Climate Group 2024). Precipitation across Morro manzanita's range
709 falls as rain and averages 46.5 cm (18.3 in) per year with most rain falling in January
710 and February (Prism Climate Group 2024). Precipitation can be highly variable in the
711 Morro Bay area with some drought years receiving as little as 8.4 cm (3.3 in) of rain
712 while other years receive as much as 108.7 cm (42.8 in) (Prism Climate Group 2024).

713 **5.3 Vegetation**

714 Vegetation describes the assemblage and arrangement of plants in an area (CNPS
715 2024). Vegetation is often considered the single best surrogate for habitat and
716 ecosystems (CSUN and CDFW 2014). Vegetation can be classified into types based on
717 species composition, percent cover of species, structure (e.g., tree height), and/or
718 environmental information (e.g., slope, aspect, and soil texture) (CSUN and CDFW
719 2014). Vegetation types are a useful classification unit for assessing and monitoring
720 habitat conditions, habitat changes, and management strategies (CSUN and CDFW
721 2014). The Department's Vegetation Classification and Mapping Program (VegCAMP) is
722 completing a statewide vegetation classification and map that includes San Luis Obispo
723 County; however, this information is not finalized. In the absence of a vegetation

724 classification and map, this section describes the general vegetation types that Morro
725 manzanita is known to occupy and common associates within those vegetation types.

726 5.3.1 Maritime Chaparral

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

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

744 Maritime chaparral vegetation can be further described and classified based on species
745 composition and habitat. Holland's 1986 "Preliminary Descriptions of the Terrestrial
746 Natural Communities of California" is an older vegetation classification system that
747 assigns California's vegetation into natural communities (Holland 1986). Using this
748 classification, Morro manzanita is predominately part of the central maritime chaparral
749 natural community. As described by Holland (1986), central maritime chaparral
750 contains drought-tolerant shrubs of moderate to high cover dominated by forms of
751 woollyleaf manzanita (*Arctostaphylos tomentosa*) plus one or more other narrowly
752 distributed manzanitas. It also contains well-drained, sandy substrates and is within the
753 zone of summer coastal fog incursion (Holland 1986).

754 In 2009, the second edition of *A Manual of California Vegetation* was published and is
755 currently updated online (Sawyer et al. 2009; CNPS 2024b). This classification system
756 separated Holland's central maritime chaparral natural community into several
757 alliances (vegetation classification categories) based mainly on the dominant or
758 characteristic species of manzanita present in the stand (Sawyer et al. 2009). One of
759 those alliances is the *Arctostaphylos morroensis* Shrubland Alliance (Morro manzanita
760 chaparral) which is characterized by more than 30% relative cover of Morro manzanita
761 in the shrub canopy. This alliance is also characterized by the presence of chamise,

762 brittleleaf manzanita, California sagebrush (*Artemisia californica*), coyote brush
763 (*Baccharis pilularis*), wedgeleaf ceanothus, orange bush monkeyflower, California
764 goldenbush, Indian Knob mountainbalm (*Eriodictyon altissimum*), California coffee
765 berry (*Frangula californica*), hollyleaf cherry (*Prunus ilicifolia*), and black sage (CNPS
766 2024b). While currently the *Arctostaphylos morroensis* Shrubland Alliance is treated at
767 the alliance level, it is anticipated to be moved to an association within the
768 *Arctostaphylos (crustacea, tomentosa)* Alliance in the future (VegCAMP, personal
769 communication, December 17, 2025).

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

782 In 2022, the Los Osos HCP was prepared for the County of San Luis Obispo and
783 described general vegetation and land cover associated with Morro manzanita within
784 the plan area (Jodi McGraw Consulting 2022). This report noted Morro manzanita as
785 occurring in three types of central maritime chaparral: Morro manzanita, Morro
786 manzanita-wedgeleaf ceanothus, and Morro manzanita-California sagebrush. The
787 Morro manzanita community has dense cover of Morro manzanita with coast live oak,
788 wedgeleaf ceanothus, orange bush monkeyflower, and black sage. The Morro
789 manzanita-wedgeleaf ceanothus community contains Morro manzanita and wedgeleaf
790 ceanothus as co-dominant species with California sagebrush, black sage, and orange
791 bush monkeyflower potentially present as well. The Morro manzanita-California
792 sagebrush community contains Morro manzanita and California sagebrush as co-
793 dominant with other possible associates being California buckwheat (*Eriogonum*
794 *fasciculatum*), deerweed, wedgeleaf ceanothus, orange bush monkeyflower, and black
795 sage.

796 5.3.2 Coastal Scrub

797 Morro manzanita is also regularly part of the central dune scrub natural community,
798 which is a dense coastal scrub community of scattered shrubs, subshrubs, and herbs
799 (Holland 1986). Common associates of Morro manzanita in coastal scrub include
800 California sagebrush, black sage, coyote brush, dune bush lupine (*Lupinus*

801 *chamissonis*), and coastal bush lupine (*Lupinus arboreus*) (Tyler and Kofron 2024).
802 Other coastal scrub species found near Morro manzanita include narrow-leaf
803 spineflower (*Chorizanthe angustifolia*), California aster (*Corethrogyne filaginifolia*),
804 peak rush-rose (*Crocanthemum scoparium*), California croton (*Croton californicus*),
805 lance-leaf liveforever (*Dudleya lanceolata*), perennial woolly-star (*Eriastrum*
806 *densifolium*), California goldenbush, seaciff wild buckwheat (*Eriogonum parvifolium*),
807 golden-yarrow (*Eriophyllum confertiflorum*), wedgeleaf horkelia (*Horkelia cuneata*),
808 San Luis Obispo monardella (*Monardella undulata* var. *undulata*), dune food
809 (*Pholisma* sp.), sand almond (*Prunus fasciculata* var. *punctata*), cardinal catchfly
810 (*Silene laciniata*), and rod wirelettuce (*Stephanomeria virgata*) (Mullany 1990; Tyler
811 and Odion 1996). Exotic grass (e.g., perennial veldt grass) and iceplant (*Carpobrotus*
812 spp. and *Conicosia pugioniformis*) invasion are common in coastal scrub (Tyler and
813 Odion 1996). Tyler and Odion (1996) also mention that when maritime chaparral has
814 been disturbed, a coastal scrub assemblage of species becomes evident with reduced
815 Morro manzanita cover and dominance of coastal scrub species (Tyler and Odion 1996;
816 Tyler and Kofron 2024).

817 5.3.3 Other Vegetation

818 Morro manzanita occurs as a large component of the *Arctostaphylos morroensis*
819 Shrubland Alliance (Morro manzanita chaparral) but the species can also occur as a
820 smaller component in other vegetation alliances, possibly including *Salvia mellifera*-
821 (*Artemisia californica*) Shrubland Alliance (black sage-California sagebrush scrub),
822 *Artemisia californica*-(*Salvia leucophylla*) Shrubland Alliance (California sagebrush-
823 (purple sage) scrub), *Lupinus chamissonis*-*Ericameria ericoides* Shrubland Alliance
824 (silver dune lupine-mock heather scrub), *Baccharis pilularis* Shrubland Alliance (coyote
825 brush scrub), *Quercus agrifolia* Forest and Woodland Alliance (coast live oak woodland
826 and forest), and *Eucalyptus (globulus, camaldulensis)* Semi-Natural Woodland Stands
827 (Mullany 1990; GIC 2024). In the future, the Department's vegetation classification and
828 map that is currently in development may further clarify the alliances that contain
829 Morro manzanita.

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

834 **6 Abundance and Population Trend**

835 This section considers the species' abundance and population trends (Fish & G. Code, §
836 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

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

845 **6.1 Area of Occupied Habitat**

846 One method for estimating abundance of Morro manzanita is to look at the area
847 occupied by the species. This includes areas with a few scattered Morro manzanita
848 individuals as well as areas with 100% cover of Morro manzanita. McGuire and Morey
849 (1992) estimated Morro manzanita to have historically occupied between 786 and 1,100
850 ha (1,942 and 2,719 ac) prior to development of the area. Based on the distribution of
851 Baywood fine sand soil and the extent of the known distribution of Morro manzanita,
852 recent estimates by Department staff suggest Morro manzanita could have historically
853 occupied as much as 1,416 ha (3,500 ac).

854 LSA Associates Inc. (1992) and McGuire and Morey (1992) estimated the area of
855 occupied habitat for Morro manzanita in the early 1990s to be between 340 and 361 ha
856 (840 and 891 ac) (Table 2). These estimates were primarily based on calculations
857 derived from hand-drawn maps of occupied Morro manzanita habitat in Marilyn
858 Mullany's 1990 Master's thesis (Mullany 1990). In 2025, Department staff used
859 geographic information systems (GIS) to digitize maps from Mullany (1990) and
860 McGuire and Morey (1992) to provide more accurate estimates. Using GIS, Department
861 staff estimated the area of habitat occupied by Morro manzanita in the early 1990s to be
862 372 ha (918 ac) (Table 3).

863 In 2025, Department staff calculated an updated estimate of the area occupied by Morro
864 manzanita using data that, while not comprehensive, is more recent than Mullany
865 (1990) and McGuire and Morey (1992). This estimate is imprecise since it is not based
866 on a comprehensive Morro manzanita survey but instead is based on data currently
867 available to the Department on: 1) areas with vegetation identified as Morro manzanita,
868 Morro manzanita-California sagebrush, Morro manzanita-wedgeleaf ceanothus, 2) areas
869 of Morro manzanita chaparral and mixed manzanita chaparral in Montaña de Oro State
870 Park, and 3) opportunistic observations of Morro manzanita scattered across the range
871 of the species. These data included locations of Morro manzanita at the El Moro Elfin
872 Forest Natural Area as documented in 2003 and 2019 reports, a vegetation map in the
873 2022 Los Osos HCP, 2024 vegetation map data for Montaña de Oro State Park, 2024
874 map data from the South Bay Boulevard Bridge Project, 2009 through July 2025

875 iNaturalist observations, and 2025 field survey observations from the Department,
876 County of San Luis Obispo, and State Parks (Morro Group 2003; Terra Verde
877 Environmental Consulting 2019; Jodi McGraw Consulting 2022; County of San Luis
878 Obispo 2024b; GIC 2024; iNaturalist 2025). Using this information, Department staff
879 calculated a rough area estimate of 396 ha (979 ac) of occupied Morro manzanita
880 habitat remaining in 2025 (Table 3). The increased area estimate in 2025 relative to
881 estimates from the early 1990s is due to the availability of more comprehensive and
882 precise data and use of modern GIS mapping tools and does not mean that occupied
883 Morro manzanita habitat has increased between the 1990s and 2025.

884
885 Estimates of the amount of occupied Morro manzanita habitat are imprecise due to a
886 lack of recent, range-wide data, but they are nevertheless useful as a rough gauge of
887 Morro manzanita abundance prior to development relative to Morro manzanita
888 abundance today. Despite differing estimates of area occupied by Morro manzanita,
889 available data suggest that the area occupied by Morro manzanita has decreased in the
890 period following development of the Baywood Park-Los Osos area by between 50 and
891 76%.

892 **6.2 Area of Morro Manzanita within Occupied Habitat**

893 While the current area of occupied Morro manzanita habitat is estimated to be between
894 340 and 396 ha (840 and 979 ac), the area within this habitat that is actually covered by
895 Morro manzanita is estimated to be much smaller (Table 3). The percent cover of Morro
896 manzanita within occupied habitat varies across its range, which means that some of the
897 habitat acreage represents areas with sparse Morro manzanita plants and other areas
898 contain dense stands. Over 40% of the area mapped by Mullany (1990) as occupied
899 Morro manzanita habitat has sparse cover of the species (5% or less cover of Morro
900 manzanita) indicating that a large amount of the 340 to 396 ha (840 to 979 ac) of
901 occupied habitat consists of scattered Morro manzanita plants.

902 The area of ground covered by Morro manzanita in the early 1990s within occupied
903 habitat was estimated by Tyler and Odin (1996) using cover classes. Tyler and Odin
904 (1996) found that Morro manzanita covered a maximum of 143 ha (353 ac) within the
905 340 ha (840 ac) of occupied habitat estimated by McGuire and Morey (1992).
906 Department staff used the same methodology as Tyler and Odin (1996), but with refined
907 area estimates, and found that Morro manzanita covered approximately 150 ha (370 ac)
908 within the 372 ha (918 ac) of occupied habitat in the early 1990s. While Department
909 staff estimated the area of remaining occupied Morro manzanita habitat in 2025 (see
910 “Area of Occupied Habitat” section), cover class information was not available for that
911 data, so more recent estimates of the area covered by Morro manzanita were not made.

912 *Table 3. Estimated area of occupied Morro manzanita habitat by cover classes, and*
 913 *estimated area of Morro manzanita within occupied habitat, calculated using cover*
 914 *classes as a multiplier (Sources: LSA Associates Inc. 1992, McGuire and Morey 1992,*
 915 *Tyler and Odion 1996, CDFW).*

Cover class	Area of occupied Morro manzanita habitat mapped within cover class (acres)						Total area (acres)
	<1%	1-5%	5-25%	25-50%	50-75%	75-100%	
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	979
Cover multiplier (based on maximum percent cover in the given cover class)	Area of Morro manzanita within occupied habitat (area of occupied habitat x cover multiplier) (acres)						Total area (acres)
	0.01	0.05	0.25	0.50	0.75	1	
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

916 *LSA Associates, Inc. (1992) adjusted the density category for some mapped polygons from
 917 Mullany (1990) which explains some of the acreage differences in this table.

918 **Newer sources do not provide percent cover estimates for Morro manzanita.

919 **6.3 Number of Plants**

920 Estimating the number of Morro manzanita plants is challenging due to the species
921 occurring in dense and often impenetrable stands in portions of its range and its
922 sometimes sprawling growth habit making it difficult to determine where one individual
923 ends and the next begins (McGuire and Morey 1992). When Morro manzanita was
924 proposed for CESA listing in 1991, the petitioner estimated there were not more than
925 2,000 plants based on personal observations of the extant populations (McLeod 1991).
926 The number of Morro manzanita plants was estimated in 1992 based on: 1) area
927 occupied by Morro manzanita, 2) percent cover of Morro manzanita within occupied
928 area, and 3) average shrub diameter (9 square meters/100 square feet to 16 square
929 meters/177 square feet) (LSA Associates 1992). Using this more thorough method for
930 estimating plant numbers, the number of Morro manzanita plants in the early 1990s
931 was estimated to be between 76,500 and 153,100 depending on the estimate of average
932 shrub diameter used (LSA Associates 1992; McGuire and Morey 1992). Using the same
933 shrub diameters from 1992, but refined acreage estimates, Department staff estimate
934 there were between 53,700 and 107,500 plants in the early 1990s. These estimates of
935 Morro manzanita abundance are imprecise because they are extrapolated from
936 imprecise estimates of occupied area, plant cover, and shrub diameter.

937 **6.4 Population Trend**

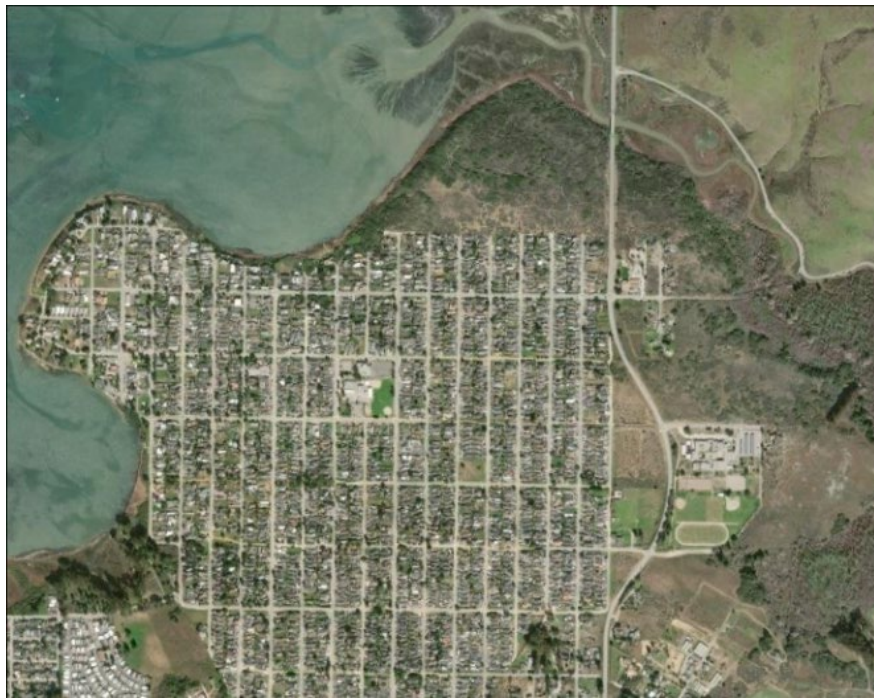
938 Population monitoring has not been conducted for Morro manzanita, but it can be
939 inferred that the species has experienced a declining population trend since European
940 colonization and settlement based on habitat loss and known extirpations of Morro
941 manzanita throughout portions of its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

943 While it is difficult to ascertain the full distribution of Morro manzanita prior to
944 development, it is clear that Morro manzanita has been negatively impacted by
945 development of the towns of Baywood Park and Los Osos in coastal San Luis Obispo
946 County. Development began in the Baywood Park-Los Osos area in the late 19th century
947 with just a few buildings and residents (Tornatzky 2016; John F. Rickenbach Consulting
948 2020). Large developers came to the area in the 1920s and the towns of Baywood Park
949 and Los Osos began to fully form with the population steadily increasing from just a few
950 people in 1919 to about 600 people by 1950, 1,500 by 1958, 3,500 by 1970, 11,000 by
951 1980, and over 14,000 by 1990 (Roest 1982; San Luis Obispo Council of Governments
952 2004; Tornatzky 2016). The Baywood Park-Los Osos area is mostly on Baywood fine
953 sand soil with 2 to 9% slopes and, prior to development, consisted of coastal sage scrub,
954 maritime chaparral, and oak woodland habitats (Mullany 1990; John F. Rickenbach
955 Consulting 2020; Soil Survey Staff 2024). Development of these towns resulted in
956 removal of most native vegetation for residences, businesses, and roads (Figure 4). An

957 estimated 50 to 76% of Morro manzanita's occupied habitat was likely lost to
958 development based on area estimates from LSA Associates, Inc (1992), McGuire and
959 Morey (1992), and Department staff. In 2014, the USFWS estimated that about 75% of
960 Morro manzanita's historical habitat had been lost to development (USFWS 2013).



