Technical Draft

Monterey County Regional Conservation Investment Strategy

August 2020

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Acronyms and Abbreviations

ACE	Area of Conservation Emphasis
BLUE	Smith's blue butterfly
BUOW	burrowing owl
CACO	California condor
Caltrans	California Department of Transportation
CBWS	California brackish water snail
CDFW	California Department of Fish and Wildlife
CEHC	California Essential Habitat Connectivity
CHL	coast horned lizard
CN	California newt
CNDDB	California Natural Diversity Database
CRLF	California red-legged frog
CSW	California sycamore woodlands
CTS	California tiger salamander
CVBM	Carmel Valley bush mallow
DPS	distinct population segment
eDNA	environmental DNA
FRAP	Fire and Resource Assessment Program
FYLF	foothill yellow-legged frog
HC	habitat connectivity
HCP	Habitat Conservation Plan
HMP	Habitat Management Plan
HO	Hickman's onion
HUC	Hydrologic Unit Code
LJ	Lemmon's jewelflower
MB	monarch butterfly
MCV	Manual of California Vegetation
MG	Monterey gilia

ML	mountain lion
MPF	Monterey pine forest
NMFS	National Marine Fisheries Service
PB	pallid bat
PM	Pajaro manzanita
RC	regional conservation
RCIS	Monterey County Regional Conservation Investment Strategy
RCP	representative concentration pathway
SBB	seaside bird's-beak
SCCCS	South-Central California Coast Steelhead
SCLTS	Santa Cruz long-toed salamander
SJKF	San Joaquin kit fox
SSO	southern sea otter
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

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EXECUTIVE SUMMARY

The Monterey County Regional Conservation Investment Strategy (RCIS) is a bold vision of future conservation in Monterey County, in which widespread conservation actions will sustain and enhance ecological resources, biodiversity, and ecological processes and functions, and will promote resilience for the benefit of biological communities, watersheds, geographically unique areas, and other special-status or non-special-status species. The RCIS is voluntary, non-binding, non-regulatory regional plan for species and habitat conservation that:

- guides regional conservation of focal species and sensitive habitats through strategic, scientifically grounded actions and investments;
- establishes conservation priorities, goals, objectives, and actions; and
- describes and promotes conservation investment that will contribute to species and habitat conservation including:
  + land acquisition and habitat protection,
  + habitat enhancement, restoration, and establishment,
  + creek and river restoration, and
  + habitat connectivity and linkage enhancement.

The RCIS area extends to the jurisdictional boundaries of Monterey County, in Central California on the Pacific County. The RCIS area is composed of important natural features, including the Pacific Ocean, Monterey Bay, Santa Lucia range, Gabilan range, Coast range, and the Carmel and Salinas valleys. Chapter 2 includes descriptions of the regional natural setting and built environment in the RCIS area.

With the passage of Senate Bill 1 and Measure X, Monterey County's self-help transportation sales tax measure, the Transportation Agency for Monterey County has habitat mitigation needs for numerous regional transportation improvements in corridors that are highly constrained by environmental factors, with some projects lying within the coastal zone. These habitat protection needs present an opportunity to develop the Monterey County Regional Conservation Investment Strategy to identify conservation strategies for critical species and habitat and then implement those strategies as advance mitigation for the transportation improvements.

A primary strength of the Monterey County RCIS is the significant co-benefits of adaptation work that will be provided, including to public health and safety, agricultural lands, natural ecosystems, air quality, and reductions in greenhouse gas emissions. The Monterey County RCIS will seek to accomplish the following specific objectives:

- Identify locations for habitat and agricultural mitigation for transportation projects, to create more meaningful land preservation and improve the resource agency approval process;
- Identify adaptation strategies to remedy identified climate related vulnerabilities;
- Advance the planning of specific climate adaptation projects; and
- Provide benefits to disadvantaged and vulnerable communities.

Focal species for the RCIS includes plant and wildlife species that are identified as having high priority for conservation, based on a necessity for habitat enhancement opportunities in the RCIS area. Other conservation elements for the RCIS are those that need conservation, including unique natural communities, ecosystem functions, and habitat connectivity. Non-focal species and non-focal other conservation elements are associated with focal species and focal other conservation elements that will benefit from the same conservation actions. Focal species were selected with the intention of maximizing conservation value, which can sustain and enhance biodiversity and ecological functions for the benefit of biological communities, watersheds, geographically unique areas, and other special-status species. Chapter 3 describes the methodology and process of focal species selection.

Table ES-1 and Table ES-2 list the focal and non-focal species, and focal and non-focal other conservation elements included in the RCIS.

Table ES-1 Focal Species and Focal Other Conservation Elements in the Monterey County RCIS

Common Name	Scientific Name
Focal Wildlife Species	
burrowing owl	Athene cunicularia
California brackish water snail	Tryonia imitator

Common Name	Scientific Name
California condor	Gymnogyps californianus
California newt	Taricha torosa
California red-legged frog	Rana draytonii
California tiger salamander	Ambystoma californiense
coast horned lizard	Phrynosoma blainvillii
foothill yellow-legged frog (Southwest/South Coast clade)	Rana boylii
monarch butterfly	Danaus plexippus pop. 1
mountain lion (Southern California/Central Coast ESU)	Puma concolor
pallid bat	Antrozous pallidus
San Joaquin kit fox	Vulpes macrotis mutica
Santa Cruz long-toed salamander	Ambystoma macrodactylum croceum
Smith's blue butterfly	Euphilotes enoptes smithi
southern sea otter	Enhydra lutris neries
steelhead (South-Central California Coast Steelhead DPS)	Oncorhynchus mykiss irideus
tidewater goby	Eucyclogobius newberryi
tricolored blackbird	Agelaius tricolor
vernal pool fairy shrimp	Branchinecta lynchi
western snowy plover	Charadrius nivosus nivosus
Focal Plant Species	
Carmel Valley bush mallow	Malacothamnus palmeri var. involucratus
Lemmon's jewelflower	Caulanthus lemmonii
Hickman's onion	Allium hickmanii
Monterey gilia	Gilia tenuiflora ssp. arenaria
Monterey spineflower	Chorizanthe pungens var. pungens
Pajaro manzanita	Arctostaphylos pajaroensis
seaside bird's-beak	Cordylanthus rigidus ssp. littoralis
Yadon's rein orchid	Piperia yadonii

Common Name	Scientific Name
Focal Other Conservation Elements	
California sycamore woodlands	Platanus racemosa Alliance
Monterey pine forest	Pinus muricata - Pinus radiata Alliance
valley oak woodland	Quercus lobata Alliance
working lands	None
dune formation	None
habitat connectivity	None

Table ES-2. Non-Focal Species and Other Conservation Elements in the Monterey County RCIS

Common Name	Scientific Name
Non-Focal Wildlife Species	
American badger	Taxidea taxus
least Bell's vireo	Vireo bellii pusillus
little willow flycatcher	Empidonax traillii brewsteri
Northern California legless lizard	Anniella pulchra
Santa Lucia slender salamander	Batrachoseps luciae
Townsend's big-eared bat	Corynorhinus townsendii
two-striped garter snake	Thamnophis hammondii
western mastiff bat	Eumops perotis californicus
western spadefoot	Spea hammondii
yellow-billed magpie	Pica nuttallii
Non-Focal Plant Species	
Carmel Valley cliff aster	Malacothrix saxatilis var. arachnoidea
Clare's pogogyne	Pogogyne clareana
Contra Costa goldfields	Lasthenia conjugens
eelgrass	Zostera marina
Jolon clarkia	Clarkia jolonensis
little Sur manzanita	Arctostaphylos edmundsii

Common Name	Scientific Name
Menzies' wallflower	Erysimum menziesii
Monterey clover	Trifolium trichocalyx
Monterey larkspur	Delphinium hutchinsoniae
sandmat manzanita	Arctostaphylos pumila
Non-Focal Other Conservation Elements	
coast live oak woodland	Quercus agrifolia Alliance
woolly-leaf manzanita shrubland	Arctostaphylos tomentosa Alliance

Climate change already is affecting plants, wildlife, and habitats throughout California (CDFW 2015), and is the primary stressor assessed in this document because of the severity of its projected future stressors. Other pressures and stressors include airborne pollutants, water management, fire, development of housing and urban areas, livestock and agriculture, habitat fragmentation, non-native invasive species, recreation and tourism, and renewable energy. Chapter 4 and Appendix B include descriptions of pressures and stressors and a climate change vulnerability assessment.

The conservation strategies proposed in the RCIS will benefit species and habitat conservation, provide resiliency to stressors and pressures, and promote adaptation to climate change. Chapter 5 includes conservation priorities, goals, objectives, and actions to benefit species and habitat conservation. Conservation strategies for each species and other conservation elements are intended to be “stand-alone” sections, giving the reader essential information needed to identify, plan, and implement habitat enhancement and conservation actions.

Monitoring and adaptive management is intended to ensure that conservation and habitat enhancement actions are implemented in ways that benefit focal/non-focal species and other conservation elements, and that contribute to achievement of the conservation goals and objectives stated in the RCIS. Chapter 6 includes a detailed monitoring strategy and the requirements for development of Mitigation Credit Agreements, which are a tool by which credits may be created to satisfy mitigation, including compensatory mitigation for impacts on resources and species, required under the California Engendered Species Act, Lake and Streambed Alteration Agreement, or the California Environmental Quality Act.

The RCIS has a companion web portal that provides a dynamic, searchable interface. This web portal displays geographic information from Chapter 4, and focal species and focal other conservation elements information and conservation strategies and actions from Chapter 5.

Southern Sea Otter
Photo Credit Marianne Rogers

1. REGIONAL CONSERVATION INVESTMENT STRATEGY OVERVIEW

The Monterey County Regional Conservation Investment Strategy (RCIS) Program, enabled through passage of Assembly Bill 2087 in 2016, is administered by the California Department of Fish and Wildlife and is designed to encourage regional planning for species and habitat conservation and enhancement. The RCIS is sponsored by the Transportation Agency for Monterey County through a planning process that includes public input and collaboration with partner organizations and agencies.

The Monterey County RCIS is a voluntary, non-binding, non-regulatory regional plan for species and habitat conservation that:

- guides regional conservation of focal species and sensitive habitats through strategic, scientifically grounded actions and investments;
- establishes conservation priorities, goals, objectives, and actions; and
- describes and promotes resiliency to climate change through conservation investment that will contribute to species and habitat conservation including:
  + land acquisition and habitat protection,
  + habitat enhancement, restoration, and establishment,
  + creek and river restoration, and
  + habitat connectivity and linkage enhancement.

The Monterey County RCIS is not a regulatory document. It does not create or modify regulatory requirements, regulate land use, establish land use designations, or affect or preempt the land use authority of a public agency to implement infrastructure and urban development in local general plans. The RCIS is in compliance with all applicable State and local requirements. The RCIS is not a mitigation plan, but it may be used to find mitigation opportunities and enable Mitigation Credit Agreements (see Section 6.2.4). The RCIS presents a vision for conservation in the county and includes quantitative conservation targets. These conservation targets are voluntary and non-binding, are not regulatory requirements or standards, and are not regulatory compliance success criteria.

1.1 Conservation Purpose

The RCIS is a bold vision of future conservation within Monterey County in which widespread conservation actions sustain and enhance ecological resources, biodiversity, ecological processes and functions, and promote resilience for the benefit of biological communities, watersheds, geographically unique areas, and other special-status or non-special-status species.

The Monterey County RCIS aligns with existing and future land use and general plans and is consistent with, and builds upon, existing conservation plans by promoting scientifically based conservation strategies that directly address threats identified in the State Wildlife Action Plan. The RCIS is consistent with species' recovery plans and habitat conservation plans, and includes actions from these plans to benefit focal species and other conservation elements. When implemented, the conservation strategies proposed in the Monterey County RCIS will benefit ecological processes, species and habitat conservation, provide resiliency to stressors and pressures, and promote adaption to climate change as required by RCIS guidelines (California Department of Fish and Wildlife, 2018a).

1.2 User's Guide

Potential users and objectives are shown in Table 1-1. For each potential user, chapters or sections of the RCIS are listed that may be useful to achieving proposed objectives.

Table 1-1. User's Guide

Potential User	Objectives	How to Use the Document	Chapter
• Transportation agencies • Utilities • Infrastructure/ development project proponents	• Determine project siting • Design more resilient, habitat compatible infrastructure • Identify high-value areas for conservation actions that can be used as Mitigation Credit Agreements	• Look at species profiles (Chapter 5) and/or the web portal to identify priority actions and areas that would benefit from conservation or enhancement actions • Review figures in Chapter 2 and/or the web portal to identify sensitive areas that should be avoided and high value areas where conservation actions could provide mitigation opportunities • Review climate resiliency strategies and incorporate them into project designs • Review Stressors and Pressures Assessment (Appendix B) on how climate change can affect species • Select mitigation consistent with conservation actions identified in the RCIS for facilitated permitting	• Chapter 2 • Chapter 4 • Chapter 5 • Section 6.2.4
• Conservation organizations • Land trusts • Resource managers	• Identify high-value areas for conservation • Obtain grants	• Look at species profiles (Chapter 5) and/or the web portal to identify priority actions and areas that would benefit from conservation or enhancement actions • Reference consistency with RCIS strategies to strengthen grant applications	• Chapter 2 • Chapter 5

Potential User	Objectives	How to Use the Document	Chapter
• Land use authorities • Municipalities • Local or regional governments	• Project siting • Designing more resilient, habitat compatible infrastructure • Prepare comprehensive, ecologically sensitive General Plans and Master Plans	• Review the regional planning and environmental overview sections to make sure new plans are consistent • Use Chapter 2 and/or web portal to identify sensitive areas to be avoided when developing and adjusting zoning and limit lines • Look at species profiles (Chapter 5) and/or the web portal to identify areas that would benefit from conservation or enhancement actions	• Chapter 2 • Chapter 4 • Chapter 5
• Mitigation Credit Agreement sponsor	• Identify high-value areas for conservation actions that can be used as Mitigation Credit Agreements	• Look at species profiles (Chapter 5) and/or the web portal to identify areas that would benefit from conservation or enhancement actions • Review climate resiliency strategies and incorporate them into project designs • Select mitigation consistent with conservation actions identified in the RCIS for sponsoring Mitigation Credit Agreements	• Chapter 2 • Chapter 5 • Section 6.2.4

Potential User	Objectives	How to Use the Document	Chapter
• Regulatory agencies	• Identify high-value areas for conservation actions that can be used as Mitigation Credit Agreements	• Look at species profiles (Chapter 5) and/or the web portal to identify areas that would benefit from conservation or enhancement actions • Review climate resiliency strategies and incorporate them into project designs • Select mitigation consistent with conservation actions identified in the RCIS for sponsoring Mitigation Credit Agreements	• Chapter 2 • Chapter 5 • Section 6.2.4

1.3 Stakeholder Involvement and Public Outreach

Diverse stakeholder involvement and feedback were instrumental in developing the RCIS. The main goals of the engagement process were to solicit input and ideas from stakeholders and the public, collect feedback on key deliverables, and integrate the comments and feedback into the RCIS as appropriate. In addition, the stakeholder involvement and public outreach process sought to foster buy-in and ongoing support among participants. Input was requested from tribal entities, ranchers and farmers; federal, State, and local agencies with land use authority, including the cities and counties in and adjacent to the RCIS area; resource districts; conservation organizations; and other non-governmental organizations.

The steering committee included representatives from the California Department of Transportation District 5, California Department of Fish and Wildlife Headquarters, California Department of Fish and Wildlife District 4, and The Nature Conservancy. The primary mechanisms for engaging stakeholders during development of the RCIS were steering committee meetings, stakeholder committee meetings held in Salinas, California, continually update of the project website with draft documents and meeting materials, stakeholder reviews of deliverables, webinars and virtual meetings, one-on-one stakeholder interviews and conversations, and presentations to the Transportation Agency of Monterey County Board of Directors.

Table 1-2 shows stakeholder involvement and public outreach efforts.

Table 1-2. Stakeholder Involvement and Public Outreach

Date	Activity
Steering committee meetings	Throughout RCIS development
Monthly email newsletter	Throughout RCIS development
March 2019	Project website established
March 2019	First stakeholder meeting
May 2020	Second stakeholder meeting
June 2019	Catch-up webinar
August 2019	One-on-one interviews with stakeholders
August 2019	Third stakeholder/public meeting
August 2019	Stakeholder review of draft Regional Setting Report
November 2019	One-on-one interviews with stakeholders
November 2019	Fourth stakeholder/public meeting and Conservation Strategy development workshop
November 2019	Stakeholder review of draft Focal Species Stressors and Pressures Assessment
November 2019	Notice of Intent filed with the County of Monterey, California Governor’s Office of Planning and Research, and the California Department of Fish and Wildlife
May 2020	Stakeholder review of draft Conservation Strategy
June 2020	Consultant presentation to Transportation Agency of Monterey County Board of Directors
June 2020	One-on-one interviews with stakeholders
July 2020	Fifth stakeholder/meeting public virtual meeting
August 2020	One-on-one interviews with stakeholders

Notice of Intent

In November 2019 a Notice of Intent was filed with the County of Monterey, the California Governor's Office of Planning and Research, and California Department of Fish and Wildlife, and was sent to each local public agency with land use authority.

Public Meeting

Information about the July 15, 2020 public virtual meeting was distributed at least 30 days before the meeting date on June 12, 2020. It was posted on the RCIS project website at https://www.tamcmonterey.org/programs/regional-conservation-investment-strategy/.

Also, two reminders were sent to:

- California Department of Fish and Wildlife at rcis@wildlife.gov
- Each city within the RCIS area, and each adjoining county, and cities in adjoining counties adjacent to the RCIS area, including:
  + Fresno County
  + Kings County
  + Monterey County
  + San Benito County
  + San Luis Obispo County
  + Santa Cruz County
  + Carmel-by-the-Sea
  + Del Rey Oaks
  + Gonzales
  + Greenfield
  + King City
  + Marina
  + Monterey (City)
  + Pacific Grove
  + Salinas
  + San Juan Bautista
  + Sand City
  + Seaside
  + Soledad
  + Watsonville
- The implementing entity for the Fort Ord Habitat Conservation Plan, the Installation-Wide Multispecies Fort Ord Habitat Management Plan, and the Post Ranch Inn Habitat Conservation Plans. No contact infornation was available for the implementing entity of the Low-Effect Habitat Conservation Plan for Gaver Ranch.
- Those listed on the Monterey County RCIS stakeholder list, which includes a broad array of stakehoders and each public agency, organization, or individual who has filed a written request for the notice, including any agency, organization, or individual who has filed a written request to California Department of Fish and Wildlife for notices of all RCIS public meetings.

2. REGIONAL SETTING

The Monterey County RCIS area extends to the jurisdictional boundaries of Monterey County, in Central California on the Pacific Coast (Figure 2-1). The RCIS area is composed of important natural features, including the Pacific Ocean, Monterey Bay, the Santa Lucia and Gabilan ranges, and the Carmel and Salinas valleys. The natural, built, and planning environments of the RCIS area are described in this chapter. The county boundary was selected to reduce land use authority conflicts, and to minimize overlap or conflicts with other RCIS areas, while maximizing jurisdictional partnerships and regional conservation efforts.

Focal species and focal other conservation elements (other conservation elements), and non-focal species and non-focal other conservation elements for this RCIS were selected based on several key considerations, described in Chapter 3. The focal species and focal other conservation elements and associated non-focal species and non-focal other conservation elements, that are identified and analyzed in this RCIS will benefit from conservation actions.

2.1 Natural Setting Overview

The RCIS area is in Central California, bordered by the Pacific Ocean to the west, the Pajaro River to the north, and extending inland to the Gabilan and Diablo ranges, and has a Mediterranean climate, characterized by cool, wet winters and dry summers. There are two U.S. Department of Agriculture defined ecoregion provinces and two sections (Cleland et al. 2007), shown in Table 2-1 and Figure 2-2.

Table 2-1. Ecoregions

Province	Ecoregion Section	Key Characteristics
California Coastal Chaparral Forest and Shrub	Central California Coast	• Mediterranean climate • Composed primarily of chaparral, woodland, and annual grassland vegetative cover • Low to moderate elevation ranges and valleys

Province	Ecoregion Section	Key Characteristics
California Coastal Range Coniferous Forest–Open Woodland–Shrub–Meadow Province	Central California Coast Ranges	• Mediterranean climate • Composed primarily of evergreen shrubland, western hardwoods, annual grassland, and chaparral vegetative cover • Low-elevation parallel ranges

2.1.1 Natural Communities

Natural communities in the RCIS area are shown in Figure 2-3 and provided in Appendix A. They were mapped using the following datasets:

- California Department of Forestry and Fire Protection Fire and Resource Assessment Program Vegetation (CalFire 2016);
- Salinas River Vegetation (TNC 2008) (The Nature Conservancy mapped portions of the Salinas River and several of its tributaries.)
- Gabilan Ranch Vegetation (TNC 2006) (The Nature Conservancy mapped approximately 11,000 acres of terrestrial vegetation at Gabilan Ranch.)
- Pinnacles National Monument Vegetation (NPS and USGS 2008) (The National Park Service mapped approximately 44,997 acres, encompassing what now is the Pinnacles National Park and some surrounding areas.)

The natural communities list used datasets categorized according to the Manual of California Vegetation (CNPS 2019a) when available, and California Department of Forestry and Fire Protection Fire and Resource Assessment Program data categorized by the California Wildlife Habitat Relationships (CDFW 2014). The composite vegetation types were cross-walked to the Manual of California Vegetation (CNPS 2019a) when possible, and otherwise include vegetation types defined by the California Wildlife Habitat Relationships (CDFW 2014), as required by California Department of Fish and Wildlife RCIS guidelines (CDFW 2018a). The crosswalk was developed by comparing similar species across habitat types and coordinating with California Department of Fish and Wildlife staff about the approach (Keeler-Wolf, pers. comm, 2019). The cross-walked vegetation types are provided in Appendix A.

GreenInfo Network, 2019
ESRI, 2016

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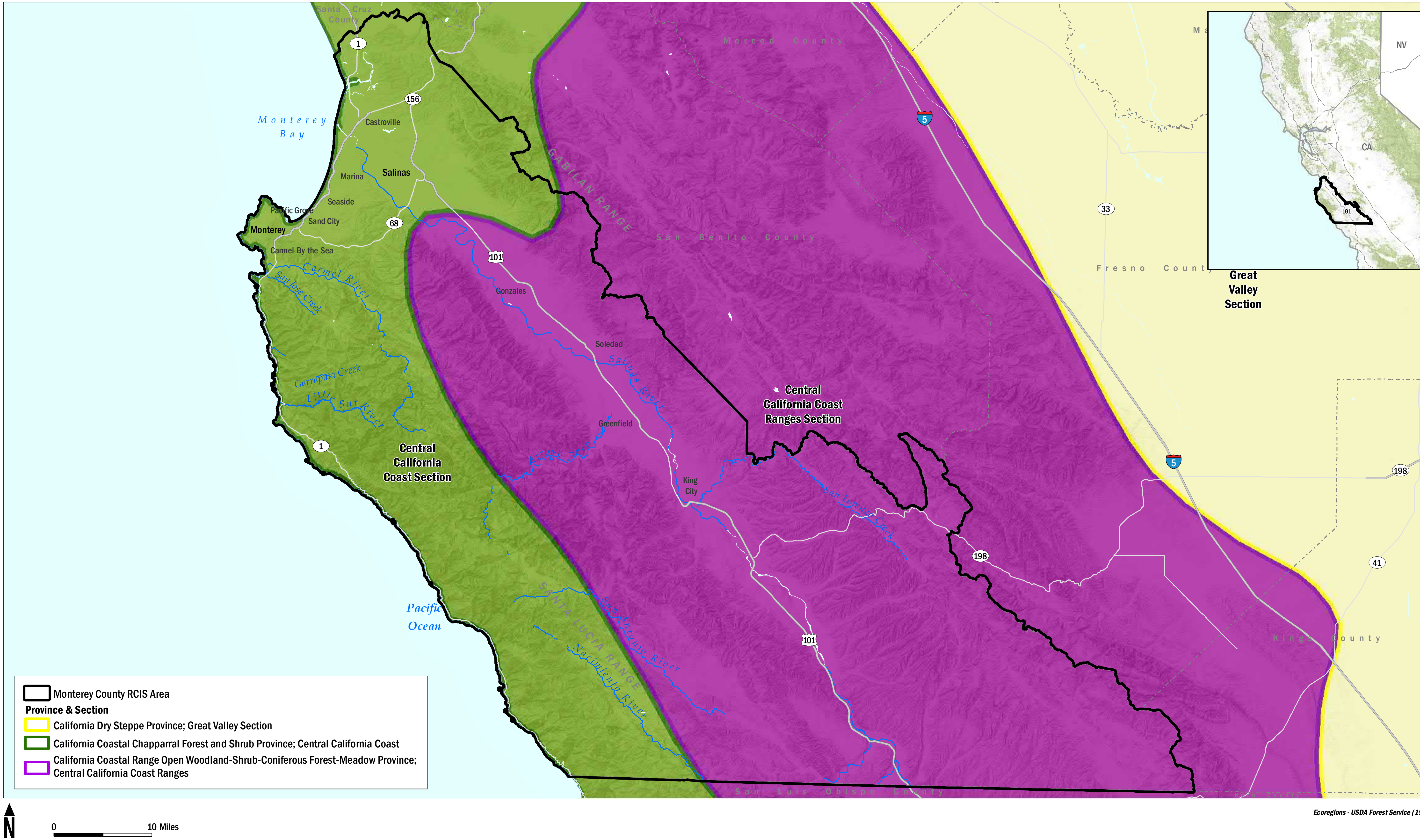
FIGURE 2-1
RCIS Area



Ecoregions - USDA Forest Service (1994)

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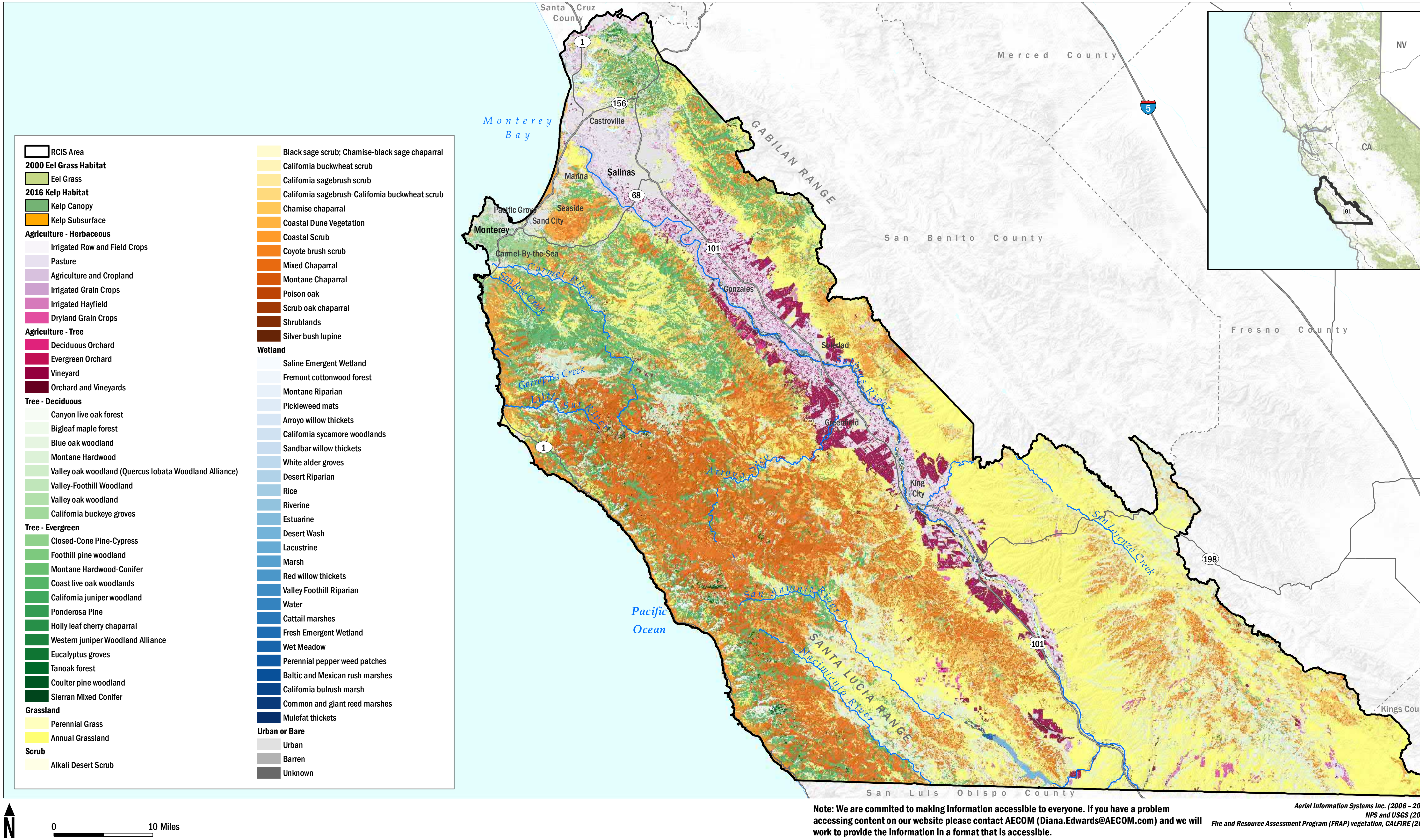
FIGURE 2-2

Ecoregions

AECOM Oakland CA 6/24/2020 USER sally.shatford PATH \\na.aecomnet.com\lfs\AMER\Oakland-USOAK01\DCS\Projects\GIS\Projects\Monterey_County_RCIS\02_Maps\02_Map_Production_and_Reports\Existing_Conditions\Fig2-2_NaturalCommunities.mxd



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Aerial Information Systems Inc. (2006 – 2008), NPS and USGS (2008), Fire and Resource Assessment Program (FRAP) vegetation, CALFIRE (2015)

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FIGURE 2-3

Natural Communities

2.1.2 Aquatic Resources

Geographic information system datasets, including the U.S. Geological Survey Watershed Boundary Dataset (USGS and NRCS 2013), National Wetlands Inventory (USFWS 2019), and the National Hydrography Dataset (USGS 2019), were used to compile aquatic resources in the RCIS area. Table 2-2 lists the 26 major watersheds in, or overlapping the RCIS area, as identified by the U.S. Geological Survey's (USGS) 10-digit Hydrologic Unit Code (HUC 10) (USGS and NRCS 2013). Many of the northern watersheds in the RCIS area drain to Monterey Bay.

Table 2-2. Watersheds

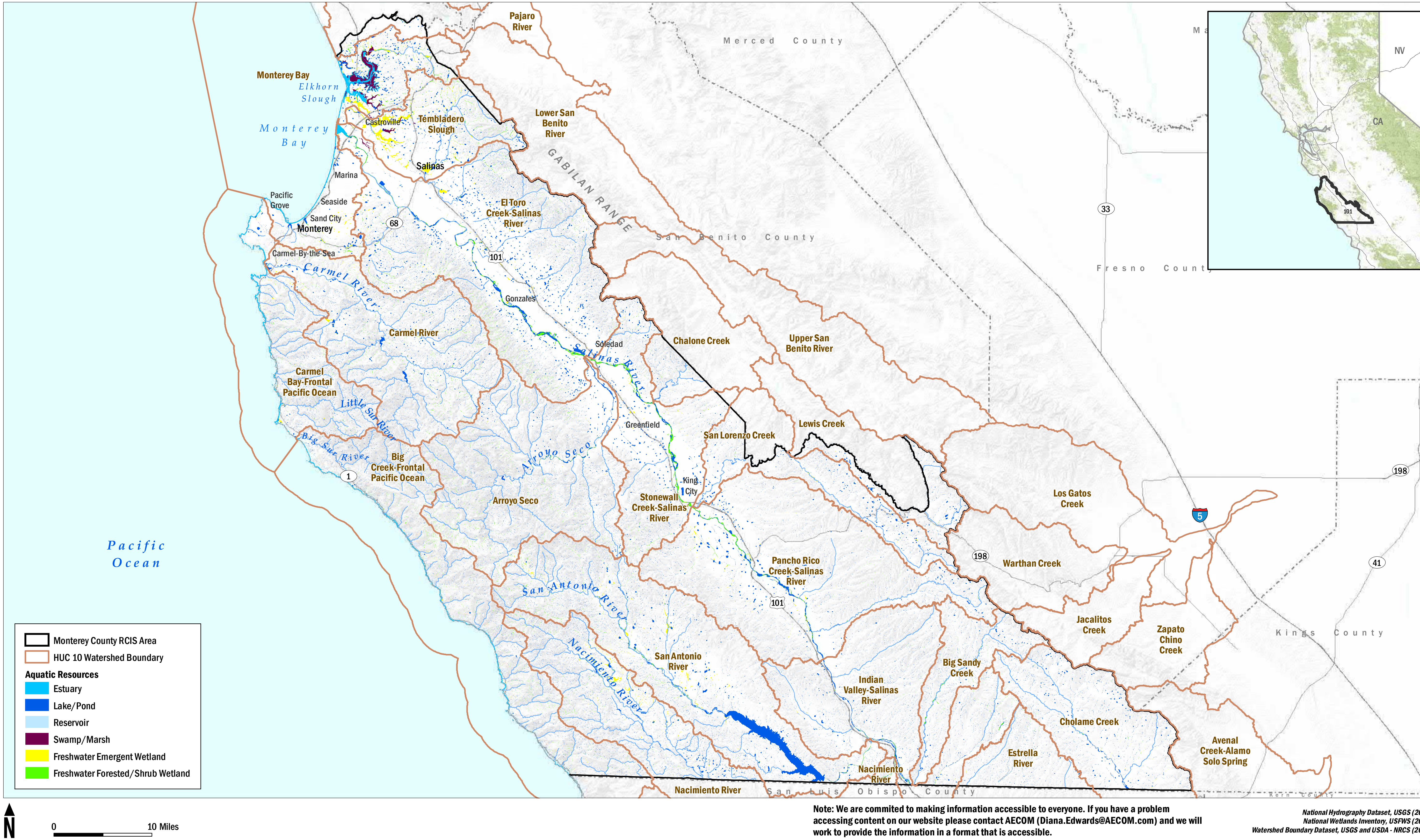
Watersheds (USGS HUC 10)	Acreage of Entire Watershed	Acreage of Watershed within RCIS Area
Arroyo Seco	190,376	190,367
Avenal Creek-Alamo Solo Spring	97,167	50
Big Creek-Frontal Pacific Ocean	264,566	136,848
Big Sandy Creek	54,639	54,619
Carmel Bay-Frontal Pacific Ocean	151,215	76,776
Carmel River	162,469	162,456
Chalone Creek	90,582	18,279
Cholame Creek	151,698	102,734
El Toro Creek-Salinas River	265,664	265,572
Estrella River	177,628	38,921
Indian Valley-Salinas River	167,182	157,399
Jacalitos Creek	46,278	30
Lewis Creek	83,646	30,588
Los Gatos Creek	142,883	21
Lower San Benito River	126,856	61
Monterey Bay	325,545	77,391
Nacimiento River	237,881	108,912
Pajaro River	117,967	9,774
Pancho Rico Creek-Salinas River	230,508	230,460

Watersheds (USGS HUC 10)	Acreage of Entire Watershed	Acreage of Watershed within RCIS Area
San Antonio River	220,574	214,010
San Lorenzo Creek	83,202	63,666
Stonewall Creek-Salinas River	115,008	113,490
Tembladero Slough	71,902	68,602
Upper San Benito River	155,631	44
Warthan Creek	76,785	65
Zapato Chino Creek	62,045	14

The RCIS area contains numerous rivers, streams, lakes, wetlands, and other aquatic features, as shown in Figure 2-4. Major rivers in the RCIS area include:

- Salinas River
- Carmel River
- Nacimiento River
- Arroyo Seco
- San Antonio River
- Little Sur River
- Pajaro River
- Big Sur River

Other significant aquatic features include Elkhorn Slough, which has the largest tract of tidal salt marsh in California outside the San Francisco Bay.



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National Hydrography Dataset, USGS (2019)
National Wetlands Inventory, USFWS (2018)
Watershed Boundary Dataset, USGS and USDA - NRCS (2014)

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FIGURE 2-4

Aquatic Resources

2.2 Protected Areas

2.2.1 Protected Lands

Datasets compiled for protected lands in and surrounding the RCIS area include the California Conservation Easement Database (GreenInfo Network 2018), California Protected Area Database (GreenInfo Network 2019), and Marine Protected Areas (CDFW 2018b).

Approximately 514,533 acres (24.26 percent of the RCIS area) of protected lands (as defined by the California Protected Area Database [GreenInfo Network 2019]) are protected through conservation easements in the RCIS area. Of these, 461,603 acres of protected lands and 56,236 acres of conservation easements are in the RCIS area, with 3,306 acres of overlap. These lands include protected public and private lands, easements, parks, and reserves that protect ecological, cultural, and historical resources and provide ecological value, and they may be protected by non-profit organizations, federal, state, county, municipal, regional, water resources, and community service agencies. Figure 2-5 shows protected lands in and surrounding the RCIS area.

Federal

Off the coast of the RCIS area is the Monterey Bay National Marine Sanctuary, one of the largest federally protected marine areas in the United States. It extends from Marin County, north of San Francisco, south to Cambria in San Luis Obispo County.

State

Approximately 5,900 acres of State-protected Marine Protected Areas are off the coast of Monterey County (Figure 2-5). Marine Protected Areas protect marine habitats, biodiversity, and ecosystems and include the following State Marine Reserves and State Marine Conservation Areas:

- Elkhorn Slough State Marine Reserve
- Elkhorn Slough State Marine Conservation Area
- Moro Cojo Slough State Marine Reserve
- Soquel Canyon State Marine Conservation Area

- Portuguese Ledge State Marine Conservation Area
- Edward F. Ricketts State Marine Conservation Area
- Lovers Point–Julia Platt State Marine Reserve
- Pacific Grove Marine Gardens State Marine Conservation Area
- Asilomar State Marine Reserve
- Carmel Pinnacles State Marine Reserve
- Carmel Bay State Marine Conservation Area
- Point Lobos State Marine Reserve
- Point Lobos State Marine Conservation Area
- Point Sur State Marine Reserve
- Point Sur State Marine Conservation Area
- Big Creek State Marine Reserve
- Big Creek State Marine Conservation Area

2.3 Mitigation and Conservation Banks in the RCIS Area

Four established mitigation and conservation banks occur in, or have service areas overlapping the RCIS area, as shown in Table 2-3 and Figure 2-5. Mitigation banks in process of establishment are not included.