961



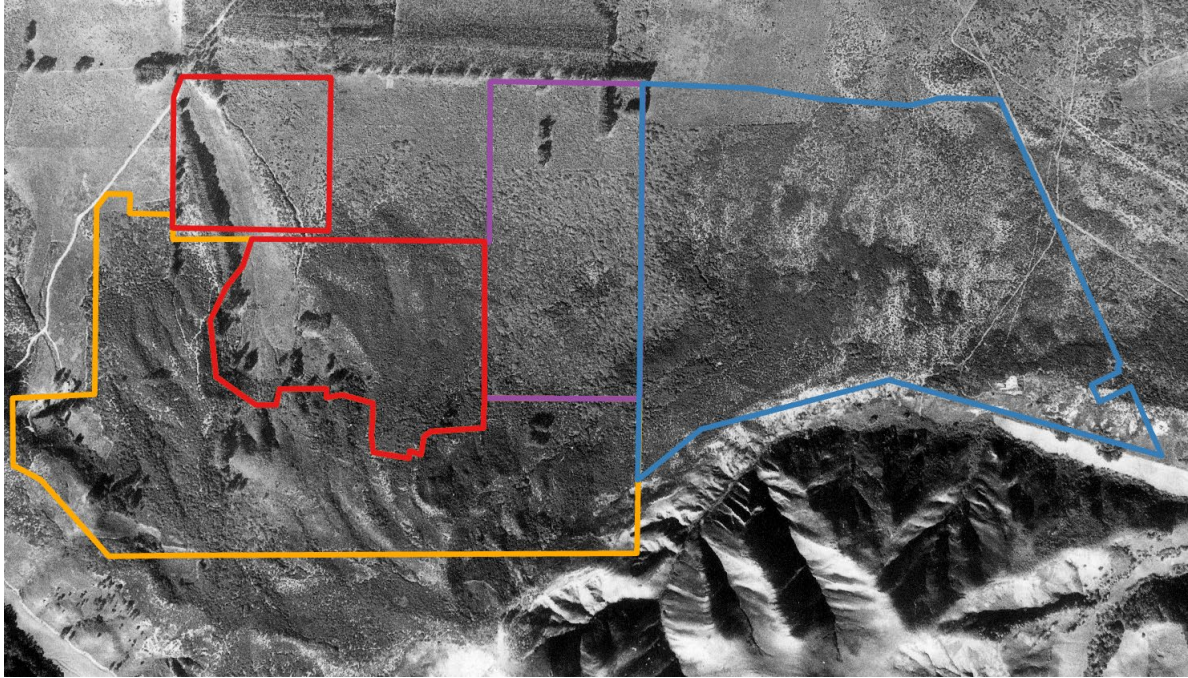
962

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

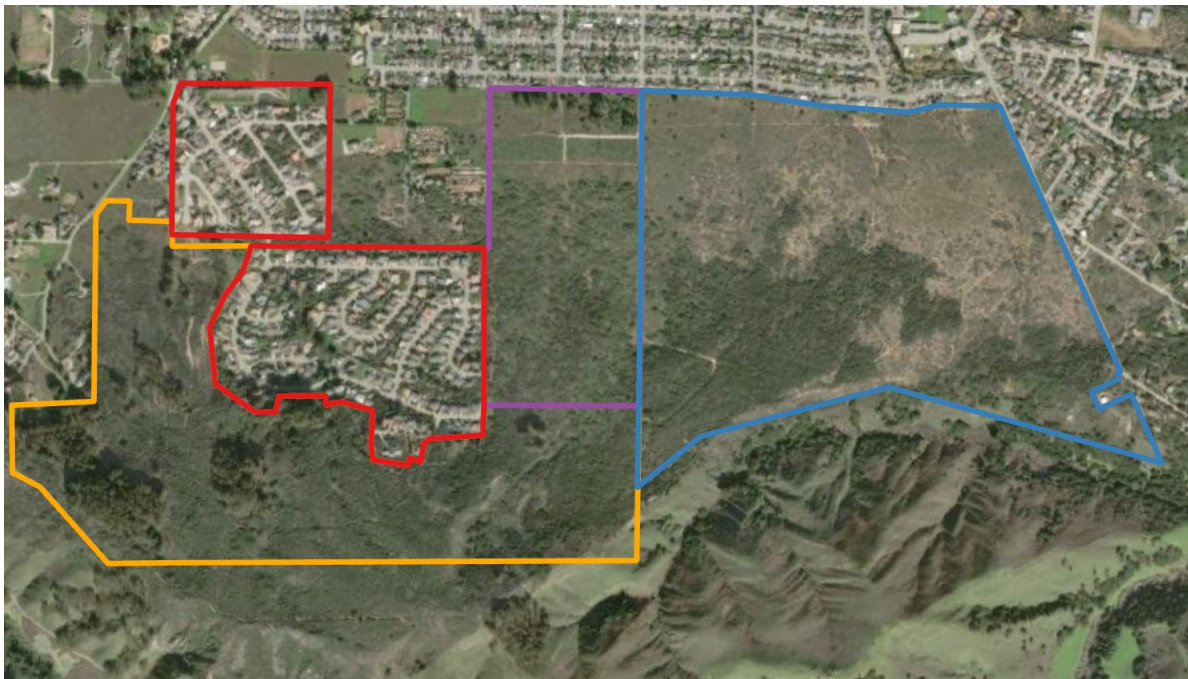
966 The impact of development on Morro manzanita varies depending on the density of
967 Morro manzanita plants within developed habitat. The densest areas of Morro
968 manzanita are on Baywood fine sand soil with steeper slopes of 9 to 30% (Tyler and
969 Odion 1996). Since the towns of Baywood Park and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

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

982 In addition to residential development, Morro manzanita plants have been removed at
983 the southern end of the range when extensive *Eucalyptus* stands were planted in the late
984 1800s and early 1900s (Mullany 1990). When Morro manzanita and *Eucalyptus* are
985 present in the same area, Morro manzanita generally stops growing right at the edge of
986 *Eucalyptus* stands, which is a strong indicator that Morro manzanita plants were
987 removed from the site when the *Eucalyptus* were initially planted and may have
988 experienced further declines as the *Eucalyptus* stands expanded (Figure 6) (Mullany
989 1990). A 2024 vegetation map for Montaña de Oro State Park estimated a total of 83 ha
990 (206 ac) of *Eucalyptus* stands currently within the park (GIC 2024). Of the 83 ha (206
991 ac) of *Eucalyptus*, an estimated 69 ha (170 ac) are immediately adjacent to occupied
992 Morro manzanita habitat indicating that *Eucalyptus* may have caused the extirpation of
993 up to 69 ha (170 ac) (approximately 10%) of historically occupied Morro manzanita
994 habitat (GIC 2024). In addition, more than 10 ha (25 ac) of *Eucalyptus* are present
995 within occupied Morro manzanita habitat on private land south of the Cabrillo Estates
996 and in the Pecho unit of the Morro Dunes Ecological Reserve, representing additional
997 areas where Morro manzanita abundance has been reduced due to *Eucalyptus*.



998



999

1000 *Figure 5. Aerial imagery from the south end of Los Osos in the vicinity of a high cover stand of*
 1001 *Morro manzanita. The area outlined in blue is part of the Morro Dunes Ecological Reserve; the*
 1002 *area outlined in purple is owned by the County of San Luis Obispo; the area outlined in red is*
 1003 *the Cabrillo Estates development; and the area outlined in orange is undeveloped private land.*
 1004 *Top photo is from 1937 and shows the natural habitat prior to development of the Cabrillo*
 1005 *Estates. Bottom photo is from 2024 and shows the Cabrillo Estates development and the*
 1006 *remaining Morro manzanita habitat on protected lands to the east and private land to the*
 1007 *south and west of the Cabrillo Estates.*



1008

1009 *Figure 6. Photos from along the Hazard Reef Trail (left photo) and the East Rim Trail (right*
1010 *photo) in Montaña de Oro State Park showing Morro manzanita growing right up to the edge*
1011 *of Eucalyptus stands. No Morro manzanita plants were observed growing under the*
1012 *Eucalyptus canopy in these areas. Photo credit: Kristi Lazar (2025).*

1013 All of these impacts across the range of Morro manzanita have contributed to a Morro
1014 manzanita population that is currently much smaller than it was prior to the
1015 development of the Baywood Park-Los Osos area, and prior to the planting of
1016 *Eucalyptus* stands. For these reasons, Department staff have determined that Morro
1017 manzanita has experienced a declining population trend since European colonization
1018 and settlement. The Morro manzanita population has likely been somewhat stable since
1019 1988 when a moratorium on wastewater discharge was enacted which slowed
1020 modification and destruction of Morro manzanita habitat in the Baywood Park-Los Osos
1021 area (further discussed in the “Present or Threatened Modification or Destruction of
1022 Habitat” section of this status review). Some increases in the Morro manzanita
1023 population may occur in the future with *Eucalyptus* removal and habitat restoration on
1024 protected lands but it is unlikely that Morro manzanita will experience a significant
1025 increase in abundance in the foreseeable future because much of the area it previously
1026 occupied has been developed and is no longer habitat. In addition, Morro manzanita
1027 usually grows on Baywood fine sand soils, which are limited in extent, thereby reducing
1028 the ability of the species to expand its range.

1029 **7 Threats**

1030 This section considers the factors affecting the ability of the species to survive and
1031 reproduce, and the degree and immediacy of threat (Fish & G. Code, § 2072.3; Cal. Code
1032 Regs., tit. 14, § 670.1, subd. (d)(1)). In addition, this section addresses the six listing

1033 factors identified in title 14 of the California Code of Regulations section 670.1,
1034 subdivision (i)(1)(A): present or threatened modification or destruction of habitat,
1035 overexploitation, predation, competition, disease, or other natural occurrences or
1036 human-related activities. This section reviews the best scientific information available,
1037 and assesses the degree of threat, for each factor. The sixth listing factor, “other natural
1038 occurrences or human-related activities,” is addressed under the following subsections:
1039 vulnerability of geographically restricted species, altered fire regime and fuel reduction
1040 activities, climate change, and recreation.

1041 **7.1 Present or Threatened Modification or Destruction of** 1042 **Habitat**

1043 Modification or destruction of habitat is a significant threat to populations of Morro
1044 manzanita, particularly on private property. Habitat modification and destruction is
1045 caused by a variety of human activities including cultivation of land for agriculture;
1046 development of land for residential, commercial, or industrial use; development of
1047 utilities, roads, and other infrastructure; resource harvest and extraction; use of land for
1048 livestock; and recreational use of land. These activities often involve removing native
1049 vegetation, disturbing soil and the biological communities therein, and installing
1050 structures, impermeable surfaces, and other features that render areas incapable of
1051 supporting native species assemblages. Even if human activities do not result in the
1052 complete elimination of habitat in an area, the indirect effects from such activities can
1053 cause substantial changes to the environment, which can affect the abundance of native
1054 species. Indirect effects from development and other human activities include soil
1055 disturbance and compaction; introduction and spread of exotic and/or invasive species
1056 and pathogens; increased dust, pollution, runoff, and trash; artificial noise, light, and
1057 vibration; and use of herbicides, pesticides, and other chemicals. Destruction of even
1058 small amounts of functioning habitat represents a significant loss of ecological function
1059 when considered over very long timescales, and restoration of habitat to pre-disturbance
1060 levels is costly and not always possible.

1061 Historical modification and destruction of Morro manzanita habitat from development
1062 have already resulted in the loss of a significant amount of occupied Morro manzanita
1063 habitat, with an estimated 50 to 76% of occupied habitat already lost, as discussed in the
1064 “Population Trend” section of this status review. A moratorium on wastewater discharge
1065 was implemented in the Baywood Park-Los Osos area in 1988, which slowed
1066 modification and destruction of Morro manzanita habitat from development (John F.
1067 Rickenbach Consulting 2020). This wastewater discharge moratorium was enacted to
1068 prevent additional groundwater contamination from individual septic systems and
1069 resulted in most new development being halted until community wastewater treatment
1070 services could be provided (Tornatzky 2016; John F. Rickenbach Consulting 2020). The

1071 Los Osos Wastewater Treatment Plant was completed in 2016 and existing development
1072 was subsequently connected to the new wastewater system (Jodi McGraw Consulting
1073 2022). In June 2024, the California Coastal Commission approved an amendment to the
1074 San Luis Obispo County Local Coastal Program that would allow development to
1075 resume in the Los Osos area (Kahn et al. 2024). Impacts to Morro manzanita habitat
1076 from development are anticipated to occur in the future as new development resumes in
1077 the area.

1078 Department staff estimate that about 25% of the remaining occupied Morro manzanita
1079 habitat is on private property subject to negative impacts from future development.
1080 Most of the private property that contains Morro manzanita is on land categorized as
1081 single family residential and is located outside of the Los Osos urban service line (Jodi
1082 McGraw Consulting 2022). A total of 39 undeveloped private parcels covering over 121
1083 ha (300 ac) are outside of the Los Osos urban service line and eligible for single-family
1084 development (Jodi McGraw Consulting 2022). Scattered Morro manzanita plants also
1085 occur within the Los Osos urban service line with 534 undeveloped parcels covering 77
1086 ha (191 ac) eligible for single-family development (Jodi McGraw Consulting 2022). It is
1087 unknown how many of these parcels will be developed in the future.

1088 Department staff estimate about 39% of the remaining occupied Morro manzanita
1089 habitat is high density (50-100% cover of Morro manzanita). Of the remaining high-
1090 density Morro manzanita habitat, about 61% is on protected land owned mainly by State
1091 Parks, County of San Luis Obispo, and the Department, with the remaining 39% on
1092 private property that could be developed. The largest and densest stand of Morro
1093 manzanita remaining is in the area between Los Osos and Hazard Canyon and covers
1094 approximately 131 ha (323 ac) total, with 70 ha (172 ac) on protected land and 61 ha (151
1095 ac) on private property (Figure 5). This area is important for conservation of the species
1096 as it represents one of only two known areas where Morro manzanita forms a large,
1097 nearly continuous, monospecific stand (Holland and Hazebrook 1993; USFWS 2013).
1098 This stand was once larger before residential development impacted about 28 ha (70 ac)
1099 of occupied Morro manzanita habitat with the construction of the Cabrillo Estates
1100 development beginning in the mid-1960s (Morro Group 1985; Mullany 1990).
1101 Immediately south of the Cabrillo Estates, residential development was proposed on 50
1102 ha (124 ac) of high-density Morro manzanita habitat in the 1970s through 1990s
1103 (California Coastal Commission 2000a, b). Development in this area was approved by
1104 the San Luis Obispo County Board of Supervisors in 1998 but was denied by the
1105 California Coastal Commission in 2000 (California Coastal Commission 2000a). The
1106 proposed development would have removed or disturbed up to 20 ha (50 ac) of habitat
1107 for development of residential lots, roads, drainage basins, and recreation facilities with
1108 17 ha (43 ac) of that 20 ha (50 ac) consisting of high-density Morro manzanita habitat
1109 (The Morro Group 1996). The remaining 30 ha (74 ac) was to be left as permanent open
1110 space (Holland and Hazebrook 1993; The Morro Group 1996). In 2000, the California

1111 Coastal Commission staff noted that the proposed project would have removed and
1112 degraded stands of rare native vegetation that are critically important to the survival
1113 and recovery of Morro manzanita (California Coastal Commission 2000b). As of 2025,
1114 this area has not been developed, but this area of high-density Morro manzanita habitat
1115 is still potentially vulnerable to direct and indirect impacts from future residential
1116 development. See the “Existing Management” section of this status review for
1117 information on how development will be managed as part of the Los Osos HCP.

1118 Morro manzanita also experiences direct impacts as a result of road construction and
1119 maintenance. The County of San Luis Obispo has proposed replacing the South Bay
1120 Boulevard Bridge spanning Los Osos Creek so that the bridge meets current seismic
1121 design and safety standards (County of San Luis Obispo 2024b). This bridge
1122 replacement project will cause temporary impacts to 23 Morro manzanita plants and
1123 permanent impacts to 30 plants (County of San Luis Obispo 2024b). As mitigation for
1124 these impacts, the County of San Luis Obispo will plant 113 Morro manzanita plants
1125 within mitigation and restoration areas on site (County of San Luis Obispo 2024b). At
1126 its October 8-9, 2025 meeting, the Commission adopted a regulation, pursuant to
1127 section 2084 of the Fish and Game Code, to authorize take of Morro manzanita during
1128 candidacy for the South Bay Boulevard Bridge project. The Department is not aware of
1129 any additional road construction projects that have recently impacted Morro manzanita,
1130 but the species grows immediately adjacent to roads in the Baywood Park-Los Osos area
1131 and road construction activities could impact the species in the future. While clearing or
1132 trimming of vegetation along roads and trails can be detrimental to Morro manzanita,
1133 this is not always the case. In 2025, Department staff observed many seedlings and
1134 young plants along the disturbed edges of trails in Montaña de Oro State Park,
1135 suggesting that trail construction and maintenance can stimulate germination of the
1136 species.

1137 In addition to direct removal of occupied Morro manzanita habitat for development and
1138 roads, Morro manzanita can experience negative indirect effects from these activities.
1139 Any development in or adjacent to occupied Morro manzanita habitat may necessitate
1140 the creation of fuel breaks around the developed areas for fire safety that will result in
1141 further disturbances to occupied Morro manzanita habitat. While fuel breaks for fire
1142 safety can be done in a way to minimize impacts to Morro manzanita, when all
1143 vegetation is cleared from the fuel breaks, Morro manzanita does not resprout (like
1144 some manzanita species can) since it lacks a basal burl. Some Morro manzanita seeds
1145 may germinate, and seedlings establish after vegetation is cleared, but those plants may
1146 then be removed or trimmed during subsequent vegetation clearing as the fuel break is
1147 maintained over time. Fuel breaks also provide habitat for invasive species to become
1148 established and spread (Merriam et al. 2007). See the “Altered Fire Regime and Fuel
1149 Reduction Activities” section of this status review for additional information on how fire
1150 and fuel breaks threaten Morro manzanita.

1151 Development and roads also contribute to the fragmentation of Morro manzanita
1152 populations. In the northern part of the range, the species distribution has already been
1153 fragmented by development and roads in the towns of Baywood Park and Los Osos, with
1154 just scattered Morro manzanita plants remaining in the developed areas of those towns.
1155 Fragmentation of populations may negatively affect the long-term health and viability of
1156 Morro manzanita, especially if pollinators have difficulty finding and visiting Morro
1157 manzanita plants that are further away from each other, resulting in a decreased seed
1158 set and inbreeding depression (reduction in the ability of offspring to survive and
1159 reproduce due to closely related parents mating) (see the “Vulnerability of
1160 Geographically Restricted Species” section of this status review for additional
1161 information) (Levin 1984; Byers and Meagher 1991; Ellstrand and Elam 1993; Tyler and
1162 Odion 1996; Allphin et al. 2002; Aguilar et al. 2006). While the scattered Morro
1163 manzanita plants that remain within developed areas may serve as a pathway for
1164 pollinators to more easily access different portions of Morro manzanita’s fragmented
1165 distribution, there are often large expanses of development between the isolated plants,
1166 and some Morro manzanita plants are pruned in a way that removes the majority of
1167 inflorescences thereby reducing their usefulness to pollinators. In addition, there is little
1168 appropriate habitat for the scattered Morro manzanita plants remaining in Baywood
1169 Park and Los Osos to expand into within developed areas which creates a fragmented
1170 landscape of isolated plants with minimal reproductive potential and reduced
1171 probability of long-term survival.

1172 As an obligate seeder, habitat fragmentation may be especially detrimental since Morro
1173 manzanita relies on the storage of seed in the soil to replenish the population after fire
1174 (Tyler et al. 2023). If fragmented Morro manzanita populations experience reduced
1175 pollination, resulting in reduced fruit and seed set, the seeds may not accumulate in
1176 sufficient quantities in the soil for the population to recover after fire or other
1177 disturbances. In addition, habitat fragmentation from development makes management
1178 of the species and habitat more difficult as natural processes important for the
1179 persistence of the species (i.e., periodic burning) will be challenging to implement given
1180 the proximity of the species to the adjacent residential community.

1181 Other indirect effects from development and roads that could negatively impact Morro
1182 manzanita include: 1) erosion from road cuts and trails, 2) soil and water contamination
1183 from fertilizers, pesticides, and herbicides, 3) trash dumping, and 4) displacement by
1184 landscape plants (Mullany 1990). Some of these indirect effects have been observed at
1185 the wildland urban interface around the Los Osos Oaks State Natural Reserve and the
1186 Cabrillo Estates (Mullany 1990; The Morro Group 1996; Department observation 2025).

1187 In summary, there has been significant loss of Morro manzanita habitat in the past, and
1188 future development and road construction and maintenance activities continue to
1189 threaten occupied habitat with modification and destruction, including areas with high

1190 density stands of Morro manzanita. Future development and road construction and
1191 maintenance activities should be minimized in the Baywood Park and Los Osos area by
1192 the Los Osos HCP which is discussed further in the “Existing Management” section of
1193 this status review. Preservation of areas with high densities of Morro manzanita is
1194 essential for the long-term persistence of the species. Department staff estimate that
1195 about 25% of the remaining occupied habitat is on private property subject to negative
1196 impacts from future development. Creation of fuel breaks and habitat fragmentation
1197 that occur as development proceeds are likely to have further negative effects on
1198 occupied Morro manzanita habitat quality and species viability. Additional indirect
1199 negative effects to occupied Morro manzanita habitat due to development and roads
1200 may include erosion, soil and water contamination, trash dumping, and displacement by
1201 landscape plants.

1202 **7.2 Vulnerability of Geographically Restricted Species**

1203 Morro manzanita has a narrow geographic range and is a habitat specialist making it
1204 particularly vulnerable to extinction (Rabinowitz 1981; Harnik et al. 2012; Staude et al.
1205 2020; IUCN Standards and Petitions Committee 2024). Morro manzanita is known
1206 from nine documented occurrences with a total range of approximately 30 km² (12 mi²)
1207 as shown in Figure 2 (CNDDDB 2025). When a species has a restricted distribution, like
1208 Morro manzanita, the species becomes more vulnerable to extirpation since habitat loss
1209 and factors that affect population dynamics are more likely to impact the entire species
1210 distribution and there are fewer individuals and occupied habitat overall to compensate
1211 for any declines in survival or reproductive success.

1212 Of particular concern for Morro manzanita are environmental and genetic chance
1213 events. Environmental chance events are random or unpredictable events related to
1214 year-to-year variation in temperature, rainfall, habitat, predators, parasites, etc., which
1215 then drive population-level fluctuations in survival and reproduction (Shaffer 1981,
1216 1987; Menges 1991; Melbourne and Hastings 2008). Environmental chance events, such
1217 as drought, fire, and landslides, can substantially increase the risk of extinction in a
1218 species with a small restricted range. Drought is an environmental chance event that
1219 may be affecting some Morro manzanita plants. Several large Morro manzanita plants
1220 were observed to be experiencing rapid die off or partial die off at the El Moro Elfin
1221 Forest Natural Area in 2021, presumably from recent drought conditions (P. Sarafian,
1222 personal communication, October 23, 2021). If too many Morro manzanita plants die-
1223 off from drought and natural recruitment doesn’t follow, this can affect the species as a
1224 whole by reducing the species’ genetic diversity and further fragmenting the species’
1225 distribution. Fire is another environmental chance event that could have a significant
1226 impact on Morro manzanita in the future. While fire is a necessary part of Morro
1227 manzanita’s life history, too frequent fire, or fire that is not frequent enough, may
1228 negatively impact the entire species distribution. See the “Altered Fire Regime and Fuel

1229 Reduction Activities” section of this status review for additional information on how fire
1230 and fuel reduction activities threaten Morro manzanita.

1231 Genetic chance events are random or unpredictable events related to changes in genetic
1232 diversity and reproductive success (mainly due to genetic drift, inbreeding depression,
1233 and gene flow) (Shaffer 1987; Ellstrand and Elam 1993). Since Morro manzanita is self-
1234 incompatible and insect-pollinated, it is reliant on pollinators for gene flow. Small,
1235 isolated, and/or fragmented populations are less likely to be visited by pollinators who
1236 would normally be delivering pollen from distant, more genetically diverse relatives.
1237 This could result in a restriction in gene flow between populations and fertilization
1238 failing more often (Ellstrand and Elam 1993; Allphin et al. 2002). Morro manzanita
1239 plants that grow in and around the town of Baywood Park consist of widely spaced,
1240 scattered plants and pollinators may be unable to travel between more distant Morro
1241 manzanita plants to cross pollinate. Restricted gene flow could cause reduction in seed
1242 set and/or offspring with reduced ability to survive and reproduce, which could
1243 negatively affect the long-term health and viability of Morro manzanita (Levin 1984;
1244 Byers and Meagher 1991; Allphin et al. 2002). This may already be occurring at the
1245 Morro manzanita stand at the El Moro Elfin Forest Natural Area, which is hypothesized
1246 to be experiencing inbreeding depression after observations of low seed viability and
1247 high seed infertility but additional studies are needed to confirm this hypothesis (Tyler
1248 and Odion 1996, 2020).

1249 In summary, a restricted distribution is an important factor to consider when assessing
1250 threats to the long-term persistence of Morro manzanita. Morro manzanita’s restricted
1251 distribution can result in large portions of the species distribution being negatively
1252 impacted by human activities, natural catastrophes, or other chance events. Species with
1253 a wider geographic range are buffered from the effects of drought, fire, or random
1254 genetic events compared to a species with a restricted geographic range, such as Morro
1255 manzanita. As Morro manzanita plants continue to be removed and disturbed by
1256 development and environmental factors, issues related to the species’ restricted
1257 distribution will continue to be a threat to the species.

1258 **7.3 Altered Fire Regime and Fuel Reduction Activities**

1259 Fire plays a critical role in the establishment and persistence of Morro manzanita (Tyler
1260 and Kofron 2024). Morro manzanita primarily occurs in maritime chaparral, which has
1261 historically been subject to disturbance by fire, and over time many chaparral plants
1262 have adapted to survive through fire-stimulated crown sprouting or seed germination.
1263 As discussed in the “Life History” section of this status review, Morro manzanita is an
1264 obligate seeder so it relies on fire to increase germination of seeds in the soil seed bank
1265 and to create suitable conditions for the species to persist in the landscape after fire
1266 (Wells 1969; Parker 2007; Tyler et al. 2023). However, if a fire occurs over the range of

1267 Morro manzanita and conditions are not optimal for Morro manzanita seed
1268 germination, establishment, and survival, Morro manzanita could experience a
1269 significant population decline (Tyler and Odion 1996).

1270 Pre-European colonization and settlement fire return intervals for chaparral ecosystems
1271 were estimated at between 30 and 90 years (Van de Water and Safford 2011). Since the
1272 coastal ranges of California experience a low frequency of lightning caused fire,
1273 maritime chaparral generally experiences fewer fires than chaparral types further inland
1274 (Keeley and Zedler 1978). It is likely that occasional long fire-free periods of 100 or more
1275 years are an important part of the maritime chaparral ecosystem (Wells 1962; Keeley
1276 and Zedler 1978; Van de Water and Safford 2011; Rundel 2018). Historically, Native
1277 Americans likely utilized fire in the central coast ranges of California to convert
1278 shrublands and woodlands to herbaceous associations which provided more food
1279 resources and reduced hazardous conditions for Native Americans (Keeley 2002). This
1280 habitat conversion was continued by Europeans after the area was colonized to create
1281 and maintain grasslands that were more suitable than shrublands and woodlands for
1282 livestock (Keeley 2002). To this day, fire return intervals continue to be altered by
1283 humans through both an increase in the frequency of human-caused ignitions and an
1284 increase in fire suppression (Keeley et al. 1999).

1285 Fire frequency is an important component in chaparral ecosystems with too short or too
1286 long of a fire return interval potentially having a negative effect on Morro manzanita.
1287 Too short of a fire return interval could result in Morro manzanita seedlings and young
1288 plants being killed by fire before they have an opportunity to flower, set seed, and
1289 contribute to the post-fire seed bank (Zedler et al. 1983; Keeley 2007). Short fire return
1290 intervals are more likely to occur in chaparral when non-native plant species have
1291 invaded an area, creating highly flammable vegetation (see the “Competition” section of
1292 this status review for additional information on how non-native, invasive plants
1293 threaten Morro manzanita). In contrast, too long of a fire return interval could result in
1294 senescent Morro manzanita individuals that have reduced reproductive potential
1295 (Ne'eman et al. 1999). In the 1990s, some individuals of Morro manzanita at older aged
1296 stands in the El Moro Elfin Forest Natural Area were observed to be dead, which may
1297 indicate that the older stands are reaching the age at which Morro manzanita plants
1298 start to naturally senesce (Tyler et al. 1998; Tyler and Odion 2020). In 2025,
1299 Department staff also observed many old, partially dead plants in El Moro Elfin Forest
1300 Natural Area, as well as at the south end of Morro Bay State Park, which may be
1301 indicative of old age.

1302 There have been very few fires documented in areas occupied by Morro manzanita and
1303 no large-scale fires that have burned throughout its habitat have been recorded. The
1304 California Department of Forestry and Fire Protection (CAL FIRE) fire perimeter
1305 database tracks fires of at least 4 ha (10 ac) in size in California from as early as the late

1306 1800s and does not have any documented fires that overlap with occurrences of Morro
1307 manzanita (CAL FIRE 2025b). This suggests that the majority of Morro manzanita
1308 stands have not burned in over 100 years, and some Morro manzanita stands may be
1309 experiencing negative effects from this prolonged lack of fire. Reintroducing fire into
1310 occupied Morro manzanita habitat may be difficult due to the risk fire poses to adjacent
1311 residential communities. Even within Montaña de Oro State Park, prescribed burns are
1312 challenging to implement due to the remote terrain and limited accessibility in parts of
1313 the park (USFWS 2013). While prescribed burns over larger areas are difficult to
1314 implement, the burning of brush piles has occurred recently at the Bayview unit of the
1315 Department’s Morro Dunes Ecological Reserve and at Montaña de Oro State Park
1316 (KSBY staff 2020; Katie Drexhage, personal communication, February 12, 2025). The
1317 burning of brush piles can open up habitat and create conditions beneficial for Morro
1318 manzanita.

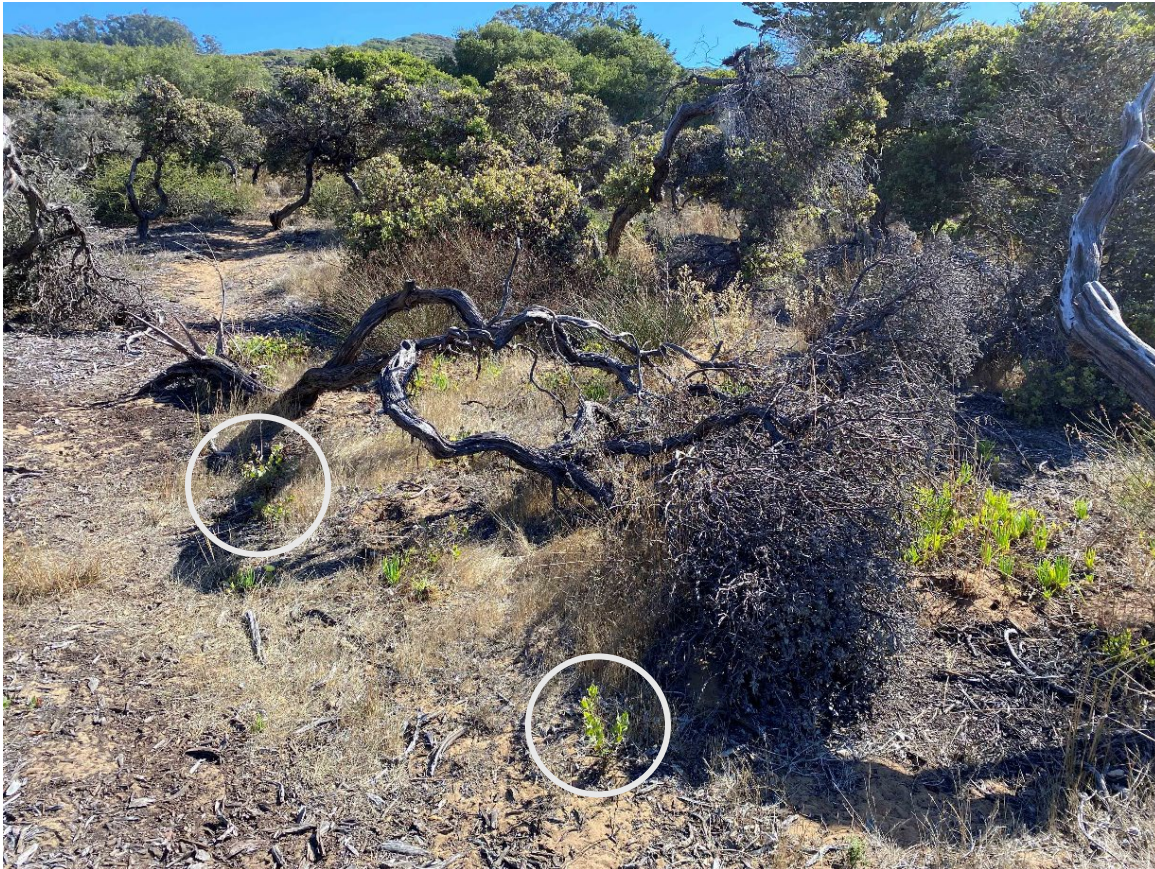
1319 Lack of fire could affect the ability of Morro manzanita to survive long-term as plants
1320 age and eventually die off with no new plants germinating after fire to take their place in
1321 the landscape. The ability of fire surrogates (such as vegetation management that
1322 mimics fire) to promote reproduction and regeneration in Morro manzanita needs
1323 further study and is difficult and expensive to implement over large areas. Mechanical
1324 clearing of vegetation can cause seed scarification, reduce vegetative competition, and
1325 increase light creating conditions suitable for the production of Morro manzanita
1326 seedlings; however, it has also been shown in some areas to convert Morro manzanita
1327 chaparral to coastal scrub vegetation with invasive species a common component of the
1328 vegetation (Tyler and Odion 1996; USFWS 1998). The role of fire within maritime
1329 chaparral communities may serve other purposes, such as nutrient cycling as a result of
1330 biomass combustion and ash deposition, that are not achieved through mechanical
1331 clearing of vegetation (Potts et al. 2010).