Table 2-3. Mitigation and Conservation Banks in the RCIS Area

Mitigation Bank	Species/Resource	Acreage of Service Area in RCIS Area	Brief Description
Sparling Ranch Conservation Bank	• California tiger salamander (CTS) • California red-legged frog (CRLF)	• CTS - 1,520,791 • CRLF - 1,670,046	• 2,000-acre bank in San Benito and Santa Clara Counties (CDFW 2018c)
Elkhorn Highlands Reserve	• Wetland habitat • Endangered species • Agriculture	• 46,290	• Advance mitigation for California Department of Transportation (Caltrans) projects in the Elkhorn Slough Watershed (Siepel and Ruggerone 2011)
Carmel River Mitigation Bank	• Riparian habitat	• Unknown	• 43 acres located in the Odello West field. • Bank credits available for transportation projects on the Monterey Peninsula that impact coastal streams (CSUMB 2016)
Pajaro River Mitigation Bank	• Seasonal wetland habitat	• 12,233	• 273 acres near Gilroy, California • Mitigation for Clean Water Act obligations • Provides wetland, agricultural, wildlife, and flood control benefits (AMBAG 2010) (Wildlands 2019)

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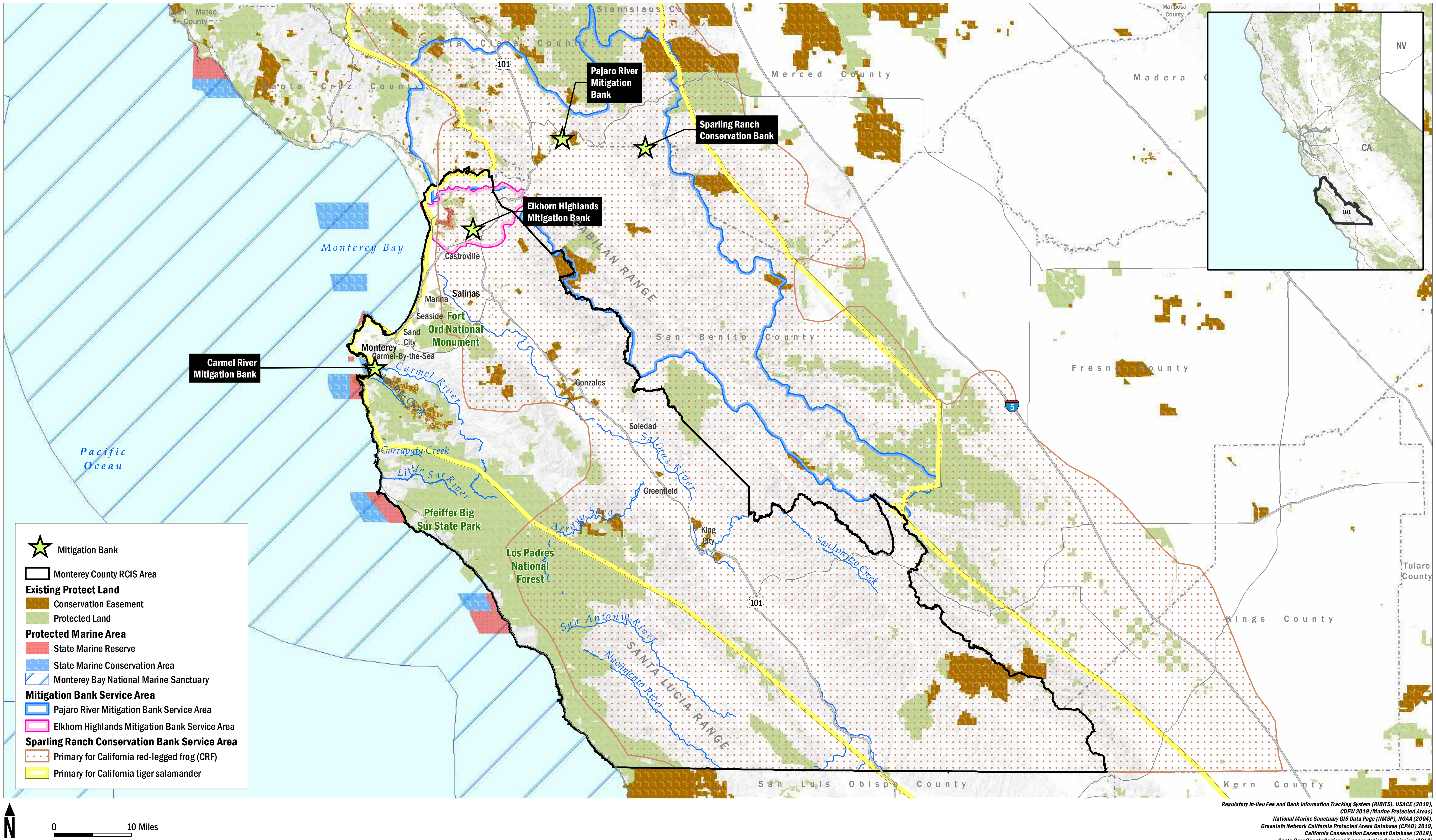

Regulatory In-lieu Fee and Bank Information Tracking System (RIBITS), USACE (2019),
CDFW 2019 (Marine Protected Areas)
National Marine Sanctuary GIS Data Page (NMSP), NOAA (2004),
GreenInfo Network California Protected Areas Database (CPAD) 2019,
California Conservation Easement Database (2018),
Santa Cruz County Regional Transportation Commission (2010)

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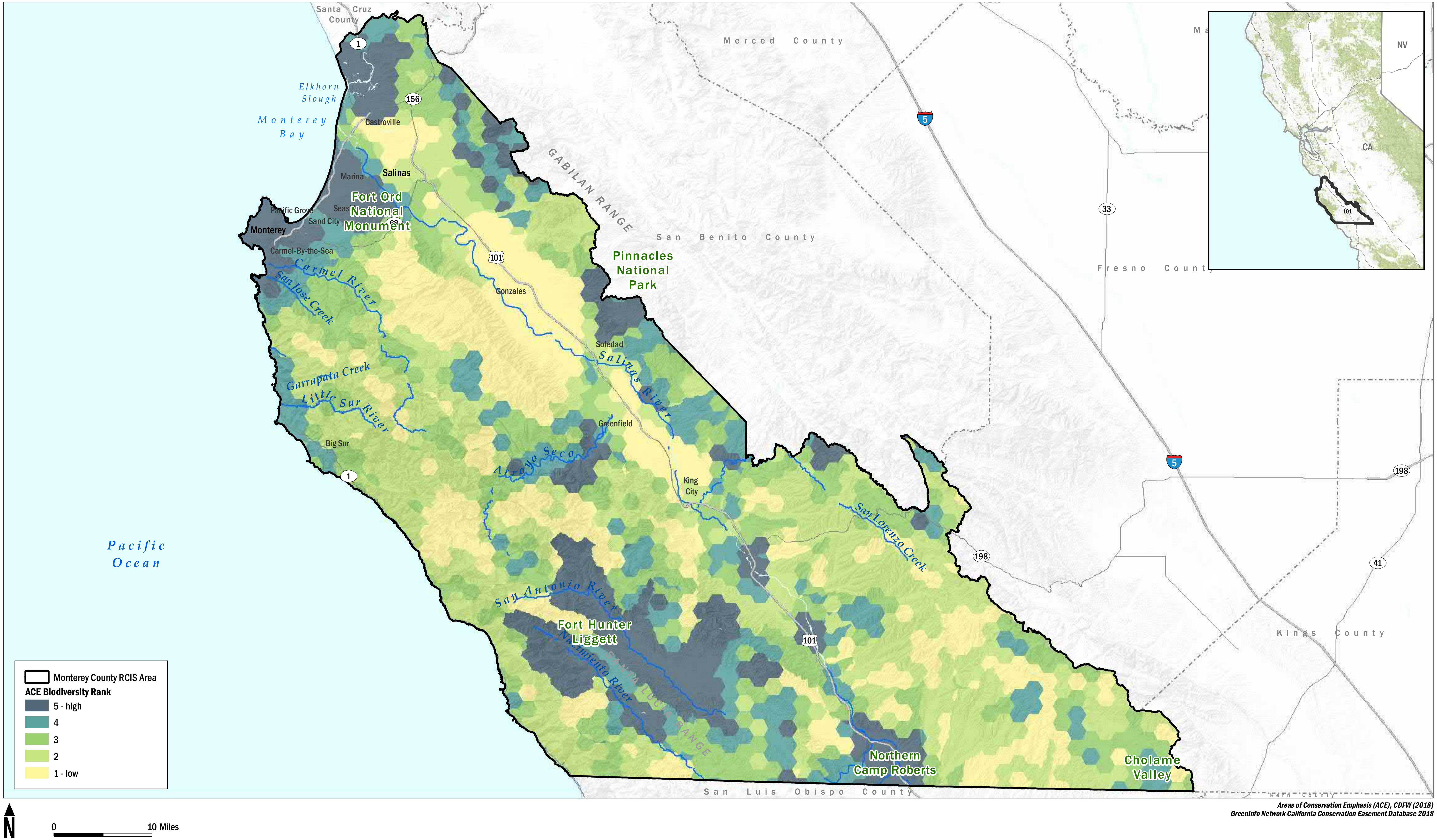
FIGURE 2-5
Protected Lands and Mitigation Banks

2.4 Biodiversity

Locations in the RCIS area were reviewed for high biological value using California Department of Fish and Wildlife Area of Conservation Emphasis dataset (CDFW 2018d), which assesses relative biological richness based on species diversity, rarity, and endemism. Sites that are considered to have native species richness, rare species diversity, and a large variety of endemic species have a higher ecoregion ranking, determined by a 1–5 scale (5 being the best ranking). As determined by the Area of Conservation Emphasis dataset, the areas or portions of areas with an ecoregion biodiversity rank of 4 or 5 in the RCIS are as follows (and shown in Figure 2-6):

- Arroyo Seco
- Big Sur
- Cholame Valley
- Elkhorn Slough
- Gabilan Range
- Monterey Penninsula
- Fort Ord
- Northern Camp Roberts
- Pinnacles National Park
- Fort Hunter Liggett/Santa Lucia Range
- Salinas River



Areas of Conservation Emphasis (ACE), CDFW (2018)
GreenInfo Network California Conservation Easement Database 2018

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FIGURE 2-6
Biodiversity

2.5 Planning Environment

Numerous planning documents and regulations relate to the content included in an RCIS. This section describes federal, State, and local requirements for protection of threatened or endangered species, preservation of habitat, and other considerations to guide the drafting of the Monterey County RCIS.

2.5.1 Regulatory Framework of the RCIS Action Area

The planning framework of the RCIS action area includes built-environment plans that describe the existing and planned development in the RCIS area. General plans, infrastructure plans, and conservation plans designate areas of planned development and conservation, while recovery plans outline protection measures for specific species' habitats.

Land use plans are documents that guide the type and distribution of land uses and open space preservation for a given area. They outline the vision and policies related to the built and natural environment and are considered to be the blueprint for development and conservation in the jurisdiction. Each plan that applies to any portion of the RCIS area is listed in Table 2-4, and the existing and planned development is shown in Figure 2-7. Geographic information systems data were provided by the Association of Monterey Bay Area Governments and each local jurisdiction.

Table 2-4. Plans in RCIS Area

Plan or Program	Plan Area	Citation
Monterey County General Plan	Monterey County	Monterey County 2010.
Monterey County Coastal Program	Monterey County Coastal Zone	Monterey County 1982, 1983, 1996, 2012
Carmel-by-the-Sea General Plan	City of Carmel-by-the-Sea	Carmel-by-the-Sea, City of 2003
Del Rey Oaks General Plan	City of Del Rey Oaks	Del Rey Oaks, City of 1997
Gonzales General Plan	City of Gonzales	Gonzales, City of 2011
Gonzales Climate Action Plan	City of Gonzales	Gonzales, City of 2018

Plan or Program	Plan Area	Citation
Greenfield General Plan	City of Greenfield	Greenfield, City of 2005
King City General Plan	City of King City	King, City of 1998
Marina General Plan	City of Marina	Marina, City of 2000
City of Monterey General Plan	City of Monterey	Monterey, City of 2005
City of Monterey Climate Action Plan	City of Monterey	Monterey, City of 2016
Pacific Grove General Plan, Pacific Grove	City of Pacific Grove	Pacific Grove, City of 1994
Point Lobos State Reserve and Carmel River State Beach General Plan	Point Lobos State Reserve and Carmel River State Beach	California Department of Parks and Recreation (CDPR) 1979
Salinas General Plan	City of Salinas	Salinas, City of 2002
Sand City General Plan	City of Sand City	Sand City, City of 2002-2017
Seaside General Plan	City of Seaside	Seaside, City of 2003, 2019
Soledad General Plan	City of Soledad	Soledad, City of 2005
State Route 68 Scenic Highway Plan	Monterey County–SR 68 corridor	Transportation Agency of Monterey County (TAMC) 2017
Monterey County Multi-Jurisdictional Hazard Mitigation Plan	Monterey County	Monterey County 2015
Route 156 West Corridor Final Environmental Impact Report/Environmental Assessment with Finding of No Significant Impact	Monterey County–SR 156 corridor	Caltrans 2013
Pacific Grove Highway 68 Study	Monterey County–Holman Highway 68 corridor	TAMC 2016a
Canyon Del Rey Boulevard (SR 218) Corridor Study (draft)	Monterey County–SR 218 corridor	TAMC 2019a
G12: Pajaro to Prunedale Corridor Study	Monterey County–G12 corridor	TAMC 2019b

Plan or Program	Plan Area	Citation
Gabilan Watershed Blueprint	Gabilan Watershed	Greater Monterey County Regional Water Management Group 2014
Palo Corona Regional Park General Development Plan	Palo Corona Regional Park District	Monterey Peninsula Regional Park District 2008
Northern Salinas Valley Watershed Restoration Plan	Northern Salinas Valley Watershed	Association of Monterey Bay Area Governments 1997
Reclamation Ditch Watershed Assessment and Management Strategy	Reclamation Ditch Watershed	Monterey County Water Resources Agency 2006
Monterey Bay National Marine Sanctuary Final Management Plan, Monterey Bay National Marine Sanctuary	Monterey County	Monterey Bay National Marine Sanctuary 2008
Elkhorn Slough Watershed Conservation Plan, California State Coastal Conservancy	Elkhorn Slough Coastal Estuary	Scharffenberger 1999
Salinas River Long-Term Management Plan	Salinas River Watershed	Monterey County Water Resources Agency and California State Coastal Conservancy 2019
Foothill Yellow-Legged Frog Conservation Assessment in California	State of California	Hayes et al. 2016
Conservation Plan for the Tricolored Blackbird	State of California	Tricolored Blackbird Working Group 2007

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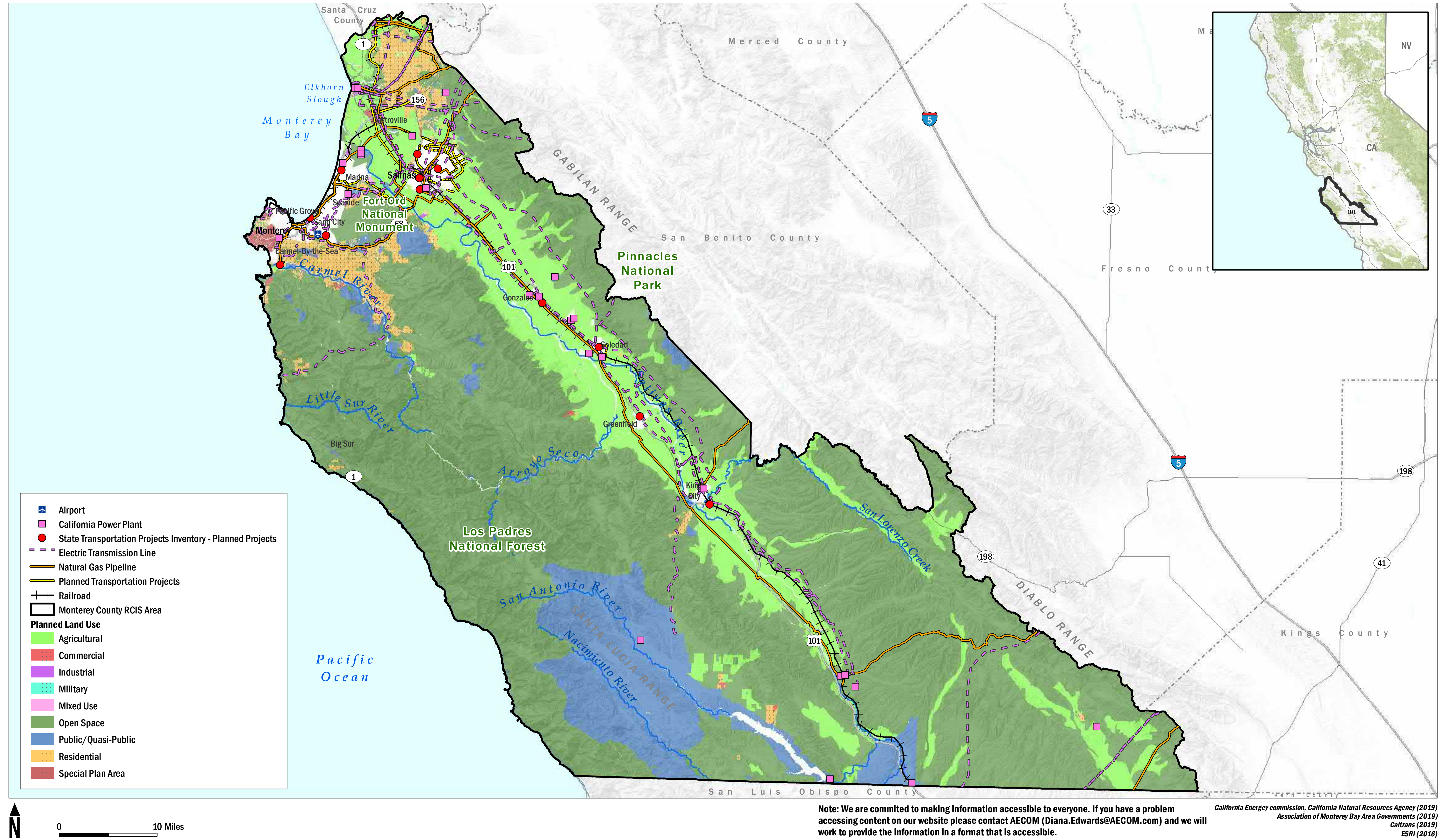

Note: We are commited to making information accessible to everyone. If you have a problem accessing content on our website please contact AECOM (Diana.Edwards@AECOM.com) and we will work to provide the information in a format that is accessible.

California Energy commission, California Natural Resources Agency (2019)
Association of Monterey Bay Area Governments (2019)
Caltrans (2019)
ESRI (2016)

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Transportation Agency for Monterey County
Monterey County Regional Conservation Investment Strategy

FIGURE 2-7
Built Environment

2.5.2 Infrastructure Plans

Infrastructure related to the RCIS goals includes water, transportation, and energy. The plans shown in Table 2-5 outline the existing and planned infrastructure projects for the region, and they were gathered from each agency as well as from data provided by the Association of Monterey Bay Area Governments. No identified energy infrastructure projects currently are planned for Monterey County.

Table 2-5. Infrastructure Plans

Plan or Project	Description
California American Water Monterey Peninsula Water Supply Project , California Public Utilities Commission	The Monterey Peninsula Water Supply Project would include building a desalination plant and making facility improvements to the existing Seaside Groundwater Basin Aquifer Storage and Recovery system. The proposed desalination plant site is near the existing wastewater treatment plant on Highway 1 north of Marina. The project would include pipelines going north to Castroville and south along General Jim Moore Boulevard.
Pure Water Monterey Groundwater Replenishment Project , Monterey Peninsula Water Management District and Monterey One Water	The Pure Water Monterey Groundwater Replenishment Project would create a reliable source of water supply by taking highly treated water from the Advanced Water Purification Facility on Highway 1 north of Marina and recharging the Seaside Groundwater Basin using a series of shallow and deep injection wells. The project would include new facilities in the cities of Salinas, Marina, Seaside, Monterey, and Pacific Grove, as well as in unincorporated Monterey County.
Greater Monterey County Integrated Regional Water Management Plan (Greater Monterey Regional Water Management Group 2018)	This plan covers regional water management in Monterey County and portions of San Benito County.

Plan or Project	Description
Storm Water Resource Plan for the Greater Monterey County Integrated Regional Water Management Region (Hunt et al. 2019)	This plan covers storm water resources and management Monterey County, exclusive of the Monterey Peninsula.
Monterey County Regional Transportation Plan (TAMC 2018b)	The 2018 Regional Transportation Plan identifies a range of transportation investments to be funded over the 22-year lifetime of the document. The plan includes projects to improve the regional transportation system, maintain local streets and roads, enhance public transit, and provide active transportation.
Monterey County Transportation Safety and Investment Plan (TAMC 2016b)	The Transportation Agency for Monterey County placed the Transportation Safety and Investment Plan (Measure X) on the November 8, 2016 ballot, and the measure was approved with 67.7% approval by Monterey County voters. The measure is anticipated to generate an estimated $20 million annually for a total of $600 million over 30 years, through retail transactions and a use tax of three-eighths of 1 percent (0.375%). The Transportation Safety and Investment Plan identifies projects in the County that will be funded by Measure X, with 60 percent of funds raised going toward local projects and 40 percent toward regional safety and mobility projects.
Moving Forward 2040 Monterey Bay (AMBAG 2018)	The Metropolitan Transportation Plan and Sustainable Communities Strategy are required to analyze mobility and accessibility needs of the region. All of the projects from the Monterey County Regional Transportation Plan are included in the Metropolitan Transportation Plan, and they are required to be consistent with the goals of the Sustainable Communities Strategy.

Plan or Project	Description
District 5 System Management Plan (Caltrans 2015)	The District System Management Plan for District 5 includes projects that will maintain and improve the Caltrans transportation system over the next 20 years. Projects included overlap with those of the Monterey County Regional Transportation Plan and Moving Forward 2040 Monterey Bay, as well as several aimed at congestion relief and road maintenance.
Active Transportation Plan for Monterey County (TAMC 2018a)	The countywide Active Transportation Plan focuses on analyzing key gaps from the existing and proposed bicycle and pedestrian networks and identifies opportunity sites for innovative bicycle facility design and areas for enhanced regional and local connectivity.

Burrowing Owl
Photo Credit: Rose Bloise

3. FOCAL SPECIES SELECTION

3.1 Focal Species Selection Methodology

Focal species for the Monterey County RCIS includes plant and wildlife species that are identified as having high priority for conservation, based on a necessity for habitat enhancement opportunities in the RCIS area. Focal species were selected with the intention of maximizing conservation value, which can sustain and enhance biodiversity and ecological functions for the benefit of biological communities, watersheds, geographically unique areas, and other special-status species.

Focal species should represent a high conservation value for the RCIS, because they provide opportunities for further conservation measures. Ideally, the focal species and other conservation elements, such as sensitive natural communities, fall into all three of the following primary key considerations:

1. Being considered “special status” by State and federal agencies. These are plant and wildlife species that are listed by federal or State agencies; plants given a California Rare Plant Ranking; or natural communities that are rated rare by the State.

2. Have a high “conservation value,” defined as an umbrella species or keystone species. These can be plants that either are dominant or otherwise tied to specific plant communities (e.g., Seaside bird’s beak in maritime chaparral; western burrowing owl in grasslands), therefore providing necessary habitat cover for a high number of other special-status or non-special-status species. These also can be sensitive natural communities, such as Monterey pine woodland, which provides habitat value for a variety of sensitive resources.

3. Have “high significance” to Monterey County/the RCIS area. These species are identified as those that are endemic or nearly endemic to Monterey County and/or have a high percentage of their global population in Monterey County (e.g., California condor [Gymnogyps californianus]); or species that are widespread in Monterey County, particularly on lands that are not yet protected by State, federal, or County in-holdings.

The following resources were consulted to generate a list of species for consideration as focal species:

- Species of Greatest Conservation Need lists in the current version of the State Wildlife Action Plan (CDFW 2015)
- The Complete List of Amphibian, Reptile, Bird, and Mammal Species in California (CDFW 2016a)
- Plant and wildlife species that are listed under the federal Endangered Species Act, are proposed for listing, or are a candidate for listing as endangered or threatened
- Plant or wildlife species that are listed under the California Endangered Species Act as endangered or threatened, or are candidates for listing
- California Department of Fish and Wildlife Animal Species of Special Concern
- California Fully Protected Animals
- Additional species identified by the California Natural Diversity Database (CNDDB) special plants and special wildlife lists (CDFW 2020)
- Native game species, managed under California Department of Fish and Wildlife's Game Management Programs (CDFW 2019c)
- Species specially protected under the California Wildlife Protection Act of 1990 (i.e., mountain lion)
- Species formally listed by the U.S. Forest Service as a Sensitive Species or a Management Indicator Species; species formally listed by the U.S. Fish and Wildlife Service as a Bird of Conservation Concern; wildlife and plant species listed by the U.S. Bureau of Land Management as sensitive; and other species identified by a State or federal agency as having special status
- Species known to be endemic or nearly endemic to Monterey County, or Monterey County and a neighboring county
- Monterey County Zoning Ordinance-protected trees (Monterey County 1997)
- Natural Communities rated as S1 (Critically Imperiled), S2 (Imperiled), or S3 (Vulnerable) by the State (CDFW 2018e)

Using these resources, more than 200 plant and wildlife species were evaluated for inclusion as focal species in this RCIS. Additional scrutiny was used to narrow down the list of focal species. The following criteria were used to exclude organisms that are considered to have a lower sensitive species value, conservation value, or relevance to the RCIS area, based on the following:

- species that have only one or two CNDDB records in the periphery of RCIS area, and are more widespread outside it;
- species that have few opportunities for conservation actions because they already occur primarily or exclusively on lands that are protected by California State Parks, the U.S. Forest Service, the U.S. Bureau of Land Management, or military lands, such as Fort Hunter Liggett;
- species that lack opportunities for conservation actions because they occur exclusively, or mostly, in areas that are protected by natural topography (e.g., steep, inaccessible areas, subtidal areas);
- species that have not been observed or collected in the RCIS area since 1985, and are presumed extirpated from the County;
- species lacking reliable data pertaining to their taxonomy, ecology, or distribution, therefore making it difficult or impossible to effectively create a robust strategy to accomplish conservation goals (e.g., many invertebrates); and
- species lacking federal or State protection.

After these parameters were set, a resulting list of 50 species formed the secondary list of candidate focal species, all of which support the three primary key considerations. From these 50, the final list of focal species was identified, based on more specific criteria chosen because of their relevance to the primary key considerations. Preference was given to species for which more than one of these statements was accurate:

- having range and habitat requirements that match a high number of special-status non-focal species, therefore acting as an umbrella species;
- having both federal and State protection (e.g., Santa Cruz long-toed salamander);
- having over 50 percent of its worldwide range in the RCIS area;
- having a high sensitivity to climate change;
- having experienced a recent very steep decline, particularly in the RCIS area (e.g., Foothill yellow-legged frog and tricolored blackbird);
- having greater conservation need as assessed by the State Wildlife Action Plan, either statewide or regionally, in the California Central Coast;

- representing one or more habitat types, HUC 10 watershed units, and unique geographical areas that are not otherwise represented by the other focal species; and
- representing a taxonomic group not otherwise represented by another focal species.

Three species that are not considered special status by federal or State listing were selected: Monarch butterfly (Danaus plexippus), mountain lion (Puma concolor), and California brackish water snail (Tryonia imitator), for the following reasons:

- The monarch butterfly was considered because of the increasing conservation concern for this State Wildlife Action Plan species, which has experienced large declines and is under consideration for federal protection. Monterey County features wintering populations using original native Monterey pine forest, making this species notable for conservation.
- Mountain lion was chosen despite the lack federal or State listings as rare or endangered. This species is widespread but requires a large home range, and may connect conservation needs between different habitats and geographic areas.
- The California brackish water snail was chosen because of its unique habitat preferences (brackish marshes), a community not well represented by a listed species in the RCIS area.

Additional species were considered or reconsidered for both the focal and non-focal species lists, after receiving feedback from stakeholders and agencies. Biologists for California Department of Fish and Wildlife Region 5 made suggestions based on species that they have identified as needing compensatory mitigation, but which also were capable of receiving a Mitigation Credit Agreement in Monterey County.

For example, Monterey gilia (Gilia tenuiflora ssp. arenaria) was moved from the non-focal species list to the focal species list based on interest in a Mitigation Credit Agreement for that species. However, western mastiff bat was moved from the focal species list to the non-focal species list based on the unlikely availability of Mitigation Credit Agreements. The same logic eliminated several suggested marine species.

Other stakeholders, including Caltrans and Big Sur Land Trust, recommended removal or addition of certain species, and advocated for inclusion of natural communities, such as valley oak woodland. Other species were removed because they are found mostly on existing protected land (or on land that is undevelopable), including purple amole (Chlorogalum purpureum var. purpureum), Gabilan Mountains manzanita (Arctostaphylos gavilanensis), and Carmel Valley cliff aster (Malacothrix saxatilis var. arachnoidea).

Several stakeholders requested inclusion of San Joaquin kit fox (Vulpes macrotis mutica), which previously was missing from the list because of its restricted range in Monterey County. Additional species and natural communities that were included based on stakeholder input were California brackish water snail, Carmel Valley bush mallow, working lands, dune formation, habitat connectivity, least Bell's vireo, eelgrass, coast live oak woodland.

Because least Bell's vireo and eelgrass are less prevalent in Monterey County and share habitats with other species on the focal species list, both were included on the non-focal species list. Coast live oak woodland was included as a non-focal other conservation element because it is not considered to be a sensitive natural community.

3.2 Focal Species

Table 3-1 and Table 3-2, show the 28 selected focal species and Table 3-3 shows the six focal other conservation elements and describes the justification for selection based on the considerations described above.

Table 3-1. Focal Wildlife Species and Justification for Selection

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
burrowing owl	Athene cunicularia	• Species of Special Concern	• All	• Agriculture • Annual grassland, Coastal scrub • Valley oak woodland	Steeply declining
California brackish water snail	Tryonia imitator	• None	• Coastal Strand	• Saline emergent wetland	Only species of brackish marshes
California condor	Gymnogyps californianus	• Federally Endangered • State Endangered • State Fully Protected	• Big Sur Coastline • Gabilan Range and Pinnacles National Park	• Closed-cone pine-cypress • Montane hardwood • Coastal scrub • Rocky outcroppings	Major relocation area representing most of species population
California newt	Taricha torosa	• Species of Special Concern	• Big Sur Coastline • Inner Coast Range • Mid Inner Coast Range	• Coastal oak woodland • Blue oak woodland • Coastal scrub • Freshwater emergent wetland, • Riparian	Coast live oak woodland species

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
California red-legged frog	Rana draytonii	• Federally Threatened	• All	• Freshwater emergent wetland • Coastal oak woodland • Valley oak woodland • Annual grassland	Successful conservation measures in practice
California tiger salamander	Ambystoma californiense	• Federally Threatened • State Threatened	• Salinas Valley • Gabilan Range and Pinnacles National Park • Inner Coast Range	• Freshwater emergent wetland • Valley oak woodland • Mixed chaparral • Annual grassland • Vernal pool	Monterey County is epicenter for hybridization with invasive barred tiger salamander

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
coast horned lizard	Phrynosoma blainvillii	• Species of Special Concern	• Monterey Bay Coastline • Inner Coast Range • Mid Inner Coast Range • Outer Coast Range	• Coastal dune • Coastal scrub • Mixed chaparral • Montane chaparral	Steeply declining on coast
foothill yellow-legged frog (southwest/south coast clade)	Rana boylii	• State Endangered • Species of Special Concern	• Gabilan Range and Pinnacles National Park • Outer Coast Range	• Riverine • Riparian	Endemic genetic clade

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
monarch butterfly	Danaus plexippus pop. 1	• None	• Monterey Bay Coastline • Monterey Peninsula to Point Lobos • Big Sur Coastline	• Montane hardwood • Closed-cone pine-cypress	Occurs on native Monterey Pine in Monterey County
mountain lion (southern California/central coast ESU)	Puma concolor	• State Candidate • Special Protection	• All	• All terrestrial communities	Umbrella species for corridors
pallid bat	Antrozous pallidus	• Species of Special Concern	• All	• All terrestrial communities	Surrogate for other bat species
San Joaquin kit fox	Vulpes macrotis mutica	• Federally Endangered • State Threatened	• San Antonio Valley • Mid Inner Coast Range	• Annual grassland • Valley oak woodland • Blue oak woodland	Currently restricted to the southern part of the county, but is anticipated to re-colonize former range

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
Santa Cruz long-toed salamander	Ambystoma macrodactylum croceum	• Federally Threatened • State Threatened • State Fully Protected	• Monterey Bay Coastline • Salinas River and Associated Corridor	• Valley oak woodland • Coastal oak woodland • Freshwater emergent wetland	Near-endemic to Monterey County
Smith's blue butterfly	Euphilotes enoptes smithi	• Federally Endangered	• Monterey Bay Coastline • Monterey Peninsula to Point Lobos • Big Sur Coastline	• Coastal scrub • Perennials grassland • Mixed chaparral • Coastal dune	Near-endemic to Monterey County

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
southern sea otter	Enhydra lutris neries	• Federally Threatened	• Monterey Bay Coastline • Monterey Peninsula to Point Lobos • Big Sur Coastline	• Marine • Estuarine	Only marine species
steelhead (South-Central California Coast Steelhead DPS)	Oncorhynchus mykiss irideus	• Federally Threatened	• Salinas River and Associated Corridor • Carmel River • Nacimiento River • Pajaro River	• Riverine • Riparian	Near endemic to Monterey County

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
tidewater goby	Eucyclogobius newberryi	• Federally Endangered • Species of Special Concern	• Monterey Bay Coastline • Salinas River and Associated Corridor • Pajaro River	• Saline emergent wetland • Estuarine	Unique coastal and estuarine habitats
tricolored blackbird	Agelaius tricolor	• State Threatened • Species of Special Concern	• All	• Freshwater emergent wetland • Agriculture • Annual grassland	Steeply declining
vernal pool fairy shrimp	Branchinecta lynchi	• Federally Endangered	• Inner Coast Range • San Antonio Valley	• Vernal pool	Only vernal pool invertebrate
western snowy plover	Charadrius nivosus nivosus	• Federally Threatened • Species of Special Concern	• Monterey Bay Coastline	• Coastal dune • Coastal scrub	Only coastal strand animal

Table 3-2. Focal Plants and Species and Justification for Selection

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
Carmel Valley bush mallow	Malacothamnus palmeri var. involucratus	• California Rare Plant Rank 1B.2	• Carmel Valley • Inner Coast Range • Mid Inner Coast Range • Outer Coast Range	• Coastal scrub • Mixed chaparral	Representative of chaparral in Carmel Valley
Lemmon's jewelflower	Caulanthus lemmonii	• California Rare Plant Rank 1B.2	• Inner Coast Range • San Antonio Valley • Stockdale Mountain • Gabilan Range and Pinnacles National Park	• Annual grassland • Perennial grassland	Representative of native grassland areas
Hickman's onion	Allium hickmanii	• California Rare Plant Rank 1B.2	• Monterey Peninsula to Point Lobos • Inner Coast Range • Carmel Valley • Big Sur Coastline	• Wet meadow • Mixed chaparral • Closed-cone pine-cypress	Near-endemic to Monterey County

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
Monterey gilia	Gilia tenuiflora ssp. arenaria	• Federally Endangered • State Threatened • California Rare Plant Rank 1B.2	• Monterey Bay Coastline	• Mixed chaparral • Coastal dune • Coastal scrub	Endemic State and federally listed species
Monterey spineflower	Chorizanthe pungens var. pungens	• Federally Threatened • California Rare Plant Rank 1B.2	• Monterey Bay Coastline • Inner Coast Range	• Coastal dune • Coastal scrub • Mixed chaparral	Near-endemic to Monterey County
Pajaro manzanita	Arctostaphylos pajaroensis	• California Rare Plant Rank IB.1	• Pajaro River • Gabilan Range and Pinnacles National Park • Monterey Bay Coastline • Outer Coast Range • Inner Coast Range • Salinas Vally	• Mixed chaparral	Near-endemic to Monterey County; unique habitat on sandstone chaparral

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
seaside bird's-beak	Cordylanthus rigidus ssp. littoralis	• State Endangered • California Rare Plant Rank 1B.1	• Monterey Bay Coastline • Outer Coast Range	• Mixed chaparral • Coastal dune	Near-endemic to Monterey County
Yadon's rein orchid	Piperia yadonii	• Federally Endangered • California Rare Plant Rank 1B.1	• Monterey Peninsula to Point Lobos • Gabilan Range and Pinnacles National Park	• Mixed chaparral • Closed-cone pine-cypres • Coastal oak woodland	Endemic to Monterey County

Table 3-3. Focal Other Conservation Elements and Justification for Selection

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
California sycamore woodlands	Platanus racemosa Alliance	• State Rarity S3 (Vulnerable)	• Big Sur Coastline • Carmel Valley • Carmel River • Gabilan Range and Pinnacles National Park • Inner Coast Range • Mid Inner Coast Range • Outer Coast Range • Nacimiento River • San Antonio River • San Antonio Valley • Salinas River and Associated Corridor	• Freshwater emergent wetland, Riparian	Sensitive community representing riparian areas
Monterey pine forest	Pinus muricata - Pinus radiata Alliance	• State Rarity S3 (Vulnerable)	• Monterey Peninsula to Point Lobos • Carmel Valley	• Closed-cone pine-cypress	Sensitive community representing fully endemic habitat within Monterey County

Common Name	Scientific Name	Special Status	Region	Natural Community (modified from CWHR types)	Additional Information
valley oak woodland	Quercus lobata Alliance	• State Rarity S3 (Vulnerable)	• All	• Valley oak woodland	Sensitive community representing fully endemic habitat in Monterey County
working lands	None	• None	• Salinas River and Associated Corridor • San Antonio Valley • Salinas Valley • Mid Inner Coast Range	• Agriculture • Valley oak woodland • Coastal oak woodland	Important land use and land cover type in the RCIS area
Dune formation	None	• None	• Monterey Bay Coastline • Salinas River and Associate Corridor	• Coastal dune	Important ecosystem function creating a unique habitat
Habitat connectivity	None	• None	• All	• All	Important conservation element connecting habitats

3.3 Non-Focal Species

After the 28 focal species and six focal other conservation elements were selected, 21 of the initial 50 candidate focal species remained. Because these species were strong qualifiers under the three key primary considerations, these species are considered non-focal species, which have preferential consideration for conservation. These non-focal species and non-focal other conservation elements share similar habitats or ranges of focal species and focal other conservation elements and can benefit from conservation actions for those focal species and focal other conservation elements, which thereby act as umbrella species and other conservation elements. Table 3-4 shows the non-focal species and non-focal other conservation elements that may benefit from conservation actions for focal species and focal other conservation elements.

Black Legless Lizard
Photo Credit: Ivan Parr

Table 3-4. Non-Focal Wildlife Species and Focal Species Associations

Common Name	Scientific Name	Status	Region	Natural Community (modified from CWHR types)	Associated Focal Species Association
American badger	Taxidea taxus	• Species of Special Concern	• All	• Annual grassland • Coastal scrub • Montane chaparral	• burrowing owl • mountain lion • Lemmon's jewelflower • San Joaquin kit fox • working lands
least Bell's vireo	Vireo bellii pusillus	• Federally Endangered • State Endangered • Species of Special Concern	• Big Sur Coastline • Carmel Valley • Mid Inner Coast Range • Outer Coast Range • San Antonio Valley • Nacimiento River • San Antonio River • Gabilan Range and Pinnacles National Park	• Riparian	• Steelhead • California sycamore woodland • foothill yellow-legged frog • California newt

Common Name	Scientific Name	Status	Region	Natural Community (modified from CWHR types)	Associated Focal Species Association
little willow flycatcher	Empidonax traillii brewsteri	• State Endangered	• All	• Riparian	• foothill yellow-legged frog • California sycamore woodland • California newt • steelhead
northern California legless lizard	Anniella pulchra	• Species of Special Concern	• All	• Coastal dune • Mixed chaparral • Montane chaparral • Riparian	• Monterey spineflower • Pajaro manzanita, seaside bird's beak • Lemmon's jewelflower
Santa Lucia slender salamander	Batrachoseps luciae	• none (endemic to Monterey Co.)	• Big Sur Coastline • Monterey Peninsula to Point Lobos	• Coastal oak woodland • Coastal scrub	• Monterey pine woodland • Yadon's rein orchid • Hickman's onion
Townsend's big-eared bat	Corynorhinus townsendii	• Species of Special Concern	• All	• All terrestrial communities	• pallid bat • working lands

Common Name	Scientific Name	Status	Region	Natural Community (modified from CWHR types)	Associated Focal Species Association
two-striped garter snake	Thamnophis hammondii	• Species of Special Concern	• All	• Freshwater emergent wetland	• California red-legged frog • tricolored blackbird • working lands
western mastiff bat	Eumops perotis californicus	• Species of Special Concern	• All	• All terrestrial communities	• pallid bat • working lands
western spadefoot	Spea hammondii	• Species of Special Concern	• Mid Inner Coast Range • Outer Coast Range • San Antonio Valley • San Antonio River • Nacimiento River • Gabilan Range and Pinnacles National Park	• Vernal pool • Annual grassland • Freshwater emergent wetland • Riparian	• California tiger salamander • vernal pool fairy shrimp • California red-legged frog • valley oak woodland • working lands

Common Name	Scientific Name	Status	Region	Natural Community (modified from CWHR types)	Associated Focal Species Association
yellow-billed magpie	Pica nuttallii	• Species of Special Concern	• Mid Inner Coast Range • Outer Coast Range • Big Sur Coastline • San Antonio River • San Antonio Valley • Nacimiento River • Gabilan Range and Pinnacles National Park	• Riparian • Valley oak woodland • Blue oak woodland	• valley oak woodland • working lands

Table 3-5. Non-Focal Plant Species and Focal Species Associations

Common Name	Scientific Name	Status	Region	Natural Community (modified from CWHR types)	Associated Focal Species Association
Carmel Valley cliff aster	Malacothrix saxatilis var. arachnoidea	• California Rare Plant Rank 1B.2	• Carmel Valley	• Rocky outcroppings	• Carmel Valley bush mallow
Clare's pogogyne	Pogogyne clareana	• State Endangered • California Rare Plant Rank 1B.2	• Big Sur Coastline	• Riparian	• Steelhead • California newt
Contra Costa goldfields	Lasthenia conjugens	• Federally Endangered • California Rare Plant Rank 1B.1	• Mid Inner Coast Range	• Vernal pool	• California tiger salamander • burrowing owl • vernal pool fairy shrimp • working lands
eelgrass	Zostera marina	• No Status	• Monterey Bay Coastline	• Saline emergent wetland • Marine • Estuarine	• southern sea otter • steelhead • tidewater goby

Common Name	Scientific Name	Status	Region	Natural Community (modified from CWHR types)	Associated Focal Species Association
Jolon clarkia	Clarkia jolonensis	• California Rare Plant Rank 1B.2	• All	• Mixed chaparral • Montane hardwood • Coastal scrub • Riparian	• California tiger salamander • burrowing owl • mountain lion • California red-legged frog • working lands
little Sur manzanita	Arctostaphylos edmundsii	• California Rare Plant Rank 1B.2	• Big Sur Coastline	• Mixed chaparral • Coastal scrub	• Smith's blue butterfly
Menzies' wallflower	Erysimum menziesii	• Federally Endangered • State Endangered • California Rare Plant Rank 1B.1	• Monterey Bay Coastline • Monterey Peninsula to Point Lobos	• Coastal dune	• Monterey spineflower
Monterey clover	Trifolium trichocalyx	• Federally Endangered • State Endangered • California Rare Plant Rank 1B.1	• Monterey Peninsula to Point Lobos	• Closed-cone pine-cypress	• Hickman's onion • Monterey pine forest

Common Name	Scientific Name	Status	Region	Natural Community (modified from CWHR types)	Associated Focal Species Association
Monterey larkspur	Delphinium hutchinsoniae	• California Rare Plant Rank 1B.2	• Monterey Bay Coastline • Big Sur Coastline	• Mixed chaparral • Perennial grassland • Coastal dune • Coastal scrub	• California condor • coast horned lizard • Smith's blue butterfly • Monterey spineflower
sandmat manzanita	Arctostaphylos pumila	• California Rare Plant Rank 1B.2	• Monterey Bay Coastline • Monterey Peninsula to Point Lobos • Big Sur Coastline	• Mixed chaparral • Coastal scrub	• Monterey spineflower • seaside bird's beak

Table 3-6. Non-Focal Other Conservation Elements and Focal Species Associations

Common Name	Scientific Name	Status	Region	Natural Community (modified from CWHR types)	Associated Focal Species Association
coast live oak woodland	Quercus agrifolia Alliance	• None	• All	• Coastal oak woodland	• California newt • California red-legged frog • Yadon's rein orchid • working lands
woolly-leaf manzanita shrubland	Arctostaphylos tomentosa Alliance	• State Rarity S3 (Vulnerable)	• Monterey Bay Coastline • Outer Coast Range • Mid Inner Coast Range	• Mixed chaparral • Montane chaparral	• Monterey gilia • Carmel Valley bush mallow • Monterey spineflower • Yadon's rein orchid • seaside bird's beak

4. PRESSURES AND STRESSORS

Section 1852(c)(5) of California Fish and Game Code, and RCIS Guidelines (CDFW 2018a) require that an RCIS include a summary of historic, current, and projected future stressors and pressures in the RCIS area, including climate change vulnerability, from the best available data. A stressor is defined as a degraded ecological condition that results from the negative impacts of pressures, which are drivers that could result in changing ecological conditions.