1332 In addition to altered fire regimes, fuel reduction activities affect Morro manzanita. Fuel
1333 reduction activities, such as vegetation thinning and clearing, are important practices in
1334 communities that have a high probability of fire. CAL FIRE uses fire hazard severity
1335 zones to identify which areas of the state have a moderate, high, or very high fire hazard
1336 severity. These fire hazard severity zones reflect areas that have similar burn
1337 probabilities and fire behavior characteristics (CAL FIRE 2023). The majority of
1338 occupied Morro manzanita habitat is within very high fire severity zones and within the
1339 “State Responsibility Area”, meaning CAL FIRE has primary responsibility for fire
1340 prevention and suppression in these areas. (CAL FIRE 2025a). California Government
1341 Code sections 51178-51182 require landowners to maintain a defensible space of 30 m
1342 (100 ft) from structures on their property in very high fire severity zones which may
1343 result in fuel reduction activities being prioritized on and around properties with Morro
1344 manzanita.

1345 As part of the Los Osos Community Wildfire Protection Plan, several potential fuel
1346 reduction areas have been identified in, or adjacent to, occupied Morro manzanita
1347 habitat (San Luis Obispo County Community Fire Safe Council 2009). These areas are
1348 around the wildland urban interface of the Morro Dunes Ecological Reserve, the Los
1349 Osos Oaks Nature Reserve, the El Moro Elfin Forest Natural Area, the south end of
1350 Morro Bay State Park, the north end of Montaña de Oro State Park, and around the
1351 Cabrillo Estates development (San Luis Obispo County Community Fire Safe Council
1352 2009). In 2019, a shaded fuel break (where vegetation is thinned but not completely
1353 removed) was constructed along a portion of the northern end of the Bayview Unit of
1354 the Morro Dunes Ecological Reserve, but it has been reported that no Morro manzanita
1355 plants were impacted by this fuel break (Jodi McGraw Consulting 2020; CAL FIRE
1356 2025c; Department observation). Fuel reduction activities have been performed around
1357 the Cabrillo Estates development with substantial impacts to Morro manzanita visible in
1358 a 30 m (100 ft) wide fuel break on the east edge of the Cabrillo Estates (CAL FIRE
1359 2025c). It is unclear when the fuel break around the Cabrillo Estates was first
1360 constructed but the fuel break is clearly visible on Google Earth aerial imagery of the
1361 area from 2013 onward. In 2025, Department staff visited the Cabrillo Estates fuel break
1362 and observed dead and heavily pruned Morro manzanita plants as well as growth of
1363 seedlings and young Morro manzanita plants in the open areas (Figure 7). The long-
1364 term persistence of the seedlings and young plants within the Cabrillo Estates fuel break
1365 is uncertain as they may experience impacts from bush clearing, trimming, or other
1366 habitat modifications when the fuel break is maintained in the future although the
1367 severity of this impact should be reduced as a result of avoidance and minimization
1368 requirements in the Los Osos HCP.

1369 Fuel reduction activities are essential for fire safety in the residential communities
1370 adjacent to occupied Morro manzanita habitat. While some of these activities have had,
1371 and will likely continue to have, negative impacts on Morro manzanita, the Los Osos
1372 HCP includes minimization measures for these fuel reduction activities by prohibiting
1373 the removal of any Morro manzanita plants and minimizing the amount of canopy
1374 thinning and lower branch removal for Morro manzanita (Jodi McGraw Consulting
1375 2022). While canopy thinning and lower branch removal is preferable to complete
1376 removal of the plant, this type of fuel reduction treatment can still cause negative
1377 impacts to Morro manzanita plants and result in a severely degraded ecosystem. While
1378 heavy pruning of Morro manzanita plants may be tolerable for some individuals, the
1379 Department observed mortality in heavily pruned plants in the fuel break on the east
1380 edge of the Cabrillo Estates (Figure 7). Pruning of Morro manzanita in the fuel breaks
1381 may also cause the plants additional stress thereby making them more susceptible to
1382 pathogen infection (see the “Disease” section of this status review) (Drake-Schultheis et
1383 al. 2022). In addition to direct negative impacts to Morro manzanita plants from fuel
1384 reduction activities, the large amount of vegetation pruned and removed from the fuel

1385 breaks creates areas of open habitat that can become heavily invaded by invasive plant
1386 species (Merriam et al. 2007; Jodi McGraw Consulting 2022). Invasive plant species
1387 that become established in fuel breaks adjacent to occupied Morro manzanita habitat
1388 can make Morro manzanita habitat more susceptible to invasion, especially following a
1389 fire (see the “Competition” section of this status review) (Merriam et al. 2007).



1390

1391 *Figure 7. Photograph of the fuel break at the east end of the Cabrillo Estates showing a heavily*
1392 *pruned and dead Morro manzanita plant in the center of photo with two seedlings/young*
1393 *Morro manzanita plants circled in white. Photo credit: Kristi Lazar (2025).*

1394 Changes related to fire management and fuel reduction practices happen regularly and
1395 could influence the ability of Morro manzanita to survive long-term. In 2023–2024,
1396 there was legislation proposed that would have allowed the State Fire Marshal to alter
1397 fire hazard severity zone designations that may have resulted in additional impacts to
1398 Morro manzanita if more areas were prioritized for fuel reduction activities based on
1399 this designation (Assem. Bill No. 3150 (2023–2024 Reg. Sess.)). That particular
1400 Assembly bill was not passed in 2024, but other bills related to the designation of fire
1401 hazard severity zones could impact Morro manzanita in the future. In 2025, the
1402 Governor of California issued a Proclamation of State of Emergency that suspended
1403 environmental statutes, rules, and regulations that are within the jurisdiction of the
1404 California Environmental Protection Agency and the California Natural Resources

1405 Agency in order to expedite critical fuels reduction projects (Governor’s Proc. (March 1,
1406 2025)). The impact that this proclamation will have on Morro manzanita is unknown
1407 but likely would not affect the avoidance and minimization requirements under the Los
1408 Osos HCP for creation and maintenance of fuel breaks.

1409 In summary, Morro manzanita needs fire to persist in the landscape; however, too short
1410 or too long of fire return intervals are both threats to the species across its range. Too
1411 short of a fire return interval may not allow Morro manzanita seedlings to establish and
1412 become reproductive before they are killed in the next fire. Too long of a fire return
1413 interval may result in older Morro manzanita stands with reduced reproductive output
1414 absent active management. Further studies are needed on the ability of fire surrogates
1415 (such as vegetation management that mimics fire) to promote reproduction and
1416 regeneration in Morro manzanita. Fuel reduction activities are necessary for the safety
1417 of residential communities adjacent to occupied Morro manzanita habitat but could
1418 nevertheless have negative effects on Morro manzanita. Fire management and fuel
1419 reduction activities could become bigger issues in the future depending on the types of
1420 legislation on fuel reduction activities that are enacted and whether any environmental
1421 regulations are suspended.

1422 **7.4 Climate Change**

1423 The Earth’s surface has become successively warmer each of the last three decades
1424 which has resulted in atmospheric warming, reduction in the amount of snow and ice,
1425 rising sea levels, and other global impacts (IPCC 2014). Much of this global warming
1426 and subsequent change in climate is a result of increased anthropogenic greenhouse gas
1427 emissions directly caused by human activities (Hawkins et al. 2008; IPCC 2021).
1428 Climate change has been shown to be negatively impacting wildlife and plant taxa and
1429 ecosystems across the globe, with local extinctions related to climate change becoming
1430 widespread (Parmesan and Yohe 2003; Parmesan 2006; Warren et al. 2011; Scheffers et
1431 al. 2016; Wiens 2016; IPCC 2022).

1432 The Department does not have any data on the extent to which predicted changes in the
1433 climate will specifically affect Morro manzanita; however, climate projections have been
1434 developed for California and information is available on how the climate is projected to
1435 change within the range of Morro manzanita (Langridge 2018; Pierce et al. 2018; Cal-
1436 Adapt 2024). These climate projections are part of California’s Fourth Climate Change
1437 Assessment and were generated from a set of 32 global climate model simulations that
1438 have been bias corrected and downscaled. These climate projections are available for
1439 mid-century (2035-2064) and end-century (2070-2099) time periods under two
1440 greenhouse gas emission scenarios, a moderate emission scenario (Representative
1441 Concentration Pathway (RCP) 4.5) and a high emission scenario (RCP8.5) (Langridge
1442 2018; Pierce et al. 2018; Cal-Adapt 2024). Projected changes to the climate within the

1443 range of Morro manzanita are available for temperature, precipitation, and area at risk
1444 from wildfires.

1445 The high temperature for the range of Morro manzanita is projected to increase by 1.5 to
1446 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
1447 (3.5 to 6.5°F) by the end of the century (2070-2099) depending on the RCP emission
1448 scenario and location within the Morro Bay area (Cal-Adapt 2024). Since Morro
1449 manzanita occupies areas of San Luis Obispo County that are closer to the coast, coastal
1450 fog helps buffer temperature extremes (Langridge 2018). However, coastal fog may
1451 decrease with climate change, and if that happens, temperature increases will likely be
1452 more significant (Moser and Ekstrom 2012).

1453 Precipitation within the range of Morro manzanita is projected to either decrease by 2.5
1454 mm (0.1 in) or increase by 5.1 mm (0.2 in) by the middle of the century (2035-2064)
1455 and increase by 7.6 to 20.3 mm (0.3 to 0.8 in) by the end of the century (2070-2099)
1456 depending on the RCP emission scenario and location within the Morro Bay area (Cal-
1457 Adapt 2024). As a whole, California is projected to have less frequent but more extreme
1458 daily precipitation, more volatile year-to-year precipitation, and an increase in the
1459 number of dry years (Bedsworth et al. 2018; Swain et al. 2018).

1460 The area at risk of burning annually within the range of Morro manzanita is projected to
1461 increase by both the middle of the century (2035-2064) and the end of the century
1462 (2070-2099); however, the frequency, severity, and impacts of fires is highly dependent
1463 on a number of factors, including development patterns, vegetation, topography, and
1464 weather (Moser and Ekstrom 2012; Langridge 2018; County of San Luis Obispo 2019;
1465 Cal-Adapt 2024). Given the proximity of many of the Morro manzanita stands to
1466 development, it is likely that any wildfires in this area will be suppressed for the safety of
1467 nearby residential communities.

1468 Morro manzanita is a species with a restricted range and is a habitat specialist, which
1469 are two factors that have been shown to make a species more susceptible to climate
1470 change (Damschen et al. 2012; Harnik et al. 2012; Rose et al. 2022). Since the area
1471 occupied by Morro manzanita is small, any effects the species may experience from
1472 climate change are more likely to impact the entire distribution of the species. As a
1473 habitat specialist, Morro manzanita has a strong preference for Baywood fine sand soil
1474 within its small range, so there are limited areas suitable for it to disperse to in the face
1475 of a warming climate. Plantings of Morro manzanita outside of its natural distribution
1476 may have benefits for the species, especially in the face of a warming climate, but
1477 consideration needs to be given to the genetic source of planted individuals, how
1478 isolated those individuals are from others, and how the area will be managed long-term.

1479 Department staff assessed the vulnerability of Morro manzanita to projected climate
1480 change using the NatureServe Climate Change Vulnerability Index (CCVI) Version 4.0
1481 (Lyons et al. 2024; CDFW 2026). The CCVI assesses a species' vulnerability to climate
1482 change by evaluating: 1) the species' exposure to projected climate change under a
1483 moderate emission scenario (RCP4.5) and a high emission scenario (RCP8.5), and 2)
1484 the species' ability to adapt to projected climate change. The CCVI uses a scoring system
1485 to separate species into one of four overall categories based on their vulnerability to
1486 projected climate change: less vulnerable, moderately vulnerable, highly vulnerable, and
1487 extremely vulnerable. Morro manzanita was assessed by Department staff to be
1488 moderately vulnerable to climate change under the moderate emission scenario and
1489 extremely vulnerable to climate change under the high emission scenario. In addition,
1490 the CCVI results for Morro manzanita indicate that the species has a low adaptive
1491 capacity based on 37 species or population level factors used to assess adaptive capacity.
1492 This CCVI assessment for Morro manzanita was influenced by several species-specific
1493 factors including Morro manzanita's small range extent and area of occupancy, habitat
1494 specialization, high site fidelity, long life span, and association with Baywood fine sand
1495 soil and coastal areas which restricts the ability of Morro manzanita to shift its range in
1496 response to climate change. Based on available information, Morro manzanita may
1497 decline in the future in response to climate change.

1498 **7.5 Competition**

1499 Competition with non-native, invasive plants is a threat to Morro manzanita.
1500 *Eucalyptus* species, iceplant (*Carpobrotus* spp. and *Conococia pugioniformis*), and
1501 perennial veldt grass (*Ehrharta calycina*) are the main non-native, invasive plants that
1502 threaten Morro manzanita.

1503 *Eucalyptus* species are native to Australia but were widely planted in California in the
1504 late 1800s and early 1900s (Mullany 1990). The lumber from these trees was intended
1505 to be used for building materials and railroad ties but the wood was found to easily rot
1506 and was not suitable for the intended purposes (Tornatzky 2016). While *Eucalyptus*
1507 stands occur throughout the range of Morro manzanita, the extensive *Eucalyptus* stands
1508 in Montaña de Oro State Park are particularly relevant when considering Morro
1509 manzanita conservation. *Eucalyptus* plantations were first planted in the Hazard
1510 Canyon area of what is now Montaña de Oro State Park in the early 1900s and it is likely
1511 other *Eucalyptus* plantations in the Montaña de Oro State Park area were also planted
1512 around this time (Bicknell 1990; Mullany 1990). Eight species of *Eucalyptus*, covering
1513 an estimated 83 ha (206 ac), have been documented in Montaña de Oro State Park with
1514 most individuals belonging to the species blue gum eucalyptus (*E. globulus*) (Bicknell
1515 1990; Mullany 1990; GIC 2024). When Morro manzanita is present surrounding the
1516 *Eucalyptus* stands, it generally stops growing right at the edge of the stands, which is a
1517 strong indicator that Morro manzanita plants were removed from the site when the

1518 *Eucalyptus* were initially planted or that as the *Eucalyptus* matured and expanded into
1519 occupied Morro manzanita habitat, Morro manzanita plants were not able to survive in
1520 the understory (Figure 6) (Mullany 1990). Over 40 ha (100 ac) of *Eucalyptus* within
1521 Montaña de Oro State Park grow immediately adjacent to Morro manzanita stands
1522 indicating that the *Eucalyptus* stands may have caused the extirpation of many acres of
1523 occupied Morro manzanita habitat (GIC 2024).

1524 *Eucalyptus* stands have been documented to be spreading at Montaña de Oro State Park
1525 with an estimated expansion of over 50% between 1949 and 1986 and an additional
1526 expansion of approximately 13% between 1986 and 2024 (Bicknell 1990; GIC 2024).
1527 While some of this expansion is due to an increase in *Eucalyptus* crown size, most of the
1528 expansion is a result of invasion of *Eucalyptus* into new areas (Bicknell 1990). In areas
1529 with *Eucalyptus* stands, growth of native vegetation (including Morro manzanita) is
1530 suppressed likely due to low light; accumulation of thick layers of leaf, bark, and fruit
1531 litter; changes in soil chemistry; and depletion of the amount of nutrients and/or water
1532 available for native vegetation (Poore and Fries 1985; Mullany 1990; USFWS 2013;
1533 McFadden 2021). Allelopathic (growth inhibiting) effects of *Eucalyptus* leaf litter have
1534 been suggested as another possible reason for lack of native vegetation under
1535 *Eucalyptus* trees; however, a recent study failed to detect an allelopathic effect of
1536 *Eucalyptus* leaf litter on native plant species (Nelson 2016). While most Morro
1537 manzanita stop growing right at the edge of *Eucalyptus* stands (Figure 6), Department
1538 staff observed an open area with scattered *Eucalyptus* that had Morro manzanita
1539 growing in the understory (Figure 8) (Department observation 2025). This area had
1540 thick *Eucalyptus* leaf litter in some areas further supporting the hypothesis that
1541 allelopathic effects from leaf litter are likely not the main reason Morro manzanita
1542 generally does not grow in the *Eucalyptus* understory. Based on Department staff
1543 observations within this open stand of *Eucalyptus*, it is more likely that low light under
1544 dense *Eucalyptus* canopies is the main factor restricting growth of Morro manzanita
1545 under the canopy. If this open *Eucalyptus* stand continues to grow and expand, Morro
1546 manzanita could be eliminated from this site as the canopy closes in and creates shady
1547 conditions unsuitable for Morro manzanita establishment and growth.



1548

1549 *Figure 8. Photos of an open stand of Eucalyptus with Morro manzanita growing in the*
1550 *understory. Ground had abundant Eucalyptus leaf litter, but ample sunlight was able to*
1551 *penetrate the canopy. Photo credit: Kristi Lazar (2025).*

1552 A 1990 study by Jennifer von Reis, referenced by Mullany (1990), also determined that
1553 there was a correlation between low embryo viability and soil seed banks for Morro
1554 manzanita stands that grew in close proximity to *Eucalyptus* stands; however, it is
1555 unknown what mechanisms are causing those effects in Morro manzanita. *Eucalyptus*
1556 stands also threaten the reestablishment of Morro manzanita after a fire as *Eucalyptus*
1557 plants readily resprout from stumps and seedlings are fast growers (Tyler and Odion
1558 1996; Wolf and DiTomaso 2016). These factors could cause *Eucalyptus* to outcompete
1559 the slower growing Morro manzanita seedlings after a fire and cause the displacement of
1560 Morro manzanita from the area (Tyler and Odion 1996; USFWS 1998). *Eucalyptus*
1561 stands could also contribute to an increased fire frequency, which would be detrimental
1562 to Morro manzanita, as *Eucalyptus* stands are considered a fire hazard due to the
1563 production of oily resins, abundant leaf litter under the tree canopy, and shedding bark
1564 that catches fire easily and can be carried into the canopy creating dangerous fire
1565 conditions (NPS 2006).