A brief summary of historic, current, and projected stressors and pressures on focal species and non-focal species, and other conservation elements is presented next. As identified in the California State Wildlife Action Plan, these stressors and pressures include airborne pollutants, climate change, water management, fire, development of housing and urban areas, livestock and agriculture, habitat fragmentation, non-native species, recreation and tourism, and renewable energy (CDFW 2015). Climate change already is affecting plants, wildlife, and habitats throughout California and is the primary stressor assessed in this RCIS because of the severity of its projected future stressors. Detailed discussion of pressures and stressors, including climate vulnerability assessments for focal species, is provided in Appendix B.

Climate vulnerability is defined as the amount of evidence that climate change is projected to negatively affect a species, asset, or system (Gardali et al. 2012). In general, climate change vulnerability assessments indicate that climate vulnerability of focal species and natural communities ranges from low to high (CDFW 2019). The following focal and non-focal species ranked as having moderate and above vulnerability in species-specific climate change vulnerability assessments and/or occupy natural communities that have a high combined vulnerability rank. The species most vulnerable to climate change in the RCIS area are listed in Table 4-1.

Table 4-1. Summary of Most Climatically Vulnerable Focal/Non-Focal Species

Focal/Non-Focal Species	Climate Change Vulnerability Rank
California tiger salamander	Moderate High
Santa Cruz long-toed salamander	High
Santa Lucia slender salamander	High
least Bell's vireo	High
yellow-billed magpie	High
western snowy plover	High
steelhead (South-Central California Coast Steelhead DPS)	Moderate High
tidewater goby	Moderate High
San Joaquin kit fox	Moderate
southern sea otter	Moderate
California brackish water snail	High
eelgrass	High
Yadon's rein orchid	High
Notes: Compiled by AECOM in 2020 Sources: Anacker and Leidholm 2012; Gardali et al. 2012; Hutto et al. 2015; Moyle et al. 2012; Stewart et al. 2016; Thorne et al. 2016; Wright et al. 2013	

4.1 Regional Pressures and Stressors

A stressor is a degraded ecological condition that results from the negative impacts of pressures, which are drivers that could result in changing ecological conditions (CDFW 2018a). Eleven categories and eight subcategories of regional stressors and pressures are identified in the State Wildlife Action Plan (CDFW 2015) for the California Department of Fish and Wildlife-designated Central California Coast, Central California Coast Ranges, and Central California Central Coastal HUC 1806 ecoregions (these ecoregions include areas outside the RCIS area). The State Wildlife Action Plan identifies which habitats these regional pressures impact. Species-specific U.S. Fish and Wildlife Service recovery plans helped identify which pressures impact focal and non-focal species. Descriptions of the Central California Coast, Central California Coast Ranges, and Central California Central Coastal HUC 1806 California Department of Fish and Wildlife -designated stressor and pressure categories and sub-categories are provided in Appendix B.

The following categories and subcategories of stressors and pressures apply to all focal/non-focal species and other conservation elements in the RCIS area (CDFW 2015):

- Climate change
- Fire and fire supression
- Loss of habitat connectivity (habitat fragmentation)
- Non-native species and disease
- Housing and urban areas:
    + Commercial and industrial areas
    + Garbage and solid waste
    + Roads and railroads
    + Utility and service lines
- Livestock and farming
    + Annual and perennial non-timber crops

Stressor and pressure categories not listed above were identified by the State Wildlife Action Plan as affecting only certain species and other conservation elements in the RCIS area. Species-specific stressors and pressures for focal species, other conservation elements, and non-focal species are provided in Appendix B, listed by species.

Stressors and pressures that often are identified by species-specific recovery plans and background research as major or novel threats to a large number of focal/non-focal species and other conservation elements are discussed next in more detail. These stressors inform many of the conservation strategies that have been developed for focal species and other conservation elements.

Habitat Loss

One of the primary causes of habitat loss and degradation in the RCIS area is the conversion of natural lands to urban and agricultural uses. Increasing human populations are putting increased demands on already limited supplies of land, water, and other natural resources (CDFW 2015). Focal and non-focal species and other conservation elements that already have a restricted range and/or are endemic to the RCIS area—monarch butterfly, Smith's blue butterfly, Santa Cruz long-toed salamander, Santa Lucia slender salamander, Clare's Pogogyne, Hickman's onion, Jolon clarkia, Little Sur manzanita, Monterey clover, Monterey gilia, Monterey larkspur, Monterey spineflower, Pajaro manzanita, sandmat manzanita, Yadon's rein orchid, and Monterey pine forest—will be most acutely negatively affected by habitat loss and degradation. These species also are associated with communities that are among the most vulnerable natural communities to climate change. Beyond direct land conversion, increased human use of the landscape will bring additional stressors, such as invasive species, fire suppression, and pest and pathogen outbreaks, further degrading natural community health (CDFW 2015).

Habitat Connectivity and Wildlife Corridors

The loss of habitat connectivity and increased habitat fragmentation will have a major impact on wildlife and natural communities in the RCIS area. Development of agricultural and urban areas, especially installation of new linear features (e.g., roads and utility lines) or development in critical choke points (areas of constrained movement) can affect plant and wildlife dispersal and predator–prey relationships, leading to increased mortality and genetic isolation. Movement by focal species such as mountain lion can be used as an indicator of healthy connectivity between different terrestrial habitat types, because of its occurrence in all the natural communities in the RCIS area and its large home range. However, habitat fragmentation and degradation can impact smaller species more acutely.

Aquatic species are limited in their abilities to bypass connectivity barriers in streams, and improving fish passage throughout riparian corridors can increase habitat connectivity for steelhead and other water-bound species. Furthermore, maintaining healthy connectivity between freshwater and saltwater habitats is important for maintaining hydrological regimes, water quality, and sediment balances.

In addition to providing habitat for aquatic species, riparian areas provide shade, water, and upland habitat for many terrestrial species. Riparian habitats disproportionately contribute to regional species richness and biodiversity (Krosby et al. 2018). These areas have the potential to act as dispersal corridors for both terrestrial and aquatic species because they often span multiple climatic gradients (Krosby et al. 2018). Riparian corridors in forested areas can reduce the effects of climate exposure by providing refugia from increasing air and water temperatures (Klausmeyer et al. 2011). Conservation strategies focusing on maintaining connectivity between various riparian habitats in the RCIS area have the potential to create future climate refugia for vulnerable species and maintain current species richness.

Non-Native Species

Non-native species can have devastating impacts on species that already are experiencing negative pressures from other non-climate and climate stressors. Invasive plants can be found in a variety of natural communities, such as grasslands, riparian, oak woodlands, and coastal dunes, and tend to dominate in brackish aquatic habitats (CDFW 2015). Invasive species outcompete and displace native plant communities and often degrade habitat for native wildlife (CDFW 2015). Invasive wildlife species occur in both terrestrial and aquatic natural communities and often have negative impacts on native species. For example, Monterey County is the epicenter of hybridization between California tiger salamander and the invasive barred tiger salamander (USFWS 2017), which threatens the genetic purity of the species.

Fire and Fire Suppression

Fire is part of the natural disturbance regime in many natural communities in the RCIS area (e.g., chaparral, closed-cone pine-cypress). Fire suppression without active forest management has caused unnatural succession in fire-adapted communities and increased wildlife intensity (CDFW 2015). Fire suppression activities (e.g., command posts, fire lines, fire retardant) also have negative impacts, such as increased erosion and sedimentation, air and water pollution, and introduction of non-native species (Backer et al. 2004). Altered natural fire regimes have led to increased forest densities, and drought-stressed forests become more vulnerable to fire because of tree deaths from pests and drought (CDFW 2015). Drought-stressed conditions are projected to become further stressed by increased climate change exposure (CDFW 2015), making more frequent, intense wildfires likely to occur.

Recreation and Tourism

As nature-based recreation and tourism have boomed in popularity, recognizing and addressing the negative impacts on species and natural communities is important. Hiking, walking, and mountain biking can lead to a reduction in vegetation cover, changes in species composition, and the introduction and spread of non-native species (Sumanapala and Wolf 2019). Long-term impacts, such as decline in plant growth, flowering, and seed production, also have been documented (Sumanapala and Wolf 2019). Increased encounters with wildlife from motorized and non-motorized recreational activities in both aquatic and terrestrial communities have been documented to have significant negative effects on all taxonomic groups (Larson et al. 2016). The presence of domestic dogs, both on-leash and off, in parks and beaches can negatively impact sensitive wildlife species.

4.2 Climate Change Vulnerability

Climate change already is affecting plants, wildlife, and habitats throughout California, and its effects are projected to continue to increase in severity (CDFW 2015). The projections of climate change in the RCIS area, vulnerability assessments of focal/non-focal species and other conservation elements, and ecological resilience are provided in Appendix B and presented in each species' description in Chapter 5.

Climate vulnerability is defined as the amount of evidence that climate change is projected to negatively affect a species, asset, or system (Gardali et al. 2012). Climate vulnerability often is expressed in terms of exposure, sensitivity, and adaptive capacity:

- Exposure – the nature and degree to which a species is exposured to climate change stressors
- Sensitivity – the degree to which the physical condition and functionality of a species is affected by climate change

- Adaptive Capacity – the ability of a species to evolve in response to, or cope with the impacts of climate change

Although exposure can be the greatest indicator of a species' susceptibility to climate change stressors, evaluating sensitivity and adaptative capacity provide valuable information on the degree to which a species would be affected or impaired and inherent characteristics that allow the species to respond or be modified. Species are most vulnerable if they are exposed to climate change stressors, have high sensitivity, and low adaptive capacity.

Conservation strategies focusing on important flagship species have the potential to affect many other focal and non-focal species as well as natural communities that are vulnerable to the impacts of climate change. The following flagship species represent some of the most widespread and/or vulnerable natural communities in the RCIS area. Discussion of flagship species and how conservation strategies focusing on them can impact other focal and non-focal species is provided in Appendix B.

- Amphibians: California red-legged frog and California tiger salamander
- Mammals: southern sea otter, mountain lion (Southern California/Central Coast ESU), and pallid bat
- Fish: steelhead (South-Central California Coast Steelhead DPS)
- Birds: western snowy plover
- Invertebrates: Smith's blue butterfly
- Plants: Monterey spineflower and Yadon's rein orchid

5. CONSERVATION STRATEGY

When implemented, the conservation strategies proposed in the Monterey County Regional Conservation Investment Strategy (RCIS) will benefit species and habitat conservation, promote resiliency to stressors and pressures, and address climate change adaptation as required under RCIS guidelines (CDFW 2018a).

Section 5.2 describes the guiding principles and vision for the Monterey County RCIS; provides a summary of stakeholder involvement in the development of strategies; details strategy elements, including guidelines for prioritization of actions; summarizes data gaps and data used in the development of strategies; and summarizes the methodology for developing conservation strategies, including

- Identification of threats, or stressors and pressures, including climate change for focal species and other conservation elements, such as monterey pine forests, and their associated habitats
- Determining quantitative protection conservation targets for each species and other conservation elements

Section 5.3 proposes regional and focal species/other conservation element-specific conservation strategies, including goals, objectives, and actions that directly address threats identified in Chapter 4.

Section 5.4 summarizes the consistency of proposed habitat enhancement and conservation actions with federal species recovery plans and habitat conservation plans in the RCIS area.

5.1 How to Use This Chapter

Conservation strategies for each focal species and other conservation elements are intended to be “stand-alone” sections that give the reader essential information needed to identify, plan, and implement habitat enhancement and conservation actions. Each conservation strategy includes focal species information, such as the following:

- Map of species range, modeled suitable habitat in the RCIS area, California Natural Diversity Database occurrences, and designated critical habitat

- Regulatory status
- Brief summary of range within the RCIS area
- Ecological requirements, which may include:
  - Associated natural communities in the RCIS area
  - Habitats
  - Habitat components
  - Movement characteristics
  - Ecological function
- Associated non-focal species,
- Summary of results of climate change vulnerability assessment
- Quantitative protection targets
- Goals, objectives, priorities, and actions
- Threats
- Co-benefits of actions

Background information, including a summary of focal and non-focal species selection methodology, the RCIS area boundary, a summary of natural communities and aquatic resources, protected areas, biodiversity, habitat connectivity and linkages, and the planned and built environment within the RCIS area, is provided in Chapter 2. Descriptions of regional and species-specific threats and a robust climate change vulnerability assessment are provided in Chapter 4. Non-focal species ecological requirements and associated focal species actions are provided in Appendix C.

5.1.1 Applying Conservation Actions

There are many ways to apply the information in this Conservation Strategy. The following is a high-level approach that could be of value:

1. Identify species or other conservation elements for conservation or mitigation need
2. Review conservation goals, objectives, priorities, and actions for the species or other conservation elements

3. Identify priority areas for the species or other conservation elements using the prioritization guidelines described in 5.2.6 and identified in the focal species/ other conservation element information

4. Identify specific key parcels and ground truth conditions for implementation of conservation actions

5. Implement conservation actions

5.2 Development of Conservation Strategies

5.2.1 Guiding Principles

The Monterey County RCIS is a bold vision of future conservation within Monterey County in which widespread conservation actions sustain and enhance ecological resources, biodiversity, ecological processes and functions, and promote resilience for the benefit of biological communities, watersheds, geographically unique areas, and other special-status or non-special-status species.

Conservation targets for the protection of suitable habitat for the Monterey County RCIS support this bold vision by presenting an aspirational conservation scenario by mid-century that will provide maximum habitat protection and conservation value for species and habitats in the RCIS area.

5.2.2 Stakeholder Involvement

Diverse stakeholders were instrumental in developing conservation goals. Robust stakeholder involvement included a “visioning” working meeting, a conservation strategy workshop, and online feedback. Input was received from Federal, State, and local agencies and non-governmental organizations.

5.2.3 Strategy Elements

The Monterey County RCIS conservation strategies include goals, measurable objectives, and conservation and habitat enhancement actions that promote resilience to, and specifically address, the pressures and stressors, including climate change, identified in Chapter 4.

Additional actions are included from species-specific recovery plans, habitat conservation plans, and other conservation plans and can be implemented to address similar threats for species without specific conservation plans. Each conservation strategy lists threats that the conservation strategy specifically addresses. Multiple co-benefits are identified for conservation and habitat enhancement actions that would provide additional ecological benefits, such as biodiversity, connectivity, climate change resilience, improved water quality, groundwater recharge, etc. Descriptions of the strategy elements are included below.

Priorities include actions or key locations for actions that are based on the focal species or other conservation goals and objectives and address threats to each focal species or other conservation element. Specific priority locations for conservation are identified based on known existing occurrences, intact resources, and suitable habitat, and include locations for federally listed species from U.S. Fish and Wildlife Service recovery plans and 5-year reviews.

Goals are broad, long-term regional visions for species and other conservation elements in the RCIS area. Desired outcomes include continued persistence of species through the protection, enhancement, restoration, and creation of habitat, and/or a reduction in causes of direct, anthropogenically caused mortality.

Objectives are targeted outcomes for species and other conservation elements and include an area of protection of suitable modeled habitat based on conservation targets, an area of enhanced or restored occupied habitat, an area of occupied habitat, and reductions in direct, anthropogenically caused mortalities detected in the RCIS area. Specific locations for conservation are identified for federally listed species from U.S. Fish and Wildlife Service recovery plans and 5-year reviews. Progress towards achieving these objectives should be measured over a 10-year time period as recommended in the RCIS program guidelines Section 4.3 (CDFW 2018). Qualitative protection targets are measured by acres protected. Habitat enhancement and restoration objectives are measured by the area enhanced or restored and occupied by focal species or other conservation elements. Mortality objectives are measured by a reduction in threat-related mortalities detected. It is recommended that 33 percent of these project target objectives be accomplished within 10 years from the approval of the RCIS.

Threats are stressors and pressures on focal species and other conservation elements. Stressor is defined as a degraded ecological condition that results from the negative impacts of pressures, which are drivers that could result in changing ecological conditions. These drivers include airborne pollutants, climate change, water management, fire, development of housing and urban areas, livestock and agriculture, habitat fragmentation, non-native species, recreation and tourism, and renewable energy. Chapter 4 describes the threats in the RCIS and includes a climate change vulnerability assessment for the RCIS area, focal and non-focal species and other conservation elements, and associated natural communities.

Co-Benefits are additional ecological benefits that result from conservation actions, such as biodiversity, connectivity, climate change resilience, improved water quality, groundwater recharge, and conservation of habitat for other focal and non-focal species.

Actions are conservation and habitat enhancement activities that aim to achieve goals and objectives. Actions are developed to promote resilience to the species' or other conservation element's threats, and are informed by biology, habitat requirements as identified by the California Department of Fish and Wildlife and U.S. Fish and Wildlife Service, or from information found through other relevant background research. Actions are included for species that have U.S. Fish and Wildlife Service recovery plans or 5-year reviews, and when non-federally listed species had threats identical to those of a federally listed species with a U.S. Fish and Wildlife Service recovery plan, similar actions were recommended to address the threats.

5.2.4 Quantitative Protection Targets

Conservation targets for the protection of suitable habitat for the Monterey County RCIS support this conservation purpose and bold vision of the RCIS by presenting an aspirational conservation scenario by mid-century that will provide maximum habitat protection and conservation value for species and habitats in the RCIS area.

Quantitative protection targets for the protection of suitable habitat, calculated in acres, were developed for each focal species by selecting a conservation target for each focal species and other conservation element and conducting a gap analysis to determine a quantitative level of protection that should be accomplished in 30 years following the approval of the RCIS. It is recommended that 33 percent of the protection target be accomplished within 10 years from the adoption of the RCIS. These protection targets provide quantitative basis for the bold and aspirational conservation scenario that will provide maximum habitat protection and conservation value for species and habitats in the RCIS area.

Conservation Targets

Conservation targets are based on factors that include a species' conservation status, distribution, and abundance in the RCIS area, ecological requirements, and life history. Listed or sensitive species with limited distribution were given the "highest" conservation target and a 90 percent conservation value; listed or sensitive species with a wide distribution in the RCIS and a 75 percent conservation value were given a "high" conservation target; and the remaining sensitive species with a wide distribution and large area of modeled suitable habitat in the RCIS were given a "moderate" conservation target and a 50 percent conservation value. Conservation targets are listed in each species conservation strategy in Section 5.3.