1566 While *Eucalyptus* plants are the non-native, invasive species that pose the greatest
1567 threat to Morro manzanita, iceplant and perennial veldt grass are additional non-native,
1568 invasive plants that could have significant negative effects on Morro manzanita in the
1569 future. Iceplant is a well-known problem in maritime chaparral and has been shown to
1570 aggressively invade openings in occupied Morro manzanita habitat (USFWS 2013). If a
1571 fire were to occur, iceplant could outcompete Morro manzanita seedlings for
1572 establishment since its germination and growth is much faster than that of Morro
1573 manzanita seedlings (Tyler and Odion 1996; USFWS 2013). After two fire cycles,
1574 iceplant can completely displace maritime chaparral if no control measures are
1575 implemented (Tyler and Odion 1996). Due to lack of recent fire in Morro manzanita
1576 stands, iceplant has not become a dominant feature of the plant community but it is

1577 currently present in sufficient quantities that if fire occurs, it could invade the area and
1578 outcompete Morro manzanita for establishment (Tyler and Odion 1996).

1579 Perennial veldt grass is a highly invasive species that is wind-dispersed and known to
1580 spread rapidly in disturbed or open areas (Pickart 2000). Since it has roots that can
1581 penetrate the soil deeply, it is especially adapted to growing in sandy soil like the
1582 Baywood fine sand soil Morro manzanita is typically found in (Pickart 2000). Perennial
1583 veldt grass competes for limited soil resources and creates a dense thatch that inhibits
1584 native plant establishment and is highly flammable (Jodi McGraw Consulting 2022). In
1585 1990, Mullany noted that perennial veldt grass was well established in the sandy soil in
1586 the Los Osos area and in openings around Morro manzanita plants (Mullany 1990). At
1587 the Morro Dunes Ecological Reserve, perennial veldt grass was noted to occur in dense
1588 patches in areas where the soil has been disturbed from land clearing or recreational use
1589 and may be impeding the recolonization of Morro manzanita into historically farmed
1590 areas at Morro Dunes Ecological Reserve (Jodi McGraw Consulting 2020; John
1591 Chesnut, personal communication, January 26, 2026). While invasion of perennial veldt
1592 grass does not currently appear to be a threat to established stands of Morro manzanita,
1593 it is abundant in adjacent open dune scrub vegetation and disturbed areas across the
1594 range of Morro manzanita (Tyler and Odion 1996).

1595 Perennial veldt grass may also become a significant threat to Morro manzanita after fire.
1596 If a fire burns through a stand of Morro manzanita, the wind-dispersed seeds of
1597 perennial veldt grass could be blown to the burned areas and become established. As
1598 perennial veldt grass colonizes an area after fire, it provides more fuel for future fires
1599 and contributes to an increase in the frequency and intensity of fires (D'Antonio and
1600 Vitousek 1992). This would be detrimental to Morro manzanita which may need a longer
1601 fire return interval to persist in the landscape.

1602 In summary, Morro manzanita is currently threatened by non-native, invasive plant
1603 species and that threat may increase in the future. *Eucalyptus* stands were planted in
1604 areas that likely once contained Morro manzanita, and those *Eucalyptus* stands are
1605 continuing to encroach into occupied Morro manzanita habitat thereby threatening the
1606 species (see the Existing Management section of this status review for discussion of
1607 current *Eucalyptus* management and habitat restoration projects occurring on
1608 protected lands). Iceplant and perennial veldt grass are present near Morro manzanita
1609 but will likely only become serious threats to the species if a fire burns through the area
1610 and kills Morro manzanita plants giving these non-native, invasive plants a chance to
1611 rapidly spread and dominate the habitat.

1612 **7.6 Recreation**

1613 Recreational use within occupied Morro manzanita habitat occurs across the species
1614 range. The Bayview unit of the Morro Dunes Ecological Reserve (just west of Bayview
1615 Heights Drive) has experienced significant habitat impacts from recreational use. As an
1616 ecological reserve, the primary purpose of the property is for protection of sensitive
1617 plants, animals, and habitat; however, the reserve experiences trespass recreational use
1618 from off-road vehicles, bicycles, and horseback riding (Cal. Code Regs., tit. 14, § 630)
1619 (CDFW 2024). These activities are prohibited on the Bayview unit of the Morro Dunes
1620 Ecological Reserve (Cal. Code Regs., tit. 14, § 630, subd. (g)), but enforcement of these
1621 restrictions has been limited and has resulted in impacts to the sensitive habitat on the
1622 reserve (CDFW 2024). Horseback riding in particular has led to removal of some of the
1623 established vegetation, soil erosion, and trail destabilization, resulting in the formation
1624 of deep gullies in the Baywood fine sand soil and the introduction and spread of non-
1625 native species (Jodi McGraw Consulting 2022; CDFW 2024). However, it has been
1626 reported that equestrian use of the Bayview unit of the Morro Dunes Ecological Reserve
1627 was effectively eliminated by mid-2024 (Department observation). Restoration and
1628 management of these recreational impacts at Morro Dunes Ecological Reserve is a
1629 component of the Los Osos HCP (see the “Existing Management” section of this status
1630 review for additional information) (Jodi McGraw Consulting 2022).

1631 The El Moro Elfin Forest Natural Area has experienced disturbance from off-trail
1632 activities which have impacted vegetation and contributed to destabilization of the soil
1633 (Terra Verde Environmental Consulting 2019). In addition, Morro manzanita plants
1634 were reportedly damaged (leveled to the ground in some areas) by vandals over an area
1635 of about 0.4 ha (1 ac) within the El Moro Elfin Forest Natural Area in 2009 (P. Sarafian,
1636 personal communication, May 25, 2009; USFWS 2013). Before the El Moro Elfin Forest
1637 Natural Area was established, off-road vehicle use damaged the native vegetation at the
1638 site, but the area appears to have recovered and off-road vehicle use is no longer
1639 considered a threat on the property (McGuire and Morey 1992; Keeley 2007). Other
1640 reserves and parks that contain Morro manzanita experience some disturbance from
1641 recreational use, but the impacts are typically limited to authorized trail use and
1642 maintenance.

1643 Private property south of the Cabrillo Estates experiences recreational impacts from a
1644 network of unofficial trails that have been created through an area of dense, high cover
1645 Morro manzanita. Portions of these trails may have originated as dirt roads created for a
1646 potential development in the 1970s but are now being used as trails for local residents
1647 (California Coastal Commission 2000a). These trails connect the Cabrillo Estates
1648 development with the East Rim Trail within Montaña de Oro State Park and to trails
1649 within the Morro Dunes Ecological Reserve. The trails cut through dense stands of
1650 Morro manzanita resulting in direct negative impacts to the species. Soil erosion is also

1651 evident along portions of the trails and the trail sides in this area had very little Morro
1652 manzanita regrowth, likely due to the low light conditions and eroding soil (Figure 9)
1653 (Department observation 2025).



1654

1655 *Figure 9. Photos of unofficial trails between the Cabrillo Estates development and Montaña de*
1656 *Oro State Park. Left photo shows trail through dense Morro manzanita. Right photo shows*
1657 *severe erosion along the trail with Morro manzanita roots exposed. Photo credit: Kristi Lazar*
1658 *2025.*

1659 **7.7 Predation**

1660 Manzanita fruits and seeds are an important source of food for rodents, rabbits, and
1661 coyotes within chaparral communities (Keeley and Hays 1976). These animals can serve
1662 as both seed predators and seed dispersers. The main seed predators and short distance
1663 seed dispersers for Morro manzanita are thought to be woodrats, while other animals,
1664 such as coyotes and birds, may serve as long distance seed dispersers (Keeley and Hays
1665 1976; Parker 2015; Tyler and Odion 2020; Tyler et al. 2023). Fruit and seed predation
1666 has been shown to be a likely cause of seed loss in studies of more common manzanita
1667 species (Keeley and Hays 1976; Keeley 1987b). A study specific to Morro manzanita
1668 found between 60 and 70% of fruits produced were lost to animal predation within a
1669 month and half of falling from the plant (Tyler et al. 2023). While some of the fruits and
1670 seeds removed from the area by animals may survive if they are moved to or buried at
1671 another suitable location (seed caching) or may survive through animal scat, it is also
1672 likely that many of the fruits and seeds were consumed by animals and the seeds killed
1673 (Keeley and Hays 1976; Tyler et al. 2023). In addition, some of those fruits and seeds
1674 may have been moved by animals to areas with unsuitable conditions and this would
1675 also result in potentially viable seeds being removed from the soil seedbank (Tyler et al.
1676 2023). The highest fruit and seed predation rates for Morro manzanita were

1677 documented in a Morro manzanita stand in the El Moro Elfin Forest Natural Area which
1678 consists of older Morro manzanita individuals (50+ years old in 1999 at the time of the
1679 study) (Tyler et al. 2023). This area may be particularly vulnerable to the negative
1680 effects of seed predation since it has also been shown to have low seed viability when
1681 compared to other Morro manzanita sites (Tyler et al. 2023).

1682 **7.8 Disease**

1683 Disease has not been documented in Morro manzanita, but pathogens may pose a threat
1684 to the species in the future, especially pathogens in the genus *Phytophthora*. The
1685 sudden oak death pathogen (*Phytophthora ramorum*) is an oomycete (fungal-like water
1686 mold) that spreads through spores dispersed by wind, water, litter, or soil (Peterson et
1687 al. 2014; Grünwald et al. 2019). In California, the sudden oak death pathogen infects
1688 and kills oaks (especially coast live oak) and California tanoak (*Lithocarpus densiflora*)
1689 and can non-lethally infect the leaves of over 100 host species (Rizzo et al. 2002; Rizzo
1690 and Garbelotto 2003; Peterson et al. 2014). The sudden oak death pathogen has been
1691 detected in a single Morro manzanita individual planted at the University of California
1692 Santa Cruz (UCSC) Arboretum but has not yet been observed to infect Morro manzanita
1693 in the wild (Garbelotto et al. 2020). Based on a study of several manzanita species at the
1694 UCSC Arboretum that were artificially inoculated with the sudden oak death pathogen,
1695 it is likely that manzanita are not an ideal host of sudden oak death pathogen as the
1696 infected manzanita had just a few sporangia (structures that house spores) detected
1697 (Garbelotto et al. 2020). While sudden oak death pathogen has not yet been
1698 documented within wild Morro manzanita stands, the pathogen has been documented
1699 to occur in several streams in coastal San Luis Obispo County so spread of the pathogen
1700 to areas with Morro manzanita is a possibility in the future (Peterson et al. 2014;
1701 Grünwald et al. 2019; Kofron and Tyler 2024).

1702 In addition to the sudden oak death pathogen, manzanita species can experience root
1703 and crown decay, branch dieback, and mortality from other *Phytophthora* species. In
1704 other parts of California, the federally threatened Ione manzanita (*Arctostaphylos*
1705 *myrtifolia*), the federally threatened and state endangered pallid manzanita (*A. pallida*),
1706 and the more common whiteleaf manzanita (*A. viscida*) have experienced extensive
1707 mortality from *P. cinnamomi* (Swiecki and Bernhardt 2003; Swiecki et al. 2011). *P.*
1708 *cinnamomi* is a soil-borne oomycete pathogen that was introduced to California through
1709 the horticultural trade (Swiecki and Bernhardt 2003; Swiecki et al. 2011). The pathogen
1710 causes root decay and is very persistent in soils; eradication of the pathogen from
1711 infected sites is generally not possible (Swiecki et al. 2011). While not yet documented in
1712 Morro manzanita, *P. cinnamomi* may be a concern in the future since Morro manzanita
1713 grows adjacent to horticultural landscaping which could be infected with the pathogen.
1714 If *P. cinnamomi* infects the Morro manzanita population, it would likely cause
1715 widespread mortality of Morro manzanita as it has in other manzanita species.

1716 Other pathogens known to infect manzanita species include stem canker fungi in the
1717 genus *Fusicoccum*, the name given to the asexual stage of several fungi responsible for
1718 stem canker, and fungi in the Botryophaeiaceae family (Swiecki and Bernhardt 2003;
1719 Drake-Schultheis et al. 2022). *Fusicoccum* species have been documented in both Ione
1720 manzanita and whiteleaf manzanita and were responsible for stem cankers and branch
1721 dieback that sometimes led to mortality (Swiecki and Bernhardt 2003). Fungi in the
1722 Botryophaeiaceae family are commonly associated with disease in plants that are
1723 experiencing environmental stress (such as heat, drought, or physical damage) (Slippers
1724 and Wingfield 2007; Drake-Schultheis et al. 2022). These fungi have been shown to
1725 infect manzanita species and cause dieback of branches and mortality in young plants
1726 (Drake-Schultheis et al. 2022). While these fungi have not been specifically looked for in
1727 Morro manzanita, taxa in the Botryophaeiaceae are known to use *Eucalyptus* as host
1728 plants and Morro manzanita often grows immediately adjacent to *Eucalyptus* stands
1729 (Slippers et al. 2004; Slippers and Wingfield 2007). Fungi in the Botryophaeiaceae
1730 family may become a threat in the future if Morro manzanita is subjected to additional
1731 or increased environmental stressors from climate change and fuel reduction activities
1732 (Slippers and Wingfield 2007; Drake-Schultheis et al. 2022).

1733 The Department considers the threat to Morro manzanita from pathogens to be low at
1734 this time, but Morro manzanita stands should be monitored for the presence of disease
1735 so early intervention and management can occur.

1736 **7.9 Overexploitation**

1737 The Department does not have any information on overexploitation affecting Morro
1738 manzanita. While Morro manzanita is available for purchase at select plant nurseries,
1739 overcollection of Morro manzanita from wild populations is not currently considered a
1740 threat (Calscape 2024). Morro manzanita can be propagated from seed or stem cuttings
1741 which can be done without negatively affecting the parent plant or population. The
1742 Department does not currently consider overexploitation to be a significant threat to the
1743 continued existence of Morro manzanita.

1744 **8 Existing Management**

1745 When Morro manzanita was initially petitioned for CESA listing in 1991, the
1746 Commission ultimately decided not to list Morro manzanita under CESA based on
1747 regional planning efforts that were initiated in 1993 and that would ideally make CESA
1748 listing of Morro manzanita unnecessary (Cochrane 1996). A condition of the 1993
1749 Commission finding was that a conservation plan, with secure funding sources for
1750 implementation, would be in place by January of 1995 (Cochrane 1996). A conservation
1751 plan was not finalized by 1995 and by the end of 1996 the Department had concerns that
1752 the regional planning efforts would not result in adequate protection of Morro

1753 manzanita habitat (Cochrane 1996). A key property owner whose land had large, dense
1754 stands of Morro manzanita was opposed to the conservation planning effort which
1755 meant that only small, fragmented areas were being considered for potential
1756 conservation easements (Cochrane 1996). While the regional planning efforts in the
1757 1990s were unsuccessful in creating a conservation plan, the federal listing of Morro
1758 manzanita and increased attention on the species resulted in funding being allocated for
1759 additional research on Morro manzanita.

1760 While Morro manzanita was not listed under CESA in the 1990s, it was listed as a
1761 threatened species under the ESA in 1994. In 1998, the USFWS published a recovery
1762 plan that delineated reasonable actions that were important for the recovery and
1763 protection of the Morro shoulderband snail and four plant species, including Morro
1764 manzanita (USFWS 1998). The 1998 recovery plan provided delisting criteria for Morro
1765 manzanita that required: 1) 90% of existing high and medium cover stands and 85 to
1766 90% of low cover stands be preserved, 2) evidence that the acreage and cover classes of
1767 Morro manzanita in preserves can be maintained over time, and 3) site-specific
1768 management plans to have been successfully implemented for the preserves (USFWS
1769 1998). As of 2022, the first recovery criterion was close to being met with 70% of
1770 existing high and medium cover Morro manzanita stands and 89% of low cover stands
1771 protected in preserves (USFWS 2022). The second and third criteria have not been met
1772 as there are no monitoring programs in place to track the maintenance of Morro
1773 manzanita stands over time and site-specific management plans have only been
1774 developed for two of the five relevant preserves (USFWS 2022).

1775 The remaining discussion in this section considers the impact of existing management
1776 efforts on the species (Fish & G. Code, § 2072.3; Cal. Code Regs., tit. 14, § 670.1, subd.
1777 (d)(1)). The Department estimates that about 25% of the remaining occupied Morro
1778 manzanita habitat is on private land with no current management. About 75% of
1779 occupied Morro manzanita habitat occurs on public lands owned by the State of
1780 California (mainly State Parks and the Department), the County of San Luis Obispo, and
1781 the U.S. Department of the Interior’s Bureau of Land Management (Table 2). Public
1782 ownership of lands with occupied Morro manzanita habitat does not guarantee the long-
1783 term survival of the species. Morro manzanita plants growing on public lands are
1784 generally safeguarded from development, but most of these lands do not have site-
1785 specific management plans that consider long-term preservation and management of
1786 Morro manzanita. In addition, these lands are subject to a variety of land uses that are
1787 not always compatible with species conservation, such as recreational use (McGuire and
1788 Morey 1992). Managing occupied Morro manzanita habitat for long-term persistence is
1789 challenging since many of the protected lands with Morro manzanita, such as the El
1790 Moro Elfin Forest Natural Area, Morro Dunes Ecological Reserve, and the Los Osos
1791 Oaks Natural Reserve, are immediately adjacent to development. Healthy Morro
1792 manzanita populations have historically needed periodic fire to stimulate reproduction

1793 and promote regeneration but use of fire as a management action has challenges due to
1794 the proximity of the habitat to adjacent residential communities. Mechanical clearing of
1795 vegetation may simulate the effects of fire for Morro manzanita and appears to be
1796 especially useful for helping to restore native habitat after *Eucalyptus* removal, but
1797 additional studies are needed on the long-term success of mechanical clearing in
1798 occupied Morro manzanita habitat as a surrogate for fire.

1799 The following subsections are not a comprehensive discussion of all management
1800 activities within the range of Morro manzanita. The existing management discussed
1801 below covers management activities that Department staff think could directly impact
1802 large portions of occupied Morro manzanita habitat. Seed collections are also an
1803 important component of managing Morro manzanita, so a discussion of the status of
1804 Morro manzanita seed collections for conservation is included at the end of this section.

1805 **8.1 Los Osos Habitat Conservation Plan**

1806 Habitat conservation plans are planning documents required as part of an application
1807 for an incidental take permit under the ESA (16 U.S.C. § 1539(a)(2)(B)). The Los Osos
1808 HCP was approved in February 2024 as part of an incidental take permit issued by the
1809 USFWS to the County of San Luis Obispo (Kahn et al. 2024). The Los Osos HCP covers a
1810 1,475 ha (3,644 ac) area centered on the unincorporated community of Los Osos with
1811 the purpose of identifying the activities and species covered under the plan, as well as
1812 the steps that the County of San Luis Obispo and plan participants will take to avoid,
1813 minimize, and mitigate impacts of the covered activities on the covered species (Jodi
1814 McGraw Consulting 2022). Covered activities include residential and commercial
1815 development of vacant parcels, redevelopments, capital improvement projects, facilities
1816 operations, road and trail creation, park expansion and creation, water system
1817 upgrades, maintenance activities, fuel reduction and fire hazard abatement treatments,
1818 and other activities (Jodi McGraw Consulting 2022). The Los Osos HCP identifies four
1819 federally listed species that are covered under the plan: Morro Bay kangaroo rat
1820 (*Dipodomys heermanni morroensis*), Morro shoulderband snail (*Helminthoglypta*
1821 *walkeriana*), Indian Knob mountainbalm (*Eriodicyton altissimum*), and Morro
1822 manzanita (Jodi McGraw Consulting 2022). While the USFWS incidental take permit
1823 provides take coverage for the Morro shoulderband snail, as a federally listed plant,
1824 Morro manzanita is not subject to the take prohibition in the ESA and is thus not
1825 eligible for take authorization.

1826 Within the Los Osos HCP area, there are about 223 ha (550 ac) of occupied Morro
1827 manzanita habitat based on acreage estimates from Department staff; this accounts for
1828 56% of the remaining occupied Morro manzanita habitat. Nearly all of the remaining
1829 Morro manzanita plants on private property are within the area covered by the Los Osos
1830 HCP. Activities covered by the Los Osos HCP will impact Morro manzanita, such as

1831 when individuals occur in project footprints and cannot be avoided. As a federal habitat
1832 conservation plan, the Los Osos HCP does not provide state take coverage, and since
1833 Morro manzanita was not state listed at the time the Los Osos HCP was approved, the
1834 Department did not need to issue state take coverage for the activities covered by the
1835 Los Osos HCP. Therefore, the Department has not previously had the opportunity to
1836 consider whether the measures in the Los Osos HCP satisfy the requirements of CESA or
1837 the Natural Community Conservation Planning Act. Impacts to Morro manzanita from
1838 the covered activities in the Los Osos HCP and the related conservation measures for the
1839 species are summarized below. Additional information on the Los Osos HCP can be
1840 found in the full document prepared by Jodi McGraw Consulting (2022).

1841 *8.1.1 Impacts from Covered Activities*

1842 Direct impacts to Morro manzanita from implementation of the Los Osos HCP include
1843 removal of plants and habitat loss, whereas indirect impacts include habitat
1844 fragmentation, habitat degradation due to spread of non-native plants, impacts from
1845 herbicides, increased fire frequency or complete exclusion of fire, and hybridization. The
1846 Los Osos HCP defines Morro manzanita habitat as areas with vegetation classified as
1847 central maritime chaparral and native woodlands; this includes vegetation identified in
1848 the Los Osos HCP as Morro manzanita California sagebrush, Morro manzanita, Morro
1849 manzanita wedgeleaf ceanothus, wedgeleaf ceanothus-California sagebrush, bishop pine
1850 woodland, and coast live oak woodland. As such, Morro manzanita habitat identified in
1851 the Los Osos HCP is actually referring to suitable Morro manzanita habitat (habitat that
1852 may or may not contain Morro manzanita) and not necessarily occupied Morro
1853 manzanita habitat. For the purposes of determining the amount of occupied Morro
1854 manzanita habitat that may be impacted through the Los Osos HCP, the Department
1855 used habitat classified in the Los Osos HCP as Morro manzanita California sagebrush,
1856 Morro manzanita, and Morro manzanita wedgeleaf ceanothus which better aligns with
1857 previous calculations in this status review regarding occupied Morro manzanita habitat.
1858 The Los Osos HCP indicates that 7.3 ha (18.1 ac) of habitat classified in the Los Osos
1859 HCP as Morro manzanita California sagebrush, Morro manzanita, and Morro manzanita
1860 wedgeleaf ceanothus is anticipated to be impacted by activities covered under the Los
1861 Osos HCP. This represents less than 2% of total extant occupied Morro manzanita
1862 habitat as estimated by Department staff. The 7.3 ha (18.1 ac) of occupied Morro
1863 manzanita habitat to be impacted consists of 6.2 ha (15.2 ac) of permanent impacts and
1864 1.2 ha (3 ac) of temporary impacts. In addition, the Los Osos Community Wildfire
1865 Protection Plan is anticipated to impact additional Morro manzanita habitat for fuel
1866 reduction and fire hazard abatement treatments. The Los Osos HCP anticipates these
1867 fuel reduction and fire hazard abatement treatments will have negligible effects on
1868 Morro manzanita, so it does not include these impacts in its total calculations for
1869 amount of Morro manzanita habitat impacted by activities covered under the Los Osos

1870 HCP. See the “Altered Fire Regime and Fuel Reduction Activities” section of this status
1871 review for further discussion on the impacts of fuel reduction and fire hazard abatement
1872 treatments on Morro manzanita.

1873 As discussed in the “Present or Threatened Modification or Destruction of Habitat”
1874 section of this status review, some of the habitat that may be developed is concentrated
1875 in areas of high-density Morro manzanita between the Cabrillo Estates and Montaña de
1876 Oro State Park. These high-density areas of Morro manzanita are within the Priority
1877 Conservation Area (PCA) outlined in the Los Osos HCP. The PCA consists of relatively
1878 intact habitat that is considered of greater conservation value than more disturbed
1879 habitat outside of the PCA. Development of intact Morro manzanita habitat on private
1880 property within the PCA will contribute to fragmentation of one of the last remaining
1881 high cover stands of the species although the Los Osos HCP sets forth avoidance and
1882 mitigation measures for development within the PCA. Development of disturbed Morro
1883 manzanita habitat on private property outside of the PCA (within the urban areas of
1884 Baywood Park and Los Osos) will also result in the removal of Morro manzanita plants.
1885 Morro manzanita plants within the urban area may play a role in creating a pathway for
1886 pollinators to more easily access different portions of Morro manzanita’s fragmented
1887 distribution. While protection of Morro manzanita plants within the urban area is a
1888 lower priority for conservation of the species as a whole, removing those plants will
1889 nevertheless negatively impact the species.

1890 *8.1.2 Conservation Program*

1891 The Los Osos HCP conservation program includes measures designed to avoid,
1892 minimize, and mitigate the impacts of covered activities on covered species and their
1893 habitat. The Los Osos HCP indicates that there will be a net positive impact to Morro
1894 manzanita through: 1) protection of 20.9 ha (51.7 ac) of suitable Morro manzanita
1895 habitat through acquisition of fee title or conservation easements, 2) restoration and
1896 management of 9 ha (22.3 ac) of suitable Morro manzanita habitat on existing protected
1897 lands, and 3) management (no restoration) of 76.3 ha (188.6 ac) of suitable Morro
1898 manzanita habitat on existing protected lands. The Los Osos HCP also sets forth
1899 avoidance and mitigation measures that may limit impacts to Morro manzanita,
1900 including 1) avoiding and minimizing impacts of project activities on Morro manzanita
1901 with a 10-foot buffer (wherever possible), 2) avoiding removal and minimizing trimming
1902 of Morro manzanita during vegetation management activities, and 3) avoiding planting
1903 other manzanita species to reduce the likelihood of hybridization.

1904 The Los Osos HCP indicates that 14.1 ha (35 ac) of suitable Morro manzanita habitat is
1905 anticipated to be permanently impacted by covered activities while 20.9 ha (51.7 ac) of
1906 suitable Morro manzanita habitat is anticipated to be permanently protected via fee title
1907 acquisitions or conservation easements. This represents a mitigation ratio of

1908 permanently protecting 0.6 ha (1.48 ac) of suitable Morro manzanita habitat for every
1909 0.4 ha (1 ac) of suitable Morro manzanita habitat destroyed. An additional 2.1 ha (5 ac)
1910 of temporary impacts and 11.7 ha (28.9 ac) of impacts related to fuel reduction and fire
1911 hazard abatement activities are anticipated in suitable Morro manzanita habitat, but
1912 these impacts may not be as significant as the 14.1 ha (35 ac) of permanent impacts that
1913 are anticipated as the result of development. Since these impacts mentioned in the Los
1914 Osos HCP are for suitable Morro manzanita habitat (whether or not the habitat is
1915 occupied), it is unclear how these impacts and subsequent mitigation will directly affect
1916 Morro manzanita.

1917 Protection of 20.9 ha (51.7 ac) of newly acquired suitable Morro manzanita habitat will
1918 be accomplished by: 1) project proponents setting aside habitat on site primarily
1919 through recordation of a conservation easement, and 2) project proponents paying a
1920 habitat protection fee. Proponents of any development project within the PCA will need
1921 to protect habitat via conservation easements at a ratio of 3 to 1 within the parcel being
1922 developed (3 square feet of habitat protected for every square foot of habitat impacted)
1923 and the disturbance envelope for the development cannot exceed 2,787 square meters
1924 (30,000 square feet) unless the County of San Luis Obispo approves a larger
1925 disturbance footprint for defensible space. Outside of the PCA, development can occur
1926 without protecting habitat onsite, but a habitat protection fee must be paid which goes
1927 toward acquiring fee title or conservation easements from willing sellers. Any land
1928 acquired through fee title or conservation easements will become part of the Los Osos
1929 HCP preserve system and is to be managed in perpetuity. Habitat to be acquired is from
1930 willing sellers and will vary in quality and size based on what is available.

1931 Restoration, management, and monitoring of habitat within the Los Osos HCP preserve
1932 system is funded through a restoration, management and administration fee which
1933 project proponents within and outside the PCA must pay. Habitat restoration and
1934 management within the area covered under the Los Osos HCP are important for the
1935 continued persistence of Morro manzanita and other sensitive resources.
1936 Implementation of the Los Osos HCP will fund habitat restoration and management
1937 activities which otherwise may not be prioritized due to lack of funding and staffing on
1938 public lands. Morro manzanita habitat restoration and management activities will occur
1939 mainly within the Department's Morro Dunes Ecological Reserve, which currently has
1940 dense stands of Morro manzanita. The Los Osos HCP indicates that 9 ha (22.3 ac) of
1941 highly degraded suitable Morro manzanita habitat will be restored, and 76.3 ha (188.6
1942 ac) of suitable Morro manzanita habitat will be managed. Habitat restoration and
1943 management activities will focus on *Eucalyptus* removal, control of perennial veldt
1944 grass and other invasive plants, and restoration of unauthorized trails. These activities
1945 will be beneficial for the coastal scrub and maritime chaparral habitats within the Morro
1946 Dunes Ecological Reserve and should result in some increase in the number of Morro
1947 manzanita plants. However, the criteria for successful implementation of these activities

1948 have not yet been determined so it is uncertain what the outcome of the restoration and
1949 management activities at Morro Dunes Ecological Reserve will be in relation to the
1950 permanent removal of Morro manzanita plants and habitat from development
1951 elsewhere in its range (see the “Present or Threatened Modification or Destruction of
1952 Habitat” section of this status review for additional information).

1953 In summary, the Los Osos HCP offers benefits to Morro manzanita, particularly within
1954 the Department’s Morro Dunes Ecological Reserve. If the Commission lists Morro
1955 manzanita pursuant to CESA, the Department’s Central Region will be responsible for
1956 determining whether to issue one or more permits consistent with the Los Osos HCP or
1957 whether additional mitigation is required to satisfy CESA’s full mitigation requirement.

1958 **8.2 California Coastal Act**

1959 The California Coastal Act was passed in 1976 with goals to protect, maintain, enhance,
1960 and restore the overall quality of the coastal zone environment and its natural and
1961 artificial resources (Pub. Resources Code, § 30001.5). The California Coastal Act
1962 includes special protections for Environmentally Sensitive Habitat Areas (ESHA) to
1963 protect these areas against significant disruptions of their habitat values (Pub.
1964 Resources Code, § 30240). Central maritime chaparral dominated by Morro manzanita
1965 is considered an ESHA in the Los Osos Community Plan and this designation has
1966 provided Morro manzanita with some protections from development as described below
1967 (County of San Luis Obispo 2024a).

1968 The San Luis Obispo County Local Coastal Program provides guidelines for
1969 implementing the California Coastal Act in San Luis Obispo County (County of San Luis
1970 Obispo 2007). Some important policies related to ESHAs and terrestrial environments
1971 in the San Luis Obispo County Local Coastal Program include: new development within
1972 or adjacent to ESHAs should not significantly disrupt the resource, permit applicants
1973 must demonstrate that there will be no significant impact on sensitive habitats from the
1974 proposed development, subdivision of parcels with ESHAs is restricted, native trees and
1975 plant cover shall be protected wherever possible, and vegetation that is rare or
1976 endangered shall be protected against any significant disruption of habitat value
1977 (California Coastal Commission 2000b; County of San Luis Obispo 2007). While the
1978 California Coastal Act and San Luis Obispo County Local Coastal Program lay out these
1979 policies for protecting ESHAs from development, a 2024 amendment to the Los Osos
1980 Community Plan will allow development of ESHAs as long as project proponents
1981 participate in the Los Osos HCP. This amendment may result in reduced protections for
1982 ESHAs (and subsequently Morro manzanita) since restrictions on disturbance of these
1983 areas in the Los Osos HCP are not as strict as those outlined in the San Luis Obispo
1984 County Local Coastal Program.

1985 **8.3 Montaña de Oro State Park**

1986 Montaña de Oro State Park consists of about 3,359 ha (8,300 ac) and is owned and
1987 managed by State Parks. Morro manzanita is generally restricted to the north end of the
1988 park but scattered individuals may occur in the Valencia Peak area, which is in the south
1989 end of the park (CNDDDB 2025). Department staff estimate 178 ha (441 ac) of Morro
1990 manzanita habitat within the park; however, this is a rough estimate since there has not
1991 been a comprehensive survey (see Table 2). Over 20 ha (50 ac) of occupied Morro
1992 manzanita habitat within the park has been documented to consist of dense stands of
1993 the species (50-75% cover of Morro manzanita) (Katie Drexhage, personal
1994 communication, May 7, 2025). Morro manzanita also co-occurs with brittleleaf
1995 manzanita and Pecho manzanita within the park (Katie Drexhage, personal
1996 communication, May 7, 2025). Montaña de Oro State Park has a general plan from 1988
1997 which states that the policy of the park is to protect and manage rare and endangered
1998 plants and to restore native vegetation and endangered species habitat, but does not
1999 specifically discuss the protection or management of Morro manzanita (Hook et al.
2000 1988). While there is not an updated management plan specifically for Morro manzanita
2001 at Montaña de Oro State Park, some activities have been done within the park to benefit
2002 the species, including *Eucalyptus* removal and management, habitat restoration, and
2003 prescribed burns.

2004 Morro manzanita plants were historically removed, within what is now Montaña de Oro
2005 State Park, for the planting of *Eucalyptus* trees in the early 1900s, and *Eucalyptus* have
2006 expanded within the park since the initial planting (see the “Competition” section of this
2007 status review for additional information). In 1989, Montaña de Oro State Park staff
2008 initiated a stand containment project which removed *Eucalyptus* seedlings that were
2009 establishing beyond the perimeter of the original groves in an effort to prevent the
2010 spread of *Eucalyptus* (USFWS 1994, 1998). Current management in Montaña de Oro
2011 State Park is focused on reducing fuels by removing *Eucalyptus*, burning the
2012 understory, allowing natural recruitment of native plants, and planting Morro
2013 manzanita (California Department of Parks and Recreation, personal communication,
2014 January 30, 2025). In the restoration plantings at Montaña de Oro State Park, Morro
2015 manzanita plants are grown from seed collected within the park to maintain the genetic
2016 integrity of the species (California Department of Parks and Recreation 2025).

2017 In 1992, a service corridor was constructed for a telephone cable line in Montaña de Oro
2018 State Park which resulted in the removal of approximately 300 Morro manzanita plants
2019 (McGuire and Morey 1992; USFWS 1994). Mitigation measures for this project included
2020 revegetation of open areas along the disturbance corridor with Morro manzanita
2021 seedlings and removal of 0.2 ha (0.5 ac) of *Eucalyptus* and revegetation of the area with
2022 a mixture of native species including Morro manzanita (McGuire and Morey 1992).
2023 These revegetated areas were to be monitored for two years (McGuire and Morey 1992).

2024 In 2008, State Parks staff considered the Morro manzanita mitigation plantings for this
2025 project a success, but no additional details were provided (Doug Barker, personal
2026 communication, August 13, 2025).