Gap Analysis

A gap analysis was conducted to quantify the desired acreage for protection of each species' modeled suitable habitat. These acreages should be used to quantitatively measure progress toward achieving protection objectives. The methodology for this geographic information system analysis is detailed below:

> (Area of Modeled Suitable Habitat – Area of Existing Built/Planned Environment) × Conservation Value (0.90, 0.75, or 0.50) - Area of Existing Protected Areas = Desired Acreage for Protection of Modeled Suitable Habitat

Numbers were then rounded down to "general" numbers. Areas of existing built and planned future development are removed from the modeled suitable habitat. Regional Conservation Investment Strategies are non-regulatory documents and do not preempt the authority of local agencies to implement infrastructure and urban development.

5.2.5 Conservation and Habitat Enhancement Actions

Conservation actions are intended to achieve goals and objectives and are developed to specifically promote resilience to an identified threat. Actions are species-specific based on their ecological requirements; however, many actions may offer co-benefits that may positively provide conservation value for other focal and non-focal species, ecosystem functions, climate resilience, and other conservation elements such as biodiversity and habitat connectivity. Conservation actions also include habitat enhancement actions as defined in Section 2.1 of the RCIS Guidelines (CDFW 2018). Typical conservation actions are described below.

Protect: Obtain suitable or potentially suitable habitat to prevent further development or modification.

Restore: Return unsuitable habitat to suitable conditions as informed by species' biology and ecological requirements.

Enhance: Make changes to habitat or associated human behavior impacting the habitat to make already suitable habitat more desirable.

Establish: Initiate, build, and/or create sustainable practices or populations

Acquire: Change ownership of a parcel or make agreements with its current owners to allow a parcel to prevent further development or modification.

Preserve: An area of suitable or potentially suitable habitat with restricted uses.

Manage: Requires ongoing, active commitments to maintain suitable conditions.

5.2.6 Prioritization Guidelines

Locations that should be prioritized for conservation actions and habitat enhancement are at or near:

- Areas with existing intact resources, occurences, or suitable habitat.
- Areas specifically recommended by a species-specific U.S. Fish and Wildlife Service recovery plan or 5-year review and/or by habitat conservation plans
- Areas with a high biodiversity ranking
- Areas identified as potential habitat corridors and linkages
- Areas with high climate resilience
- Existing protected and open space areas
- Riparian and aquatic habitats
- Areas that benefit multiple focal and non-focal species and other conservation elements
- Areas that are currently unprotected

Chapter 2 includes figures of the elements listed above.

Additional considerations for prioritization include:

- Actions that can be implemented in the 10-year period of an approved Regional Conservation Investment Strategy
- Actions that provide co-benefits

5.2.7 Data

Publicly available data sources were leveraged to model range and habitat in the RCIS area for most focal species and other conservation elements when possible (Table 5-1). For those species and other conservation elements lacking publicly available habitat models, AECOM geospatial analysts created Maxent habitat models or used the RCIS natural communities inhabited by focal species to model habitat (Table 5-1). Details on the publicly available data sources and models created by AECOM geospatial analysts are described next. Current species occurrence, as documented by the California Natural Diversity Database (CDFW 2020), are shown for each focal species or other conservation element, when available.

Species Range

U.S. Fish and Wildlife Service

U.S. Fish and Wildlife Service range data layers, available from the Environmental Conservation Online System, were used to model range for many focal species (USFWS 2020a).

Winter Steelhead Range

The Winter Steelhead Range data layer (CDFW 2012) was used to model steelhead (South-Central California Coast Steelhead Distinct Population Segment [DPS]) (Oncorhynchus mykiss irideus) range. This dataset contains Calwater Planning Watersheds where California Department of Fish and Wildlife has documented steelhead occurrences since 1990. This model does not model the entire distribution of steelhead; therefore, it likely is an underestimation of the entire geographic distribution (CDFW 2012).

California Wildlife Habitat Relationships

California Wildlife Habitat Relationships models are based on life history, geographic range, habitat relationships, and management information (CDFW 2014).

AECOM Geospatial Analysis

Focal plant species lacked publicly available range data. AECOM geospatial analysists develop range models by defining a species' range as HUC-12 watersheds containing Calflora (Calflora 2020) observations of a given species.

Modeled Habitat

U.S. Geological Survey Analysis Program Species Habitat Maps

U.S. Geological Survey Gap Analysis Program Species Habitat Maps were chosen for use in the RCIS as the majority of focal species were available in the database. These species models are based on habitat associations from scientific literature and core datasets, such as elevation and land cover (USGS 2018). Attributes such as occurrence/presence, origin, reproductive use, and seasonal use also were included in species models.

U.S. Fish and Wildlife Service and National Marine Fisheries Service Critical Habitat

U.S. Fish and Wildlife Service critical habitat geographic information system layers are included for some focal species—tidewater goby (Eucyclogobius newberryi), vernal pool fairy shrimp (Branchinecta lynchi), and Monterey spineflower (Chorizanthe pungens var. pungens)— that lacked modeled habitat from the U.S. Geological Survey Gap Analysis Program Species Habitat Maps (USFWS 2020b). The National Marine Fisheries Service critical habitat geographic information system layer was included for steelhead, which lacks U.S. Geological Survey Gap Analysis Program Species Habitat Maps (NMFS 2019). Critical habitat is defined as habitat containing "physical or biological features essential to the conservation of the species and that may require special management considerations or protection" and may or may not be occupied presently by the species (NMFS 2019).

AECOM Geospatial Analysis

Two focal plant species—Carmel Valley Bush Mallow (Malacothamnus palmeri var. involucratus) and Lemmon's Jewelflower (Caulanthus lemmonii)—lacked publicly available habitat models or previously generated AECOM maxent models (described next). AECOM geospatial analysts modeled habitat as the natural communities where the species occurs within the species' range (defined as the HUC-12 watersheds containing Calflora observations of the species).

Maxent

AECOM Maxent models were used for five focal plant species with publicly available habitat models—Hickman's onion (Allium hickmanii), Monterey gilia (Gilia tenuiflora ssp. arenaria), Pajaro manzanita (Arctostaphylos pajaroensis), seaside bird's-beak (Cordylanthus rigidus ssp. littoralis), and Yadon's rein orchid (Piperia yadonii). Maxent models evaluate the predicted probability of a species' geographic distribution, based on occurrence data, life history and habitat requirements, and environmental variables, including topography, precipitation, temperature, proximity to water, soil, and terrain ruggedness. Potential habitat based on vegetative cover and natural vegetative or aquatic communities is based on occurrence data from the Berkeley Consortium of California Herbaria, California Natural Diversity Database, and the U.S. Geological Survey Gap Analysis Program.

Additional Data Sources

Additional data sources for mountain lion, monarch butterfly, connectivity, working lands, and dune formation are listed in Table 5-1. For focal plant species and other conservation elements lacking the above models, the existing RCIS natural communities in which the species or other conservation element occurs was mapped as modeled habitat.

Table 5-1. Habitat Model Data Sources

Focal Species	Range Data Source	Modeled Habitat Data Source
burrowing owl	California Wildlife Habitat Relationships (CDFW 2014)	U.S. Geological Survey–Gap Analysis Project, 2017
California brackish water snail	U.S. Fish and Wildlife Service Environmental Conservation Online System (USFWS 2020a)	RCIS Natural Communities (saltwater emergent wetlands)
California condor	U.S. Fish and Wildlife Service Environmental Conservation Online System (USFWS 2020a)	U.S. Geological Survey–Gap Analysis Project, 2017
California newt	California Wildlife Habitat Relationships (CDFW 2014)	U.S. Geological Survey–Gap Analysis Project, 2017

Focal Species	Range Data Source	Modeled Habitat Data Source
California red-legged frog	California Wildlife Habitat Relationships (CDFW 2014)	U.S. Geological Survey–Gap Analysis Project, 2017
California tiger salamander (central California DPS)	California Wildlife Habitat Relationships (CDFW 2014)	U.S. Geological Survey–Gap Analysis Project, 2017
coast horned lizard	California Wildlife Habitat Relationships (CDFW 2014)	U.S. Geological Survey–Gap Analysis Project, 2017
foothill yellow-legged frog (southwest/couth coast clade)	California Wildlife Habitat Relationships (CDFW 2014)	U.S. Geological Survey–Gap Analysis Project, 2017
monarch butterfly	U.S. Fish and Wildlife Service Environmental Conservation Online System (USFWS 2020a)	Xerces Society Western Monarch–Milkweed Mapper (Dilts et al. 2019)
mountain lion (Southern California/Central Coast ESU)	California Wildlife Habitat Relationships (CDFW 2014)	Justin Dellinger et al. (Dellinger 2020)
pallid bat	California Wildlife Habitat Relationships (CDFW 2014)	U.S. Geological Survey–Gap Analysis Project, 2017
San Joaquin kit fox	U.S. Fish and Wildlife Service Environmental Conservation Online System (USFWS 2020a)	U.S. Geological Survey–Gap Analysis Project, 2017
Santa Cruz long-toed salamander	U.S. Fish and Wildlife Service Environmental Conservation Online System (USFWS 2020a)	U.S. Geological Survey–Gap Analysis Project, 2017
Smith’s blue butterfly	U.S. Fish and Wildlife Service Environmental Conservation Online System (USFWS 2020a)	RCIS Natural Communities (coastal scrub, coastal dune, chaparral, perennial grassland)

Focal Species	Range Data Source	Modeled Habitat Data Source
southern sea otter	U.S. Fish and Wildlife Service Environmental Conservation Online System (USFWS 2020a)	U.S. Geological Survey–Gap Analysis Project, 2017
steelhead (South-Central California Coast Steelhead Distinct Population Segment [DPS])	Winter Steelhead Range (CDFW 2012)	National Marine Fisheries Service West Coast Region Critical Habitat Data Archives and Maps (NMFS 2019)
tidewater goby	U.S. Fish and Wildlife Service Environmental Conservation Online System (USFWS 2020a)	U.S. Fish and Wildlife Service Environmental Conservation Online System Threatened and Endangered Species Active Critical Habitat Report (USFWS 2020b)
tricolored blackbird	California Wildlife Habitat Relationships (CDFW 2014)	U.S. Geological Survey–Gap Analysis Project, 2017
vernal pool fairy shrimp	U.S. Fish and Wildlife Service Environmental Conservation Online System (USFWS 2020a)	U.S. Fish and Wildlife Service Environmental Conservation Online System Threatened and Endangered Species Active Critical Habitat Report (USFWS 2020b)
western snowy plover	U.S. Fish and Wildlife Service Environmental Conservation Online System (USFWS 2020a)	U.S. Geological Survey–Gap Analysis Project, 2017
Carmel Valley bush mallow	HUC-12 watersheds containing Calflora observations	Areas where RCIS Natural Communities (coastal scrub, mixed chaparral) coincide with range
Hickman’s onion	HUC-12 watersheds containing Calflora observations	AECOM maxent model
Lemmon’s jewelflower	HUC-12 watersheds containing Calflora observations	Areas where RCIS Natural Communities (annual and perennial grassland) coincide with range

Focal Species	Range Data Source	Modeled Habitat Data Source
Monterey gilia	HUC-12 watersheds containing Calflora observations	AECOM maxent
Monterey spineflower	HUC-12 watersheds containing Calflora observations	U.S. Fish and Wildlife Service Environmental Conservation Online System Threatened and Endangered Species Active Critical Habitat Report (USFWS 2020b)
Pajaro manzanita	HUC-12 watersheds containing Calflora observations	AECOM maxent model
seaside bird's-beak	HUC-12 watersheds containing Calflora observations	AECOM maxent model
Yadon's rein orchid	HUC-12 watersheds containing Calflora observations	AECOM maxent model
California sycamore woodland	California Wildlife Habitat Relationships (CDFW 2014)	RCIS Natural Communities (California sycamore woodland)
Monterey pine forest	California Wildlife Habitat Relationships (CDFW 2014)	RCIS Natural Communities (closed-cone pine-cypress)
valley oak woodland	California Wildlife Habitat Relationships (CDFW 2014)	RCIS Natural Communities (Valley oak woodland and Valley oak woodland (Quercus lobata Woodland Alliance))
working lands	Not applicable	California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program, 2016 (CDOC 2016)

Focal Species	Range Data Source	Modeled Habitat Data Source
habitat connectivity	Not applicable	Area of Conservation Emphasis Terrestrial Connectivity Dataset (CDFW 2019a) Fish Passage Assessment Database (CDFW 2019b California Essential Habitat Connectivity (Spencer et al. 2010) Bay Area Linkage Network (Penrod et al. 2013)
dune formation	Not applicable	County of Monterey Open Data CDFG Natural Communities geographic information system layer (Monterey County 2016) Monterey Bay National Marine Sanctuary (NOAA 2019)

Data Limitations

U.S. Geological Survey Gap Analysis Program Species Habitat Maps are based on coarse resolution satellite imagery and do not incorporate finer-scale habitat details. Therefore, suitable habitat may not be represented accurately. Habitat models created by AECOM may differ in size and actual habitat quality, because models are based only on the RCIS natural communities in which the species occurs, within the HUC-12 watersheds containing occurrences documented by Calflora, and do not consider species' life history and ecological requirements.

Except for AECOM Maxent habitat models, the models used for the RCIS do not consider California Natural Diversity Database occurrence data. However, available current California Natural Diversity Database occurrences are shown in Figure 3-1 through Figure 3-31, to help inform locations that should be prioritized for preservation of existing habitat. Models show areas and general locations of habitat, and areas that should be prioritized for conservation actions. All locations should be ground-truthed before implementation of conservation actions.

Some focal species and other conservation elements do not have species-specific climate change vulnerability assessments. In these cases, statewide vulnerability assessments for the natural communities (see Chapter 2) in which the focal species occurs has been used as proxy for potential climate change vulnerability. However, vulnerability of natural communities does not incorporate species' life history and ecological requirements, regional significance, current range, and specific threats, and thus may not accurately represent the actual vulnerability.

5.3 Conservation Strategies

This section presents conservation strategies that can be implemented throughout the RCIS area, including strategies to benefit water resources and aquatic habitats, focal species, and other conservation elements. Each focal species and other conservation element conservation strategy includes a summary of life history relevant to conservation actions, range, modeled suitable habitat, listing status, and the threats assessed in Chapter 4; conservation goals, objectives, and actions that address those pressures and stressors; and co-benefits of included actions. At least one objective for each species includes a quantitative conservation target for protection of suitable habitat, listed in acres. Objectives are intended to be accomplished within 10 years from the approval of the RCIS, if feasible. If implemented, the actions proposed also would benefit associated non-focal species because they have similar ecological requirements, habitats, or ecosystem functions. Species associations are described in Chapter 2. Biodiversity is addressed through goals, objectives, and actions for each focal species and other conservation elements as co-benefits, and thus are not addressed specifically as stand-alone other conservation element.

5.3.1 Regional Conservation Strategies

The regional conservation strategy includes broad goals that address regional threats of habitat loss, fragmentation, and connectivity barriers. These goals benefit multiple habitats and species throughout the RCIS area and should be implemented regionwide. Goals, objectives, and actions that benefit water resources and aquatic habitat also are included and should be implemented throughout the RCIS area.

Table 5-2 summarizes these regional goals, objectives, and actions.

Preservation and protection of existing intact resources should be prioritized, particularly in areas with high biodiversity and high climate resilience, that support multiple focal and non-focal species and other conservation elements, are highest risk for development, or act as habitat corridors and linkages, such as aquatic and riparian habitats.

Table 5-2. Regional Conservation Goals, Objectives, and Actions

Goal	Objective	Threats	Action
Regional Conservation Goal 1: Sustain resilient, connected natural communities for the full range of native species, habitats, and ecological functions in the RCIS area through the protection of large blocks of continuous habitat supporting sensitive species.	Regional Conservation Objective 1.1: Protect and preserve existing intact non-marine habitats and resources and allow expansion of habitat by protecting suitable or occupied habitat. Measure progress toward achieving this objective by the number of acres of habitat and adjacent/associated acres protected.	• Climate change • Habitat loss, degradation, fragmentation	RC 1.1.1: Acquire parcels with suitable habitat through fee title purchase or conservation easement.
		• Climate change • Habitat loss, degradation, fragmentation	RC 1.1.2: Conduct surveys using eDNA and/or traditional survey methods in suitable or potentially suitable habitat, to locate undocumented occurrences of focal species and other conservation elements and opportunities for habitat protection, enhancement, restoration, and creation (USFWS 2008).
		• Climate change • Habitat loss, degradation, fragmentation	RC 1.1.3: Create and sustain long-term funding for protected areas maintenance.
		• Climate change • Habitat loss, degradation, fragmentation	RC 1.1.4: Establish an incentive program for private landowners to protect occurrences and manage habitat.

Goal	Objective	Threats	Action
		• Transportation infrastructure construction and maintenance	RC 1.1.5: Protect populations from impacts from construction, vegetation management, and/or activities, by surveying areas such as roads/trails and implementing species protection measures.
	Regional Conservation Objective 1.2: Enhance occupied and suitable habitat. Measure progress toward achieving this objective by number of acres of habitat enhanced and/or occupied.	• Recreation (e.g., off-road vehicles, foot traffic, unleashed pets)	RC 1.2.1: Manage current and future recreation access, including off-road vehicles, biking, equestrian, foot traffic, and unleashed pets to reduce impacts on and disturbance to sensitive species and habitats. Ensure that recreation is compatible with suitable and future potentially suitable habitat and adjacent areas, and areas of known occurrences. Enforcement and fencing may be used to prevent illegal off-road vehicle use (USFWS 2010).

Goal	Objective	Threats	Action
		• Non-native species	RC 1.2.2. Control non-native invasive species from occupied and/or suitable habitat, and areas designated by the U.S. Fish and Wildlife Service as critical habitat throughout the RCIS area.
		• Pesticide and insecticide use	RC 1.2.3: Reduce/eliminate pesticide, rodenticide (especially first- and second-generation anticoagulant rodenticides), and herbicide use, including for roadside vegetation removal projects as part of integrated pest management efforts in identified suitable habitat, and sensitive natural communities. Promote alternative pest reduction methods, such as promoting natural predator populations (Ventura County Public Works Agency 2017).

Goal	Objective	Threats	Action
		• Predation	RC 1.2.4: Minimize impacts from native and non-native predator populations that have increased because of anthropogenic factors, by educational outreach and trainings on how to safely coexist with native predators and predator removal programs, where appropriate.
		• Recreation (e.g., off-road vehicles, foot traffic, unleashed pets) • Transportation infrastructure construction and maintenance	RC 1.2.5: Reduce anthropogenic impacts on habitat, including infrastructure construction and maintenance, inappropriate grazing, uncontrolled grazing, or overgrazing, off-road vehicles, foot traffic, fire suppression, recreational development and activities, non-native plants, and sand mining.

Goal	Objective	Threats	Action
		• Transportation infrastructure construction and maintenance	RC 1.2.6: Manage infrastructure construction and maintenance projects, including transportation, solar energy facilities, and projects on military properties, to be compatible with sensitive species.
		• Agricultural practices (e.g., grazing)	RC 1.2.7: Manage grazing, including installation of wildlife-friendly fencing, to ensure that it is compatible with suitable and future potentially suitable habitat and adjacent areas, and areas of known occurrences. Grazing in sensitive natural communities and public lands should be reduced.
		• Trash dumping	RC 1.2.8: Reduce trash dumping in areas with suitable and future potentially suitable habitat and adjacent areas, and areas of known occurrences.

Goal	Objective	Threats	Action
		• Habitat loss, degradation, fragmentation	RC 1.2.9: Enhance and restore native vegetation in occupied habitat and suitable but unoccupied habitat.
		• Climate change • Habitat loss, degradation, fragmentation	RC 1.2.10: Work with private landowners and stakeholders to research species' biology, threats, populations, densities, and/or ranges.
		• Habitat loss, degradation, fragmentation	RC 1.2.11: Create/enhance connections between ecologically required habitat types, such as between breeding aquatic and dispersal upland habitats.