2027 Two prescribed burns in Morro manzanita habitat have been documented at Montaña
2028 de Oro State Park. In 1987, a prescribed burn of about 0.2 ha (0.5 ac) was conducted in
2029 dune scrub and resulted in the fire consuming about a dozen Morro manzanita plants
2030 (McGuire and Morey 1992). There was no recruitment of Morro manzanita plants
2031 immediately after the 1987 burn which may have been due to it being a cool burn in
2032 October after the first rain of the season (McGuire and Morey 1992). In 1998, a
2033 prescribed burn of about 2.3 ha (5.7 ac) was conducted in a 40-year-old Morro
2034 manzanita stand at Montaña de Oro State Park to evaluate fire effects on Morro
2035 manzanita. While the Morro manzanita stand did not appear to recover in the first few
2036 years after the prescribed burn, a revisit to the area in 2023 documented a recovered
2037 Morro manzanita stand that had high shrub cover with plants flowering, fruiting, and
2038 contributing to the post-fire seed bank (Tyler and Kofron 2024). See the “Life History”
2039 section of this status review for additional information about these prescribed burns and
2040 the “Altered Fire Regime and Fuel Reduction Activities” section for additional
2041 information on the effect of fire on Morro manzanita.

2042 In addition to the activities discussed above, Montaña de Oro State Park staff maintain
2043 roads and trails for visitor use. While mechanical clearing of vegetation to maintain
2044 roads and trails can be detrimental to Morro manzanita, that is not always the case. In
2045 2025, Department staff observed many seedlings and young plants along the disturbed
2046 edges of trails in Montaña de Oro State Park. While large, dead Morro manzanita plants
2047 were also observed along some of these trails (possibly from when the trails were first
2048 created), the disturbance appeared to also stimulate germination of Morro manzanita in
2049 some areas.

2050 **8.4 Morro Dunes Ecological Reserve**

2051 The Morro Dunes Ecological Reserve is a 113-ha (279-ac) property that is owned and
2052 managed by the Department (Figure 3). It is composed of two units: the 19-ha (48-ac)
2053 Pecho Unit, and the 93-ha (231-ac) Bayview unit. The Pecho unit, located mostly west of
2054 Pecho Valley Road, was purchased in 1978 and designated as part of the Morro Dunes
2055 Ecological Reserve in 1983 (McGuire and Morey 1992; CDFW 2024). It contains coastal
2056 sage scrub and central maritime chaparral with generally low densities of Morro
2057 manzanita covering about 15 ha (36 ac), although dense patches have been reported in
2058 the southeast corner of the Pecho Unit (McGuire and Morey 1992; Jodi McGraw
2059 Consulting 2020; CDFW 2024; Department observation). The Pecho unit may have
2060 once had more Morro manzanita on the property prior to the use of a bulldozer to
2061 remove unexploded military ordinances in the 1950s which cleared some of the native

2062 vegetation (Jodi McGraw Consulting 2020). The Bayview unit, located just west of
2063 Bayview Heights Drive, was acquired by the Department in 2000 and 2003 and
2064 contains coastal sage scrub, central maritime chaparral, and coast live oak woodland
2065 (Jodi McGraw Consulting 2020). The Bayview unit has medium to high densities of
2066 Morro manzanita covering approximately 70 ha (174 ac) (Jodi McGraw Consulting
2067 2020; CDFW 2024). Based on aerial imagery, much of the Bayview unit was cleared of
2068 vegetation in the 1940s and was reportedly farmed for many years before being
2069 disturbed again for unexploded ordinance removal (USDA 1937a, b; ESRI 2024;
2070 Department observation). Areas of the Bayview unit that were historically farmed are
2071 reportedly being recolonized by Morro manzanita and much of the vegetation across the
2072 Bayview unit appears to have recovered to pre-disturbance levels (USDA 1937a, b; ESRI
2073 2024; John Chesnut, personal communication, January 26, 2026).

2074 The primary purpose of an ecological reserve, such as Morro Dunes Ecological Reserve,
2075 is to protect rare, threatened, or endangered native plants, wildlife, aquatic organisms,
2076 and specialized terrestrial or aquatic habitat types (Cal. Code Regs., tit. 14, § 630). A
2077 management plan was prepared for the Morro Dunes Ecological Reserve in 1982 when
2078 the reserve consisted of just the Pecho unit, but this management plan has not been
2079 updated since that time and does not include the larger Bayview unit (Jodi McGraw
2080 Consulting 2020). Limited funding and resources have impacted the ability of the
2081 Department to enforce regulations on the reserve resulting in the creation of many
2082 unauthorized trails and illegal recreational use, primarily from horseback riding (Jodi
2083 McGraw Consulting 2020; CDFW 2024). These activities have primarily occurred on the
2084 Bayview unit and have resulted in trail destabilization, erosion, and the introduction
2085 and spread of non-native invasive species. The Department is working to address
2086 management of the reserve by adding signage, designating authorized walking trails,
2087 and closing unauthorized trails (CDFW 2024). As of 2025, equestrian trespass has
2088 reportedly been virtually eliminated and trails have become more vegetated
2089 (Department observation). Maintaining restrictions on recreational use will help protect
2090 Morro manzanita and other sensitive resources on the property from further
2091 degradation.

2092 As part of the 2009 Los Osos Community Wildfire Protection Plan, a fuel break was
2093 proposed on the northern and eastern sides of the Bayview Unit of the Morro Dunes
2094 Ecological Reserve (San Luis Obispo County Community Fire Safe Council 2009). In
2095 2019, a shaded fuel break (where vegetation is thinned but not completely removed) was
2096 constructed along a portion of the northern end of the Bayview Unit of the Morro Dunes
2097 Ecological Reserve but it has been reported that no Morro manzanita plants were
2098 impacted (Jodi McGraw Consulting 2020; CAL FIRE 2025c; Department observation).
2099 If a fuel break is constructed on the eastern side of the Bayview Unit of the Morro Dunes
2100 Ecological Reserve in the future, this may impact some Morro manzanita plants
2101 depending on the placement of the fuel break.

2102 Morro manzanita chaparral within the Pecho unit of the Morro Dunes Ecological
2103 Reserve contains a 0.34-ha (0.84-ac) stand of *Eucalyptus* and these trees have likely
2104 resulted in the reduction of Morro manzanita (Jodi McGraw Consulting 2020). Morro
2105 manzanita skeletons are present in the shaded understory of the *Eucalyptus* trees
2106 (Hacker 2025). In 2023, *Eucalyptus* trees were illegally cut at the Pecho unit and the
2107 downed trees subsequently removed by the Department in 2024 (Hacker 2025). After
2108 the downed *Eucalyptus* trees were removed, abundant Morro manzanita seedlings were
2109 observed and Morro manzanita seeds from surrounding mature shrubs were visible on
2110 the open substrate that resulted from the *Eucalyptus* removal (Hacker 2025). Complete
2111 removal of the *Eucalyptus* trees at the Pecho unit is reportedly being implemented as of
2112 December 2025 in order to improve the habitat for Morro manzanita as part of
2113 mitigation and restoration activities associated with the Los Osos HCP (Jodi McGraw
2114 Consulting 2022; Department observation). The Los Osos HCP also proposes invasive
2115 species control, trail closures, and trail restoration within Morro Dunes Ecological
2116 Reserve as additional mitigation for impacts to Morro manzanita elsewhere in its range
2117 (Jodi McGraw Consulting 2020, 2022). The Los Osos HCP requires that these
2118 mitigation and restoration activities occur ahead of future permitted impacts to Morro
2119 manzanita (Jodi McGraw Consulting 2022).

2120 **8.5 El Moro Elfin Forest Natural Area**

2121 The El Moro Elfin Forest Natural Area is a 36-ha (90-ac) area that is owned by the
2122 County of San Luis Obispo, State Parks, and California State Lands Commission, and
2123 managed by the Los Osos-Morro Bay Chapter of the Small Wilderness Area Preservation
2124 (Morro Group 2003; Jodi McGraw Consulting 2022). The El Moro Elfin Forest Natural
2125 Area contains oak woodland, maritime chaparral, and coastal scrub with more than 500
2126 Morro manzanita plants documented in 2018 (Morro Group 2003; Terra Verde
2127 Environmental Consulting 2019). Morro manzanita plants at this location have become
2128 relatively isolated from adjacent Morro manzanita plants by the development of the
2129 towns of Baywood Park and Los Osos. Management at the El Moro Elfin Forest Natural
2130 Area has primarily focused on erosion control, trail and sign improvements, installation
2131 of fencing to reduce visitor impacts to sensitive habitat, invasive species removal, and
2132 restoration of disturbed areas (Morro Group 2003; Terra Verde Environmental
2133 Consulting 2019).

2134 In 2009, Morro manzanita plants were reportedly damaged (leveled to the ground in
2135 some areas) by vandals over an area of about 0.4 ha (1 ac) within the El Moro Elfin
2136 Forest Natural Area (P. Sarafian, personal communication, May 25, 2009; USFWS
2137 2013). In 2011, 100 Morro manzanita seedlings were planted at the El Moro Elfin Forest
2138 Natural Area in the area previously damaged by vandals to try to mitigate for impacts to
2139 Morro manzanita (Sarafian 2011; USFWS 2013). All but one of the 100 Morro
2140 manzanita seedlings survived the first six months, but the Department does not have

2141 any information on how long the plants were monitored after 2011. In 2018, a small
2142 patch of dead Morro manzanita plants that were young at the time of death were
2143 observed in the vicinity of the 2011 restoration plantings suggesting that the restoration
2144 attempt in 2011 was not successful as of 2018 (Terra Verde Environmental Consulting
2145 2019). Since the plantings were not formally monitored, the Department does not have
2146 any additional information on if all the planted seedlings died or if some were able to
2147 survive.

2148 While the El Moro Elfin Forest Natural Area protects Morro manzanita from
2149 development, plants at this location are thought to be some of the oldest Morro
2150 manzanita individuals and have low seed production, low seed viability, and low seed
2151 density in the soil (Tyler and Odion 2020; Tyler et al. 2023). It has been hypothesized
2152 that low seed production and low seed viability may be a sign that this relatively isolated
2153 population is experiencing genetic effects from its isolation but further studies are
2154 needed (Tyler and Odion 2020). Small, fragmented populations, like that at the El Moro
2155 Elfin Forest Natural Area, are prone to decreased gene flow which can affect seed
2156 viability (Tyler and Odion 2020). Morro manzanita seeds at the El Moro Elfin Forest
2157 Natural Area also have high seed predation which further reduces the number of seeds
2158 stored in the soil (Tyler et al. 2023).

2159 Tyler and Kofron (2024) indicate that prescribed fire may be the most effective tool to
2160 ensure aging stands of Morro manzanita regenerate; however, the proximity of El Moro
2161 Elfin Forest Natural Area to development may prevent the use of fire as a management
2162 tool. Alternative treatments to stimulate germination of Morro manzanita that do not
2163 involve fire may be useful at the El Moro Elfin Forest Natural Area, but further research
2164 is needed.

2165 **8.6 Conservation Seed Banking**

2166 In 2020, 15,699 seeds were collected from 34 maternal lines at Montaña de Oro State
2167 Park (CNDDDB occurrence #9) (California Plant Rescue 2021). These seeds are currently
2168 in long-term seed storage at UCSC with back-up seed stored at the National Laboratory
2169 for Genetic Resources Preservation in Fort Collins, Colorado (California Plant Rescue
2170 2021). Living collections are also present at the Santa Barbara Botanic Garden, Regional
2171 Parks Botanic Garden, California Botanic Garden, and University of California Botanical
2172 Garden (California Plant Rescue 2025).

2173 **9 Recommendation to the Commission**

2174 CESA requires the Department to prepare this status review to 1) assess the status of
2175 Morro manzanita in California based on the best scientific information available to the

2176 Department and 2) indicate whether the petitioned action is warranted (Fish & G. Code,
2177 § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)).

2178 Under CESA, an endangered species is defined as “a native species or subspecies of a
2179 bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming
2180 extinct throughout all, or a significant portion, of its range due to one or more causes,
2181 including loss of habitat, change in habitat, overexploitation, predation, competition, or
2182 disease” (Fish & G. Code, § 2062). A threatened species is defined as “a native species or
2183 subspecies...that although not presently threatened with extinction, is likely to become
2184 an endangered species in the foreseeable future in the absence of the special protection
2185 and management efforts required by [CESA]” (Fish and G. Code § 2067).

2186 The petitioned action was to list Morro manzanita as endangered under CESA. Based on
2187 the criteria described above and the best scientific information available, the
2188 Department has determined that listing Morro manzanita as threatened under CESA is
2189 warranted at this time (Fish & G. Code, § 2075.5, subd. (e)(2): the Commission may find
2190 that “the petitioned action is not warranted but listing the petitioned species at a
2191 different status than that requested by the petitioner is warranted”). Although not
2192 presently threatened with extinction, Morro manzanita is likely to become an
2193 endangered species in the foreseeable future in the absence of the special protection and
2194 management efforts required by CESA.

2195 **10 Protection Afforded by Listing**

2196 It is the policy of the state to conserve, protect, restore, and enhance any endangered or
2197 any threatened species and its habitat (Fish & G. Code, § 2052). If listed as an
2198 endangered or threatened species, unauthorized “take” of Morro manzanita will be
2199 prohibited, making the conservation, protection, and enhancement of the species and its
2200 habitat a statewide concern. “Take” is defined under CESA as “hunt, pursue, catch,
2201 capture, or kill, or attempt to hunt, pursue, catch, capture, or kill” (Fish & G. Code, §
2202 86). Any violation of the “take” prohibition would be punishable under state law. The
2203 Fish and Game Code provides the Department with related authority to permit “take”
2204 under certain circumstances (Fish & G. Code, §§ 2081, 2081.1, 2086, 2089.6, 2089.10, &
2205 2835).

2206 While Morro manzanita is federally listed under the ESA, CESA listing will provide extra
2207 protection for Morro manzanita plants on private and other unprotected properties.
2208 Since the federal prohibition on take of plants listed under the ESA applies only to
2209 individuals of a listed species that occur on lands under federal jurisdiction, CESA
2210 listing would provide stronger protections for Morro manzanita by making the species
2211 subject to CESA’s take prohibition throughout California and by requiring full
2212 mitigation of take and related impacts as a requirement of incidental take permits

2213 pursuant to Fish and Game Code section 2081(b). CESA incidental take permits would
2214 also require that adequate funding is ensured for the full mitigation to be achieved. The
2215 Department could also authorize taking of a CESA-listed species whose conservation
2216 and management is provided for in an approved Natural Community Conservation Plan
2217 (Fish & G. Code, § 2800 et seq.).

2218 While Morro manzanita is currently a covered species under the Los Oso HCP because
2219 of its federal listing status, the existence of the Los Osos HCP doesn't provide the same
2220 legal protection that CESA listing provides. The Los Osos HCP, like all HCPs, is a
2221 planning document designed to accommodate development while also providing long-
2222 term benefits to the covered species. CESA listing provides legal protections for the
2223 species that are independent of any federal protections or regional conservation plans
2224 which could change or be amended in the future.

2225 Both federally and state listed species receive additional considerations during
2226 environmental review under the California Environmental Quality Act (CEQA). CEQA
2227 requires public agencies to analyze and disclose project-related environmental effects
2228 before discretionary approval of a project. CEQA requires adoption of mitigation
2229 measures to reduce or eliminate any significant environmental impacts. As a federally
2230 listed species, Morro manzanita is already considered during CEQA review, but state
2231 listing would allow CEQA protections for the species to continue if it were to be delisted
2232 from the ESA.

2233 CESA listing may prompt increased interagency coordination specific to Morro
2234 manzanita conservation and protection. Listing may also increase the likelihood that
2235 state and federal land and resource management agencies will allocate additional
2236 resources toward monitoring, research, protection, and recovery actions. Currently,
2237 none of the Morro manzanita populations on protected lands have species-specific
2238 management plans in place but some have general habitat management plans. CESA
2239 listing may make specifically addressing the health and protection of Morro manzanita
2240 on protected lands an increased priority.

2241 **11 Future Management**

2242 This section considers suggestions for future management and other recommendations
2243 for recovery of the species (Fish & G. Code, §§ 2072.3 & 2074.6; Cal. Code Regs., tit. 14,
2244 § 670.1, subd. (d)(1) & (f)(1)). The following actions, generated by the Department, are
2245 not a detailed conservation strategy; however, they outline the major steps needed to
2246 prevent the extinction of the species. The Department recommends that the following
2247 actions be conducted in coordination with partners and interested parties, consistent
2248 with California's goals of preventing the extinction of rare, threatened, and endangered
2249 species.