Goal	Objective	Threats	Action
Regional Conservation Goal 2: Promote persistence of species and important natural communities through establishment and improvement of habitat connectivity in the RCIS area.	Regional Conservation Objective 2.1: Establish and improve habitat connectivity between large blocks of suitable habitat. Measure progress toward achieving this objective by the number of improved connectivity corridors used by sensitive species.	• Climate change • Habitat loss, degradation, fragmentation	RC 2.1.1: Install, repair, and improve infrastructure (e.g., by adding large culverts, undercrossings, overcrossings, bridges, directional fencing, scuppers, barrier breaks, roadside wildlife detection systems, sound barriers), limiting lighting at constructed or natural linkages, and removing existing barriers to promote wildlife movement and reduce road mortality (Yap and Rose 2019). Focus on areas with high numbers of vehicle-related mortality, areas with high Area of Conservation Emphasis Terrestrial Connectivity rankings and include areas to create corridor redundancy.
		• Climate change • Habitat loss, degradation, fragmentation	RC 2.1.2: Enhance habitat on either side of crossing structures, including protecting adjacent areas and restricting human activity nearby.

Goal	Objective	Threats	Action
		• Vehicle-impact mortality • Decreased habitat connectivity	RC 2.1.3: Create and sustain long-term funding for long-term management of crossings, including acquisition and maintenance of adjacent habitat, where suitable.
		• Vehicle-impact mortality	RC 2.1.4: Work with transportation districts or others to collect and analyze roadkill data, to identify hotspots where mortality occurs and inform the design of wildlife crossing infrastructure improvements (Yap and Rose 2019).

5.3.2 Water Resources

Water resources and aquatic natural communities are among the resources most vulnerable to climate change impacts (Thorne et al. 2016). The projected effects of climate exposure and modeled spatial disruption are significant enough that adapting to changing climate conditions will be difficult for these resources (Thorne et al. 2016). Significant current pressures from urban and agricultural development that impact water resources and aquatic communities, including urban wastewater, agriculture and forestry effluents, and dams and water management/use will increase the difficulty of these resources to adapt to changing climate conditions. Water resources and aquatic natural communities in the RCIS area are described in Chapter 2.

Table 5-2 summarizes the goals, objectives, and actions for water resources.

Table 5-3. Water Resources Goals, Objectives, and Actions

Goal	Objective	Threats	Action
Water Goal 1: Improve conditions of water resources, aquatic and riparian habitats, and connectivity throughout the RCIS area through enhancement and restoration.	Water Objective 1.1: Improve freshwater aquatic and riparian habitat conditions in areas with sensitive species and habitats. Measure progress toward achieving this objective by the improvement of aquatic and riparian conditions (inundation duration, water depth, water chemical composition, stream substrate composition and/or stream characterization, habitat structure, native species diversity, percent cover), water	• Climate change • Agriculture practices • Erosion and runoff • Degraded water quality	Water 1.1.1: Reduce water pollutants, such as fine sediments, pesticides, herbicides, sewage effluent, and other non-point and point source waste discharges, by development and implementation of stormwater policy and infrastructure.
		• Fish passage barriers	Water 1.1.2: Improve/remove barriers to fish passage throughout RCIS area, includes ground truthing and monitoring all assumed fish passage barriers.

Goal	Objective	Threats	Action
	quality, and connectivity of water resources.	• Habitat loss, degradation, fragmentation • Climate change	Water 1.1.3: Improve the quality of wetland habitats, through invasive species control, increased water period, and recontouring to enhance proper elevation.
		• Climate change • Habitat loss, degradation, fragmentation • Modifications to riparian substrates, vegetation, and channel morphology • Modifications to natural thermal regimes	Water 1.1.4: Improve the quality of riparian habitats, focusing on temperature profiles and appropriate substrate, especially considering areas of expected climate change impacts and future range.
		• Habitat loss, degradation, fragmentation	Water 1.1.5: Minimize impacts to water resources from construction, military activities, and agricultural practices.
		• Increased sedimentation • Habitat loss, degradation, fragmentation	Water 1.1.6: Reduce introduction of sediments in creek channels from bank erosion, livestock grazing, timber harvestings, unpaved roads and trails, and recreation.

Goal	Objective	Threats	Action
		• Habitat loss, degradation, fragmentation • Erosion and runoff	Water 1.1.7: Improve and expand existing riparian and upland buffers and create new buffers where they are lacking around stream and wetland habitats, as well as connectivity corridors between heterogeneous habitats. A qualified biologist and the best available science should be used to determine buffer distances.
		• Climate change • Habitat loss, degradation, fragmentation	Water 1.1.8: Preserve and protect intact aquatic and riparian resources where protection is lacking.
	Water Objective 1.2: Improve appropriate hydrology and hydrological functions to support sensitive species and habitats. Measure progress toward achieving this objective by the improvement of	• Modifications to natural hydrology and thermal regimes • Climate change • Habitat loss, degradation, fragmentation	Water 1.2.1: Moderate extreme water temperature fluctuations by controlling water flow regimes downstream from impoundments, water diversions, and residential or industrial developments.

Goal	Objective	Threats	Action
	hydrological indicators such as water depth, stream flow, water temperature and chemical composition.	• Modifications to natural flow regimes • Climate change	Water 1.2.2: Ensure that releases from water storage and diversion facilities maintain surface flows necessary for all life history stages of sensitive species (NMFS 2013).
		• Modifications to natural flow regimes	Water 1.2.3: Maintain appropriate management of flood-control activities (both routine and emergency) to be compatible with sensitive species (NMFS 2013).
		• Modifications to natural flow and thermal regimes • Climate change	Water 1.2.4: Restore hydrological functions of waterways to mimic natural flow, temperature regimes, and sediment loads where feasible (Hayes et al. 2016).
		• Modifications to natural flow regimes • Climate change	Water 1.2.5: Develop and implement operating criteria to ensure that the pattern and magnitude of groundwater extractions and water releases provide essential ecological functions.

Goal	Objective	Threats	Action
	Water Objective 1.3: Improve estuarine and marine aquatic conditions in areas with sensitive species and habitats. Measure progress toward achieving this objective by the improvement of aquatic conditions (water chemical composition, habitat structure, native species diversity) water quality, and connectivity of water resources.	• Altered natural flow regimes (e.g., tidal regimes, freshwater intrusion) • Tide gate installation • Harbor development	Water 1.3.1: Minimize impacts to estuary water quality and tidal regimes from coastal transportation, military activities, and agricultural practices upstream, and other development projects.
		• Degraded water quality • Climate change resilience	Water 1.3.2: Enhance water quality in occupied and suitable estuary and lagoon habitats.
		• Channelization of rivers, streams, lagoons (dredging), and wetland draining and filling • Degraded water quality	Water 1.3.3: Manage negative impacts of upstream and estuarine channelization and water quality (USFWS 2005a).
		• Modifications to natural flow regimes (e.g., water diversions, channelization, altered flows, groundwater overdraft) • Climate change	Water 1.3.4: Develop and implement strategies for managing freshwater inflow to estuary and lagoon habitats (USFWS 2005a).

5.3.4 Focal Wildlife Species-Specific Conservation Strategies

All the regional conservation and many of the water resources goals, objectives, and actions apply to focal wildlife species. The applicable actions are included in the species-specific conservation strategy.

Regional Amphibians

Goals, objectives, and actions that benefit amphibians as a group are summarized in

Table 5-4. and should be implemented throughout the RCIS area.

Table 5-4. Regional Amphibian Goals, Objectives, and Actions

Goal	Objective	Threats	Action
Amphibian Goal 1: Promote persistence of amphibian populations in the RCIS area through habitat protection, restoration, and enhancement.	Amphibian Objective 1.1: Enhance occupied and suitable habitat for focal amphibians throughout the RCIS area. Measure progress toward achieving this objective by the acres of habitat and adjacent/associated acres enhanced and/or occupied	• Habitat loss, degradation, fragmentation	Amphibian 1.1.1: Manage a suitable vegetation structure surrounding breeding and upland habitat to support appropriate vegetative cover for breeding and amphibians.
		• Agricultural practices (e.g., grazing, herbicides, pesticides)	Amphibian 1.1.2: Manage grazing (e.g., fencing, seasonal timing, stocking rates) to benefit amphibians.

Goal	Objective	Threats	Action
		• Agricultural practices (grazing, pesticides, herbicides) • Climate change	Amphibian 1.1.3: Reduce/eliminate the use of pesticides, herbicides, fertilizers, petroleum products, and other chemicals near breeding and upland habitats, including collaboration with mosquito abatement divisions, to prevent negative impacts from mosquito abatement activities (USFWS 1999, 2019a).
		• Agricultural practices (grazing, pesticides, herbicides) • Climate change	Amphibian 1.1.3: Reduce/eliminate the use of pesticides, herbicides, fertilizers, petroleum products, and other chemicals near breeding and upland habitats, including collaboration with mosquito abatement divisions, to prevent negative impacts from mosquito abatement activities (USFWS 1999, 2019a).

Goal	Objective	Threats	Action
		• Erosion and runoff (e.g., sedimentation) • Degraded water quality • Climate change	Amphibian 1.1.4: Reduce sources of sedimentation (e.g., bank erosion, livestock grazing, timber harvestings, unpaved roads and trails, and recreation) near known and potential breeding ponds and remove excess sedimentation where feasible (USFWS 2019a).
		• Non-native species	Amphibian 1.1.5: Remove non-native species such as bullfrogs, mosquitofish, other non-native predatory fish, and non-native turtles from breeding ponds, stream segments, and artificial ponds (USFWS 2002). This includes managing hydrology to decrease suitability for non-native species.
		• Modifications to natural flow regimes • Degraded water quality • Climate change	Amphibian 1.1.6: Manage appropriate ephemeral breeding pond hydrology and phenology.

Goal	Objective	Threats	Action
		• Modifications to natural flow regimes	Amphibian 1.1.7: Work with private landowners of known breeding locations to promote positive management of those sites, including maintaining natural hydrology, limiting non-native species, and conducting appropriate management of upland habitats (USFWS 2009).
		• Modifications to natural flow regimes	Amphibian 1.1.8: Manage breeding pond hydrology to control for aquatic predator populations.
	Amphibian Objective 1.2: Restore occupied and suitable habitat and create new habitat. Measure progress toward achieving this objective in acres of habitat and adjacent/associated acres restored or created habitat and number of breeding ponds.	• Altered vegetation density in breeding ponds	Amphibian 1.2.1: Establish native emergent and other biologically suitable vegetation in suitable ponds and wetlands to provide cover where little or none exists.
		• Habitat loss, degradation, fragmentation • Climate change	Amphibian 1.2.2: Establish native vegetation with suitable density and structure in upland habitats within dispersal distance of known breeding locations.

Goal	Objective	Threats	Action
		• Habitat loss, degradation, fragmentation • Climate change	Amphibian 1.2.3: Create suitable breeding habitat, such as artificial perennial and/or ephemeral ponds within the dispersal distance of known breeding locations.
		• Habitat loss, degradation, fragmentation • Climate change	Amphibian 1.2.4. Create suitable upland habitat within dispersal distance of known and suitable breeding habitat.

5.3.5 Focal Plant Species-Specific Conservation Strategies

All the regional conservation (RC) and many of the water resources goals, objectives, and actions apply to focal plant species and other conservation elements. The applicable actions are included in the species-specific conservation strategy. All regional plant goals, objectives, and actions summarized in Table 5-5 apply to focal species and other conservation elements and should be implemented throughout the RCIS area.

Table 5-5. Regional Plant Goals, Objectives, and Actions

Goal	Objective	Threats	Action
Plant Goal 1. Promote persistence of focal/non-focal plant species and other conservation element natural community populations in the RCIS area through protection, restoration, and enhancement of habitat.	Plant Objective 1.1: Restore habitat for focal/non-focal plant species and other conservation elements. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres restored.	• Habitat loss, degradation, fragmentation	Plant 1.1.1: Improve/research propagation methods.
		• Habitat loss, degradation, fragmentation	Plant 1.1.2: Store and maintain seeds collected along maternal lines from multiple generations in the RCIS area, to promote genetic diversity for later use in research, restoration, and other conservation actions.

Goal	Objective	Threats	Action
		• Habitat loss, degradation, fragmentation • Climate change	Plant 1.1.3: Where appropriate, translocate plants onto protected habitat and suitable habitat to create new populations in coordination with scientific advisors, universities, and/or regulatory agencies, to inform the locations and methods (USFWS 2004b).
		• Decreasing pollinator populations	Plant 1.1.4: Promote persistence of sustainable pollinator populations.

5.3.6 Burrowing Owl (Athene cunicularia)

Burrowing Owl
Photo Credit: Rose Bloise

Status

- State Species of Special Concern

Ecological Requirements

- RCIS Regions: All terrestrial regions
- RCIS Natural Communities: Agriculture, Annual Grassland, Coastal Scrub, Valley Oak Woodland (CDFW 2020)
- Wintering, foraging, and breeding habitat: Open, dry areas with suitable mammal burrows or cavities surrounded by sparse vegetation for nestings. Will also nest in culverts, pipes, and artificial burrow. Require nests to be surrounded by sparse, low-growing native vegetation (CDFW 2020; USFWS 2003b)
- Preys on insects and small mammals (USFWS 2003b)
- Full species account available: Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States (USFWS 2003b)
- RCIS Conservation target: Moderate (large area of suitable habitat being converted to agriculture)

Associated Non-Focal Species

- American badger (Taxidea taxus)

- Contra Costa goldfields (Lasthenia conjugens)
- Jolon clarkia (Clarkia jolonensis)

Climate Change Vulnerability Assessment

Most of the burrowing owl (BUOW) summer and winter ranges in the RCIS are likely to remain stable under different warming scenarios (Wilsey et al. 2019). Gardali et al. (2012) conducted a species-specific climate change vulnerability assessment for burrowing owl (BUOW) on exposure and sensitivity factors which include:

Exposure Factors:

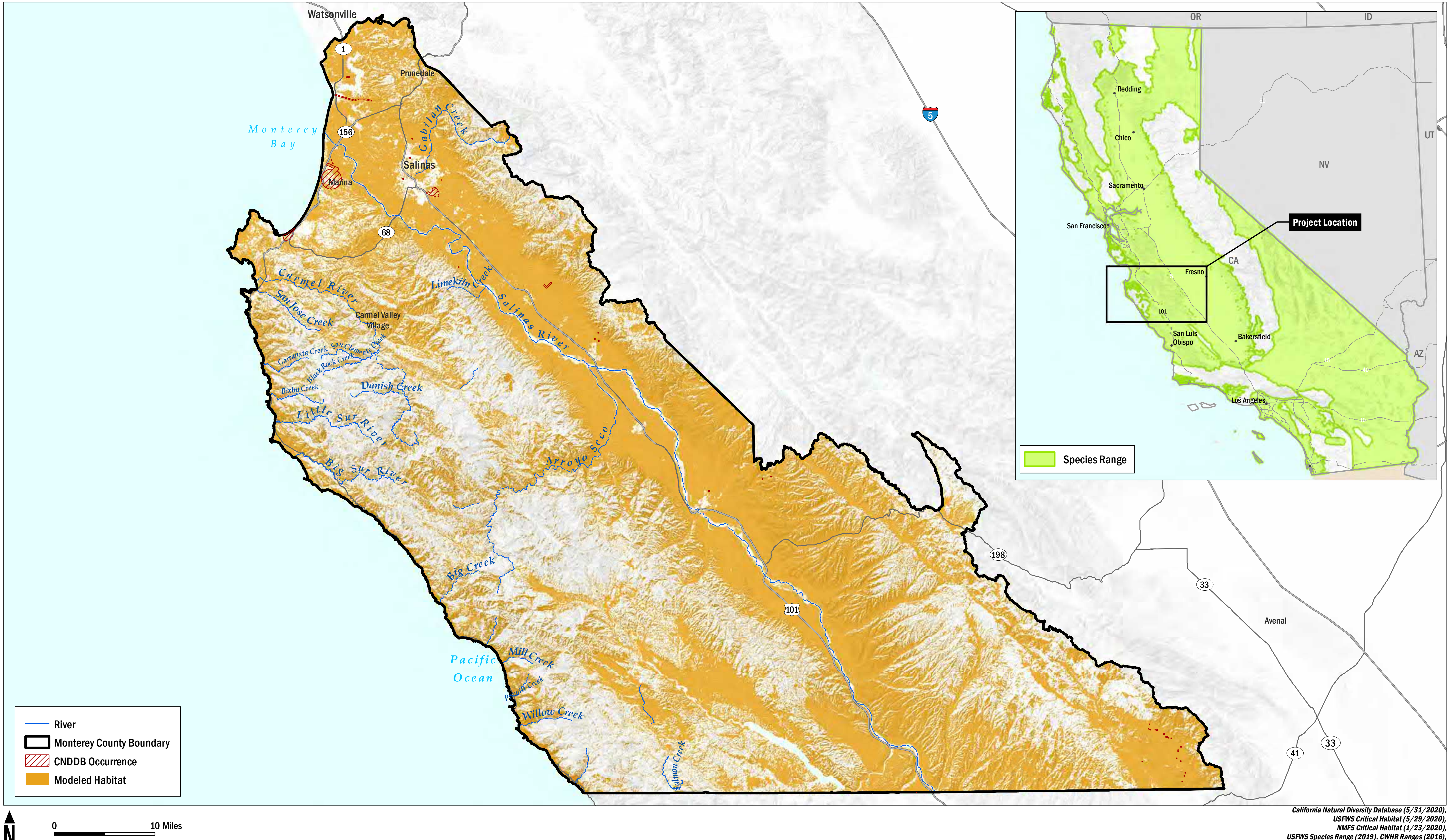
- Habitat suitability-Low
- Food availability-Low
- Extreme weather-Low

Sensitivity Factors:

- Habitat specialization-High
- Migratory status-Moderate
- Dispersal ability-Low
- Physiological tolerances-Low

Though burrowing owls only use specific habitat types, they do have a high dispersal ability (Gardali et al. 2012). Based on this ability to disperse to newly suitable habitats and an ability to successfully use some urbanized habitats, burrowing owls are not included on the Climate Change Vulnerability Priority list (top 25 percent of highest assessed scores) (Gardali et al. 2012). However, climate threats include increased frequency and intensity of wildfires, increases in spring heat waves, and drought (Wilsey et al. 2019).

The goals, objectives, and actions shown in Table 5-6. aim to protect, enhance, and restore present day suitable habitats for burrowing owl, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as available nesting burrows and sustainable prey availability, which may allow burrowing owl to adapt and move to newly suitable habitats in the future. A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-1 shows the range and modeled suitable habitat for the burrowing owl.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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Monterey County Regional Conservation Investment Strategy

FIGURE 5-1
Burrowing Owl

Burrowing Owl Conservation Priorities, Goals, Objectives, and Actions

All regional goals, objectives, and actions apply to burrowing owl. Table 5-6. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect habitat surrounding known occurences near King City, San Lucas, San Ardo, and the Monterey Peninsula near Point Pinos (RC Objective 1.1).
- Enhance suitable vegetation structure, as it is an important habitat feature for this species. Priority locations for enhancment actions should include the Salinas Valley (near known occurences), Monterey Peninsula, and Chloame Valley (BUOW 1.2.1).

Table 5-6. Burrowing Owl Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
BUOW Goal 1. Promote persistence of burrowing owl populations in the RCIS area through protection, restoration, and enhancement of habitat.	BUOW Objective 1.1: Protect known occurrences and intact habitat and allow expansion of habitat by protecting 289,000 acres of suitable habitat. Measure progress toward achieving this objective by the number of breeding locations, acres of adjacent foraging habitat protected, and associated/equivalent acres.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	BUOW Objective 1.2: Enhance occupied and suitable burrowing owl breeding, wintering, and foraging habitat. Measure progress toward achieving this objective by acres of habitat and associated/equivalent acres enhanced and/or occupied by burrowing owls and/or evidence of presence (occupied burrows).	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	BUOW 1.2.1: Manage suitable vegetation structure (e.g., mowing, revegetation with low-growing and less dense native plants, controlled grazing) to encourage burrowing owl wintering and breeding occupancy (Shuford and Gardali 2008; USFWS 2003b).
		• Small mammal eradication	• Other focal/ non-focal species • Biodiversity	BUOW 1.2.2: Reduce/eliminate small mammal control efforts. Implement programs to increase small mammal populations in areas where they have been eradicated.

Goal	Objective	Threats	Co-Benefits	Action
		• Agricultural practices (e.g., grazing, pesticides, insecticides)		BUOW 1.2.3: Create conservation agreements with row-crop agriculturalists and ranchers to encourage management of water conveyance structures, roadsides, and field margins, to benefit burrowing owl (USFWS 2003b).
		• Agricultural practices (e.g., grazing, pesticides, insecticides)	• Other focal/ non-focal species • Biodiversity	BUOW 1.2.4: Eliminate or reduce the use of insecticides. If insecticide use is necessary, use insecticides with the lowest toxicity to nontarget organisms. Do not spray pesticides within 400 to 600 meters of burrowing owl nest burrows during the breeding season (USFWS 2003b).