- 2250 • Protect remaining occupied Morro manzanita habitat via acquisition of fee titles
2251 and/or recordation of conservation easements, prioritizing high-density,
2252 contiguous stands. Preservation of high-density, intact stands of Morro
2253 manzanita that are not fragmented by development is essential for the long-term
2254 persistence of the species.
- 2255 • Continue with removal of *Eucalyptus* that are growing adjacent to Morro
2256 manzanita stands at Montaña de Oro State Park. Monitor the success of
2257 *Eucalyptus* stand removal and recolonization of Morro manzanita into the
2258 habitat at Montaña de Oro State Park and at the Pecho unit of the Morro Dunes
2259 Ecological Reserve. Planting of native vegetation (including Morro manzanita)
2260 may be needed after *Eucalyptus* removal. Any *Eucalyptus* removal plans should
2261 consider the use of the trees for Monarch butterfly roost sites and wind breaks
2262 before removal.
- 2263 • Conduct a detailed survey for Morro manzanita to determine the current
2264 distribution and abundance of the species. Work with USFWS, State Parks, the
2265 County of San Luis Obispo, and CNPS to conduct surveys. Submit all findings to
2266 the CNDDDB.
- 2267 • Monitor Morro manzanita on conserved lands. Monitoring should include
2268 regular site visits to monitor the health of the Morro manzanita stands, detect
2269 pathogens (e.g., sudden oak death), and document invasive species.
- 2270 • Manage all conserved occupied Morro manzanita habitat for the persistence of
2271 the species. Management recommendations should be based on the
2272 characteristics of the Morro manzanita stand on the site (i.e., age of stand,
2273 proximity to development, recreational impacts on the site, level of invasion by
2274 non-native plants, etc.). Management recommendations should include success
2275 criteria to evaluate the effectiveness of implemented management.
- 2276 • Determine the need, feasibility, and timing of prescribed burns at Morro
2277 manzanita stands on protected lands. Identify which Morro manzanita stands
2278 may benefit from a prescribed burn and work with Morro manzanita experts and
2279 land managers to properly implement prescribed burns, if needed.
- 2280 • Conduct experimental studies on which types of treatments may best serve as fire
2281 surrogates for use in areas where prescribed burning of Morro manzanita stands
2282 may not be a realistic option.
- 2283 • Work with CAL FIRE to verify the implementation of appropriate fuel break
2284 procedures and practices for use in occupied Morro manzanita habitat.
2285 Vegetation clearing for fuel breaks and fire abatement treatments should focus on
2286 removal of non-native species, removal of dead vegetation, pruning of existing
2287 shrubs and trees, and selective removal of non-sensitive shrubs (Jodi McGraw
2288 Consulting 2022).

- 2289 • Continue research on Morro manzanita biology and ecology to help guide
2290 management, restoration, and recovery efforts. Additional research is needed
2291 across Morro manzanita’s range on seed viability, dispersal, and germination
2292 rates; genetic diversity of the species; and factors affecting reproductive success.
- 2293 • Collect seeds across the range of Morro manzanita to make sure the full genetic
2294 diversity of the species is seed banked at an accredited institution for long-term
2295 conservation storage.
- 2296 • Model the projected effects of climate change on the distribution of Morro
2297 manzanita. Consider these results when developing management strategies for
2298 the species.
- 2299 • Educate the public on the unique and sensitive species in the area, including
2300 Morro manzanita. Discourage the planting of other manzanita species in
2301 landscaping due to the risk of hybridization.

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2813

2814 **Appendix A. Summary of Morro manzanita Occurrences**

2815 Table A1. Summary of CNDDDB occurrence information and population estimates for
 2816 Morro manzanita as of July 2025. Estimated population sizes are from information in
 2817 LSA Associates, Inc. (1992), McGuire and Morey (1992), and the CNDDDB (2025).

CNDDDB 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	

2818 *CNDDDB occurrence numbers are assigned in sequential order. As more information
2819 becomes available, occurrences are sometimes merged giving the appearance of skipped
2820 occurrence numbers.

2821

2822 **Appendix B. Tribal Engagement Summary**

2823 The Department communicated with tribes throughout the status review process for
2824 Morro manzanita. The Department reached out to tribes identified by the Native
2825 American Heritage Commission as having a cultural or traditional affiliation with the
2826 geographic area of Morro manzanita. Initial outreach was in the form of a tribal
2827 notification letter sent to tribes to notify them that Morro manzanita is a candidate for
2828 listing as endangered under CESA and to explain the status review and listing process.
2829 Additionally, the tribal notification letter outlined opportunities for engagement with
2830 the Department in the form of direct communication with Department staff and formal
2831 government-to-government consultation. Additional details on the tribal outreach
2832 conducted for Morro manzanita and a summary of the responses received are listed
2833 below.

- 2834 • On May 20, 2025, the Department distributed by mail and email the attached
2835 tribal notification letter to 21 contacts from 11 tribes. On August 4, 2025, follow-
2836 up emails were sent to tribes that had not yet responded to the tribal notification
2837 letter.
- 2838 • In response to tribal notification, the Department received comments from three
2839 tribes. Two tribes expressed support for the preservation and conservation of
2840 Morro manzanita. One tribe provided information on traditional tribal uses of
2841 manzanita.

2842 **Appendix C. Public Comment Summary**

2843 A public notification letter was distributed to affected and interested parties to notify
2844 them that Morro manzanita is a candidate for listing as endangered under CESA. The
2845 letter requested data and comments on the species, explained that take authorizations
2846 are required now that the species is a candidate for listing, and explained the upcoming
2847 steps in the listing process. Additional details on the public outreach conducted for
2848 Morro manzanita and a summary of the responses received are listed below.

- 2849 • On May 20, 2025, the Department distributed the attached public notification
2850 letter to approximately 50 affected or interested parties, including the County of
2851 San Luis Obispo, California Native Plant Society, State Parks, United States Fish
2852 and Wildlife Service, Bureau of Land Management, Caltrans, and the Cabrillo
2853 Estates property owners association.
- 2854 • The Department received a total of seven responses. Three comments supported
2855 listing, two comments did not support listing, and one comment did not indicate
2856 if they supported or did not support listing.
 - 2857 ○ Two comments were from the general public supporting the listing of
2858 Morro manzanita as endangered under CESA.
 - 2859 ○ One comment was from the general public and discussed manzanita
2860 outside of Morro manzanita’s range and was encouraging the planting of
2861 manzanita on hillsides along freeways.
 - 2862 ○ One comment was from the Friends of El Moro Elfin Forest supporting the
2863 listing of Morro manzanita as endangered under CESA.
 - 2864 ○ Comments provided by the County of San Luis Obispo indicate that they
2865 do not support listing of Morro manzanita as endangered under CESA
2866 since the Los Osos Habitat Conservation Plan provides permanent
2867 conservation, restoration, and effective management of Morro manzanita.
 - 2868 ○ Comments from CAL FIRE do not support listing Morro manzanita as
2869 endangered under CESA as listing may create regulatory restrictions that
2870 undermine wildfire risk mitigation in Los Osos and the long-term
2871 ecological health of the species. CAL FIRE encourages CDFW to
2872 collaborate with local fire agencies, land managers, and conservation
2873 organizations to develop a management strategy that balances species
2874 protection with wildfire risk reduction.
- 2875 • On May 20, 2025, the Department distributed the attached press release to a
2876 CDFW list serve for recipients interested in CESA listing. On May 23, 2025, the
2877 Department distributed the press release to an email distribution list maintained
2878 by the Department’s Office of Communication, Education and Outreach, and
2879 posted the attached press release to the Department’s Newsroom website.

2880 All communications are on file with the Department and can be provided on request by
2881 emailing NativePlants@wildlife.ca.gov.

2882

2883 **Appendix D. Comments from Peer Reviewers**

2884 Pursuant to Fish and Game Code section 2074.6 and California Code of Regulations,
2885 title 14, section 670.1, subdivision (f)(2), the status review process included independent
2886 peer review by experts on [common name] (Table X). Reviewers were asked to evaluate
2887 the assessments and conclusions in the draft status review.

2888 Table [X]. Status review peer reviewers.

Name	Title and Affiliation

2889

2890 The following pages of this appendix contain the peer reviewer invitation letter and a
2891 [table or list] of consolidated peer reviewer comments (arranged by page and line
2892 number) and Department responses to those comments. At the end of this appendix is
2893 the draft version of this status review sent by the Department to peer reviewers.

Comments from Peer Reviewers on the Draft Morro Manzanita Status Review Report

Page Number	Line Number	Reviewer	Reviewer Comment	Department Response
2	210	D. Keil	change Malcolm G. McCleod to Dr. Malcolm G. McLeod	Fixed
10	447-449	D. Keil	Add that the pericarp (fruit coat) is sparsely to densely covered with short white, non-glandular hairs. This encloses the mealy outer layer. Each seed of a Morro manzanita is individually encased by a hard stony layer, not "a hard inner layer that encases multiple seeds." The descriptions states "stones free" (Parker et al. 2012). The citation should be changed from Baldwin et al. 2012 to Parker et al. 2012.	Added further fruit/seed descriptions to the Species Description section. Also edited text on page 10, lines 448-450.
10-12		V.T. Parker	This section is very accurate as far as it went. These are obligate seeding species dependent principally on insects for pollination and rodents for dispersal, fire to release dormancy and permit germination. The authors mention that low viability can be detected in some of the seeds of these plants. A more extensive analysis would have determined variable viability among years, as much of the viability loss is due to small insect destruction of individual seed. Insect damage varies among years depending on the size of the fruit crop.	Added a sentence on insect damage contributing to low viability on page 11, after line 480.
10-12		V.T. Parker	Fruit production is also variable among years in two different ways. One is that flowering potential is determined in the year before flowering as these plants produce juvenal and dormant inflorescences (nascent inflorescences) at the end of new stem growth the spring prior to flowering the next year. Long-term studies indicate that manzanitas have an every-other year pattern of fruit production, the extent to which is reflected in the climate of the fruiting year (analysis of 12 species yielded an autocorrelation of 1 year, fitting the definition of masting) (Parker, unpublished data). So, understanding any pattern of fruit production would require a long-term study. It would not be surprising that what the authors have found would be supported by such a study.	Added additional text on fruit production on page 10, line 455.
10-12		V.T. Parker	Dispersal: Long-range dispersal is by bears, coyotes, and foxes, while short-range dispersal is by rodents. (Moore, C. M., and S. B. Vander Wall. 2015. Scatter-hoarding rodents disperse seeds to safe sites in a fire-prone ecosystem. <i>Plant Ecology</i> 216: 1137–1153. Parker, V. T. 2015a. Large-scale disturbances transform dispersal mutualism into fire adaptation. <i>PLoS ONE</i> 10(7): e0132625. doi: 10.1371/journal.pone.0132625. Parker, V. T. 2015b. Seed bank divergence between <i>Arctostaphylos</i> Adans. (Ericaceae) and <i>Ceanothus</i> L. (Rhamnaceae) suggests different seed predator interactions. <i>Ecologia Mediterranea</i> 41(2): 5-13. Peterson NB, VT Parker. 2016. Scatter-hoarding increases seed survival even at soil depths with killing heat pulse. <i>Ecology & Evolution</i> , 6: 4298-4306. doi:10.1002/ece3.2156.). What this means is that scatter-hoarding rodents are a critical mutualism for manzanitas as they create the soil seed banks, burying them sufficiently to mostly survive fire. More under 'predation'. Models suggest that manzanita stands have to reach around 30-35 years of age before seed banks reach a dynamic equilibrium.	Added additional text and edited text in the seed caching section on page 10-11, lines 455-465 and page 12, line 496.
17		N. Havlik	Following the map on page 17, I recommend a second map focusing on the immediate area around Los Osos and Baywood Park, which map would indicate the current County general plan designations, current zoning, and property lines. Morro manzanita is growing in a developing urban area, and its survival in that area may be very dependent upon trade-offs between development and conservation; therefore land ownership patterns and status is very significant to whatever conservation tools are chosen to be employed and where.	Added a new figure that shows the Los Osos Habitat Conservation Plan area in Section 8.1.
19	681	D. Keil	Change D. Chipping and D. Asquith to Dr. David Chipping and Dr. Donald Asquith	Fixed
22	772	D. Keil	Change Odin to Odion	Fixed
23	802-803	D. Keil	Actually this is Eastwood's spineflower (<i>Chorizanthe eastwoodiae</i>). See Gowen & Johnson (2020), <i>Phytotaxa</i> 455 (1): 001–008	Fixed
25	903	D. Keil	Change Odin to Odion. Change Odin to Odion.	Fixed
25	906	D. Keil	Change Odin to Odion.	Fixed
37-42		V.T. Parker	Generally, current fuel reduction efforts are an overall negative impact on manzanita and chaparral stands. The encroachment by herbaceous species provides flash fuels that are rarely or insufficiently managed in the fuel breaks and along trails. The authors do a good job pointing this out, in a clearly politic manner. The burden needs to shift more to home owners rather than natural vegetation. CalFire has recently lost a court case concerning their Vegetation Treatment Plan because the net result is increased fire potential and loss of natural habitat.	Added text about CAL FIRE's Vegetation Treatment Program on pages 41, line 1395.

Page Number	Line Number	Reviewer	Reviewer Comment	Department Response
44-47		V.T. Parker	This is a good section and points out the extreme dangers (at different time scales) of Eucalyptus, Iceplant, and Ehrharta (Veldt grass). The latter speedily takes over disturbed areas, iceplant can invade maritime chaparral (documented by Odion and D'antonio in several papers; e.g., D'Antonio CM, Mahall BE. 1991. Root profiles and competition between the invasive, exotic perennial, <i>Carpobrotus edulis</i> , and two native shrub species in California coastal scrub. <i>American Journal of Botany</i> 78: 885–894.). Eucalyptus, it should be pointed out, shares mycorrhizal mutualists with manzanitas, as a consequence, manzanita mycorrhizal fungi actually facilitate the invasion of manzanita stands due to sharing of mutualists (e.g., Horton, T. R., T. Bruns and V. T. Parker. 1999. Ectomycorrhizal fungi in <i>Arctostaphylos</i> patches contribute to the establishment of <i>Pseudotsuga menziesii</i> . <i>Canadian Journal of Botany</i> 77: 93-102. Dunne, J. A. and V. T. Parker. 1999. Seasonal soil water potential patterns and establishment of <i>Pseudotsuga menziesii</i> seedlings in chaparral. <i>Oecologia</i> 119: 36-45.). The manzanitas produce arbutoid-style mycorrhizae but the fungi also can form ectomycorrhizal-style roots as well with the Eucalyptus.	Added sources and some additional text regarding iceplant invasion on page 46 after line 1570 and page 47, line 1578. Added text about mycorrhizal fungi helping Eucalyptus invade manzanita stands on page 46, after line 1565.
49-50		V.T. Parker	The authors indicate that seed predators, principally rodents, strongly impact the seeds produced by these plants. This is certainly true and studies that provide fruit in the field discover that all will disappear, usually within a single day (their Keeley and Hay citation, Kelly, V. R. and V. T. Parker. 1990. Seed bank survival in sprouting and nonsprouting <i>Arctostaphylos</i> species. <i>American Midland Naturalist</i> 124:114-123.). The local endangered Kangaroo Rat would principally be focused on Morro manzanita fruit, analogous to the Santa Cruz Kangaroo Rat that is focused on Big-berry and Hoary manzanita fruit in the Santa Cruz Mountains in sandy soil (Ken Hickman, personal communication). At the same time, rodents cache the fruit and that is the process by which seed banks for these obligate seeders are created. Thus, management of the plants also requires consideration of rodent populations, especially chipmunk, Kangaroo rat, <i>Perognathus</i> , and <i>Peromyscus</i> species. Rodent populations would be expected to fluctuate given fruit production of manzanitas fluctuates every-other year.	Edited text on page 49 and 50 in the Predation section to emphasize that predation is part of the natural process (predation and seed dispersal) by which seed banks for obligate seeders are created.
50	1688	D. Keil	The accepted scientific name for tanoak is <i>Notholithocarpus densiflorus</i> .	Fixed
55-56		N. Havlik	Following up on the above, on pages 55-56, I believe that the goals of the Los Osos Habitat Conservation Plan are basically reactive rather than proactive. A stronger emphasis on permanent protection and the means to accomplish it must be spelled out more clearly. The need for outside funding is central to this; it will not do to simply wait for a development proposal to come along and propose to commit funds or set aside portions of a property for conservation. This arises from long experience in attempting to address similar dilemmas in many areas in California during my professional career. A prime example of this is a very recent case in San Luis Obispo County that has resulted in a large residential project being approved in an area of oak woodland with a partial manzanita understory, and the manzanita has been determined to be a new species. In a settlement of litigation over the project, the project sponsors have offered money to essentially try to recreate a population of the manzanita in an as-yet undetermined location, which was not at all what had been hoped.	Added additional text on page 57 at line 1954 to address the lack of guaranteed permanent protections.
59	2024	N. Havlik	On page 59, line 2024, the lack of proof of the success of mitigation along the constructed utility line is very disappointing, and points strongly to the preferred option of protection of existing populations rather than hoping for success in translocation and transplanting.	Comment noted
65	2250	N. Havlik	On page 65, Line 2250, it seems clear that the area between the two CDFW properties is the most important such area for conservation, with a seemingly healthy population, being adjacent to an already protected area in Montana de Oro State Park, and offering at least some potential for successful establishment of new plants, makes that area a candidate for early efforts at conservation.	Edited the text on page 65, line 2253 to highlight the stand of Morro manzanita that is high priority for conservation.
83	2888	D. Keil	David J. Keil, Ph.D. Professor Emeritus, California Polytechnic State University, San Luis Obispo	Added

Page Number	Line Number	Reviewer	Reviewer Comment	Department Response
83	2893	D. Keil	<p>I have read through the Draft Status Review for Morro Manzanita (<i>Arctostaphylos morroensis</i>), and I am impressed by the thoroughness of its preparation and organization.</p> <p>One topic that received minimal attention was the military activity in the Morro Bay area during World War 2 training exercises (https://en.wikipedia.org/wiki/Amphibious_Training_Base_Morro_Bay; https://www.spl.usace.army.mil/Portals/17/docs/FUDS/BPTA_FactSheet_2017.pdf?ver=2018-01-25-125131-733). There were a couple of mentions of ordinance removal, but no discussion of the impacts of military training exercises, even if these are unknown. There should be historical documents that discuss these activities and photos (likely including aerial photos) from military sources.</p> <p>The moratorium on construction activities imposed on the Los Osos area in 1988 had its effect in the immediate Los Osos-Baywood Park area, but outside the area of the moratorium some development continued in areas occupied by Morro manzanita, up to the border of Montaña de Oro State Park near Pecho Valley Road. I prepared the botanical report for one of these sites.</p> <p>I agree with the recommendation to the Commission that Morro manzanita be accorded the status of threatened species under the provisions of the CSEA.</p>	<p>Additional information on military training activities in the Morro Bay area and development outside of the moratorium zone were added to the Population Trend section.</p>