Goal	Objective	Threats	Co-Benefits	Action
	BUOW 1.3: Restore occupied, and suitable burrowing owl breeding, wintering, and foraging habitat and create new habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres restored or created and/or by evidence of presence (occupied burrows).	• Habitat loss, degradation, fragmentation • Small mammal eradication • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	BUOW 1.3.1: Where potential nesting burrows are lacking, install artificial burrows or encourage the presence of California ground squirrels (USFWS 2003b).
Sources: CDFW 2015, 2020; Shuford and Gardali 2008; USFWS 2003b				

5.3.7 California Brackish Water Snail (Tryonia imitator)

Status

- None

Ecological Requirements

- RCIS Regions: Coastal Strand
- RCIS Natural Communities: Saline Emergent Wetland (CDFW 2020)
- Inhabits coastal lagoons, estuaries, sloughs, and Salicornia-dominated marshes with areas of permanent water harboring stands of immergent native vegetation and algae (CDFW 2020, Kellogg 1985)
- Rare species found only in permanently submerged areas in a variety of sediment types; able to withstand a wide range of salinities (4-44 parts per trillion) (CDFW 2020, Kellogg 1985)
- Sensitive and desiccation in habitats subjected to seasonal or occasional drying (Kellogg 1985)
- Full species account available: California Natural Diversity Database, RareFind 5 (CDFW 2020)
- RCIS Conservation Target: Moderate (non-listed, limited distribution in the RCIS area, representative of brackish marshes)

Associated Non-Focal Species

- None

Climate Change Vulnerability Assessment

In the RCIS area, occurrences of the California brackish water snail (CBWS) are primarily in Elkhorn Slough, and modeled suitable habitat also occurs at the mouth of the Carmel River. Fifty-year predications of Elkhorn Slough estuarine habitat trends include a significant decrease in the extent of salt marsh and conversion to mudflats and tidal creeks (Elkhorn Slough Tidal Wetland Project Team 2007). The erosion rate is expected to increase, causing significant marsh losses (Elkhorn Slough Tidal Wetland Project Team 2007). By mid-century, large portions of Elkhorn Slough's low-lying salt marshes are projected to be flooded. By the end-of-century, flooded areas are projected to expand and cover a larger region (NOAA 2015). Table 5-7.

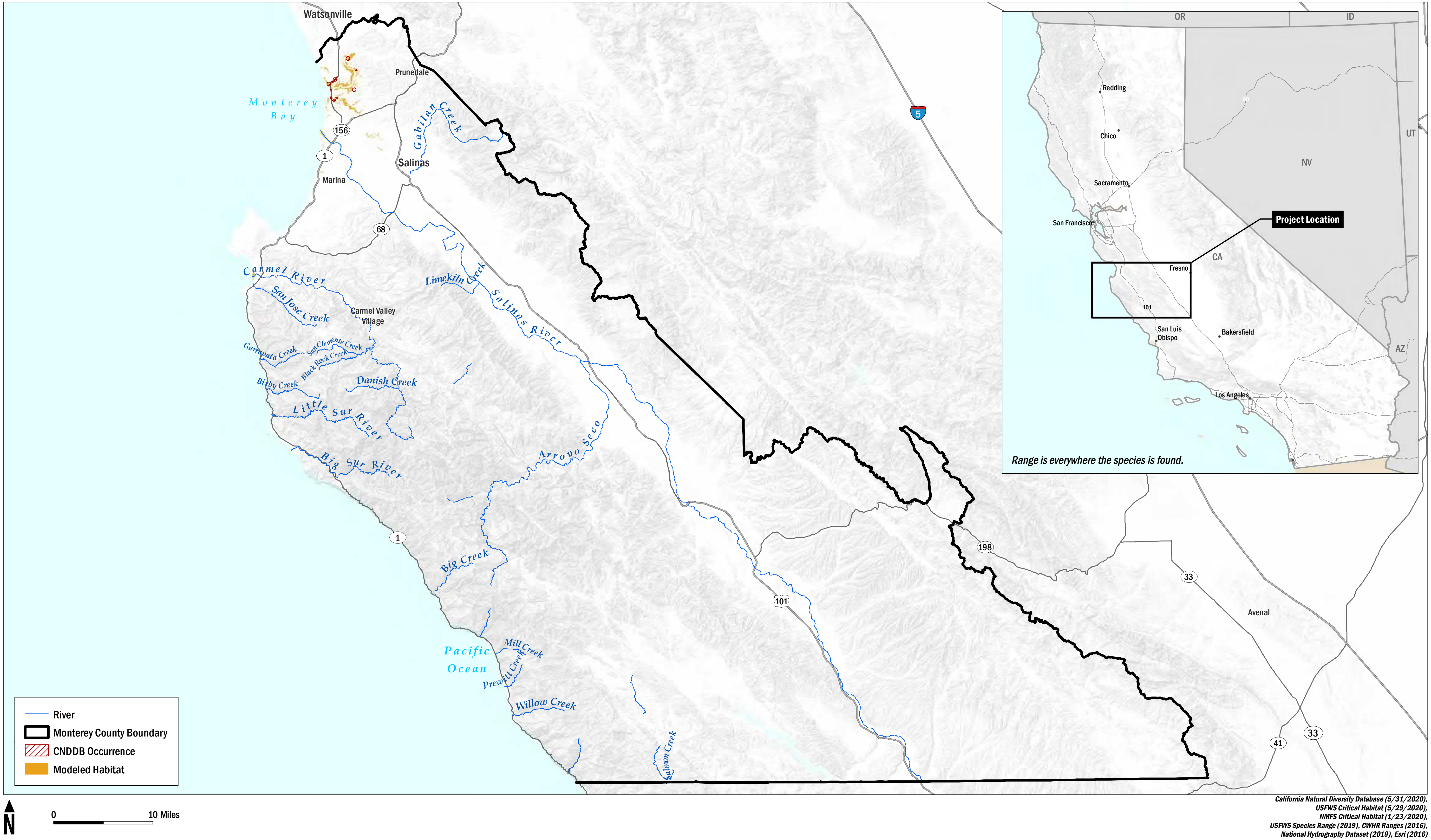
summarizes the climate change exposure, spatial distribution, and vulnerability of saline emergent wetland communities statewide, which could experience a 75 to 100 percent reduction in habitat suitability.

Table 5-7. California Brackish Water Snail Natural Communities Climate Vulnerability Ranking

Natural Communities	Mean Combined Vulnerability Rank Low Emissions (RCP4.5)	Mean Combined Vulnerability Ran High Emissions (RCP8.5)
Saline Emergent Wetland	High	High
Source: Thorne et al. 2016		

The goals, objectives, and actions shown in Table 5-8. aim to protect, enhance, and restore present day suitable habitats for California brackish water snail, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as research into California brackish water snail biology, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-2 shows the range and modeled habitat of the California brackish water snail.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-2
California Brackish Water Snail

All RC goals, objectives, and actions apply to this species and Water Objectives 1.2 and 1.3 apply to California brackish water snail. Table 5-8. summarizes species-specific goals, objectives, and actions.

Conservation Priorities

- Aquire and protect habitat near known occurences at Elkhorn Slough at the mouth of the Salinas River, to encourage habitat connectivity between occupied and suitable but unoccupied habitat (RC Objective 1.1).
- Because population size and trend data is lacking for this species, conduct species surveys in brackish habitats along the coastline, including the Carmel River, Salinas River, and Elkhorn Slough (CBWS 1.2.1).

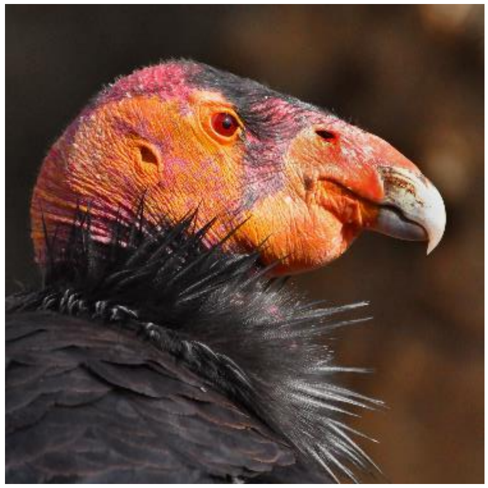
Table 5-8. California Brackish Water Snail Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
CBWS Goal 1. Promote persistence of California brackish water snail populations in the RCIS area through protection, restoration, and	CBWS Objective 1.1: Protect known occurrences and allow expansion by protecting 390 acres of suitable habitat. Measure progress toward achieving this objective in acres of habitat and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
enhancement of habitat.	CBWS Objective 1.2: Enhance or restore occupied, suitable, and potentially suitable California brackish water snail habitat in the RCIS area. Measure progress toward achieving this objective in acres of habitat and adjacent/equivalent acres enhanced or restored and occupied by California brackish water snail.	• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species	CBWS 1.2.1: Survey known occupied and potentially suitable habitats to enhance knowledge about population size and population trends.
		• Non-native species	• Non-native invasive species • Other focal/ non-focal species • Biodiversity	CBWS 1.2.2: Remove non-native plant species in suitable brackish habitats throughout the RCIS area.
		• Altered vegetation communities • Climate change	• Water quality • Climate change resilience • Other focal/ non-focal species • Biodiversity	CBWS 1.2.3: Enhance or restore native submerged vegetation in suitable or potentially suitable habitat.

Goal	Objective	Threats	Co-Benefits	Action
		• Altered natural flow regimes (e.g., tidal regimes, freshwater intrusion) • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	CBWS 1.2.4: Restore tidal regimes in suitable or potentially suitable habitat.
Sources: CDFW 2015, 2020				

5.3.8 California Condor (Gymnogyps californianus)



California Condor
Photo Credit: Ivan Parr

Status

- Federally Endangered
- State Endangered
- State Fully Protected

Ecological Requirements

- RCIS Regions: Big Sur Coastline, Gablian Range and Pinnacles National Park, but fly throughout the modeled suitable habitat.
- RCIS Natural Communities: Closed-Cone Pine-Cypress, Montane Hardwood, Coastal Scrub, Rocky Outcroppings (USFWS 1996)
- Nesting habitat: Nests in cavities on steep rock formations or in the burned-out hollows of old-growth conifers (USFWS 2013)
- Foraging habitat: Includes open terrain of foothill grasslands, chaparral, or oak savannah, and open terrain at coastal sites; an obligate scavenger that takes wide-ranging foraging flights (USFWS 1996, 2013)

- Roosting habitat: Located throughout an individual's range near feeding sites on ridgelines, rocky outcrops, steep canyons, and in tall trees or snags near nesting areas and foraging habitat (USFWS 1996, 2013)
- Susceptable to mortality from lead poisoning, ingestion of microtrash, and electrocutions (USFWS 2013, 2018)
- Full species account available: California Condor (Gymnogyps californiaus) 5-Year Review: Summary and Evaluation (USFWS 2013)
- RCIS Conservation Target: High (widespread in RCIS area, represents most of species population)

Associated Non-Focal Species

- Monterey larkspur (Delphinium hutchinsoniae)

Climate Change Vulnerability Assessment

Gardali et al. (2012) conducted a species-specific climate change vulnerability assessment for the California condor (CACO) on exposure and sensitivity factors:

Exposure Factors

- Extreme weather-Moderate
- Habitat suitability-Low
- Food availability- Low

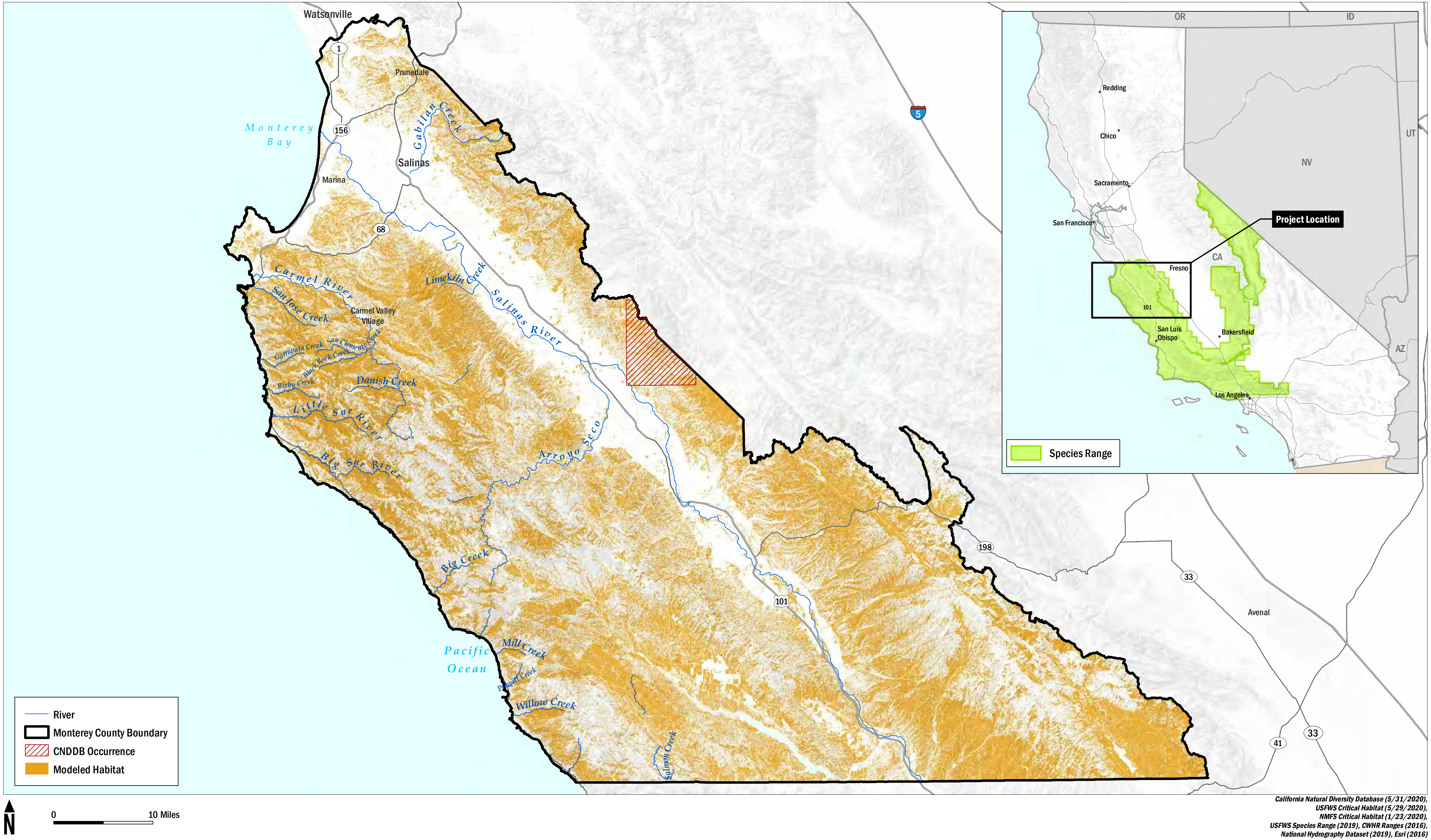
Sensitivity Factors

- Habitat specialization-Hgh
- Dispersal ability- Low
- Physiological tolerances-Low
- Migratory status- Low

The California condor only uses specific habitat types and is projected to be moderately exposed to more frequent or severe weather events. The U.S. Fish and Wildlife Service 5-Year Review (2013) predicted possible future climate change impacts. The prevailing winds that California condors rely on for soaring may or may not be affected by changing climate conditions. It is possible that large ungulate populations and ranching operations that provide food sources may be negatively affected. An increase in wildfire frequency has the potential to destroy roosting sites and cause direct mortality, and hotter summer temperatures and a smaller snowpack may reduce water availability. The U.S. Fish and Wildlife Service (2013) did note that California condors have a very wide historical range, from the Pacific Northwest to the southwest desert, which indicates an ability to adapt to a broad range of climatic and habitat scenarios.

The goals, objectives, and actions shown in Table 5-9. aim to protect, enhance, and restore present day suitable habitats for California condor, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as microtrash removal programs and promoting non-lead ammunition, which may allow individuals to move to newly suitable habitats in the future.

A summary of natural communities this species occurs is presented in Chapter 4. Figure 5-3 shows the range and modeled suitable habitat for the California condor.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-3
California Condor

California Condor Conservation Priorities, Goals, Objectives, and Actions

All RC goals, objectives, and actions apply to California condor, and Table 5-9. summarizes the goals, objectives, and actions for this species. Users should consult with the National Park Service or Ventana Wildlife Society, as co-managers of the Central California condor population, before beginning projects that could affect condors.

Conservation Priorities

- Acquire and protect habitat throughout the species range, to encourage habitat connectivity between occupied and suitable but unoccupied habitat (RC Objective 1.1).
- Because ingestion of microtrash and electrucution are the leading causes of California condor mortality, where feasible, place utilities underground, and for energy facilities such as windfarms, conduct an analysis to determine compatability with condor flight patterns (including areas where condor may fly through) (CACO Goal 2).

Table 5-9. California Condor Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
CACO Goal 1: Increase and promote a self-sustaining California condor population in the RCIS area through protection, restoration, and enhancement of habitat.	CACO Objective 1.1: Protect known occurrences and allow expansion of habitat by protecting 391,000 acres of suitable habitat. Measure progress toward achieving this objective by the number of breeding locations, acres of adjacent foraging habitat protected and associated/equivalent acres.	• Habitat loss, degradation, fragmentation • Infrastructure construction and maintenance • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions
	CACO Objective 1.2: Enhance occupied and suitable California condor breeding, roosting, and foraging habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced and occupied by California condors.	• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity	CACO 1.2.1: Maintain sustainable native ungulate populations to sustain the native prey base for California condor, by native ungulate reintroduction in historical foraging habitats (USFWS 1996).

Goal	Objective	Threats	Co-Benefits	Action
	CACO Objective 1.3: Restore occupied and suitable California condor breeding, roosting, and foraging habitat and create new habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres restored or created and/or occupied by California condors.	• Habitat loss, degradation, fragmentation		CACO 1.3.1: Restore foraging habitat adjacent to breeding locations.
CACO Goal 2: Support stability and recovery of California condor populations in the RCIS area through measures to	CACO Objective 2.1: Reduce contaminant-related mortality. Measure progress toward achieving this objective by the reduction of contaminant-related California condor	• Lead poisoning	• Biodiversity • Recreation • Other focal/ non-focal species • Agriculture	CACO 2.1.1: Promote the use of high-quality copper ammunition, supporting programs that provide non-lead ammunition (USFWS 2018).

Goal	Objective	Threats	Co-Benefits	Action
reduce direct mortality.	deaths detected, compared to present day (USFWS 1996).	• Ingestion of micro trash		CACO 2.1.2: Reduce the presence of microtrash in foraging and nesting habitats at sites, such as roadside pullouts or overlooks, through surveys and community outreach and cleanup days (USFWS 2013).
	CACO Objective 2.2: Reduce impact-related mortality. Measure progress toward achieving this objective by the reduction of impact-related California condor deaths detected, compared to present day.	• Power lines	• Other focal/ non-focal species • Biodiversity	CACO 2.2.1: Where feasible, relocate power lines underground or encase them in insulated tree wire in areas with high numbers of California condor collisions and electrocutions (USFWS 2018).

Goal	Objective	Threats	Co-Benefits	Action
		• Renewable energy development	• Other focal/ non-focal species • Biodiversity	CACO 2.2.2: Implement recommendations by the U.S. Fish and Wildlife Service and California Condor Wind Energy Working Group to minimize the potential of collisions at wind energy sites throughout all suitable habitat areas, including locations that condors soar across (such as the Salinas Valley).
		• Power lines	• Other focal/ non-focal species • Biodiversity	CACO 2.2.3: Install deterrents on power transmission towers, to reduce the likelihood for such structures to be used as roosting sites by California condors (USFWS 2018).

Goal	Objective	Threats	Co-Benefits	Action
		• Renewable energy development	• Other focal/ non-focal species • Biodiversity	CACO 2.2.2: Implement recommendations by the U.S. Fish and Wildlife Service and California Condor Wind Energy Working Group to minimize the potential of collisions at wind energy sites.
Sources: CDFW 2020, USFWS 1996, 2013, 2018				

5.3.9 California Newt (Taricha torosa)

California Newt
Photo Credit: Ivan Parr

Status

- State Species of Special Concern

Ecological Requirements

- RCIS Regions: Big Sur Coastline, Inner Coast Range, Mid Inner Coast Range (CDFW 2020)
- RCIS Natural Communities: Coastal Oak Woodland, Blue Oak Woodland, Coastal Scrub, Freshwater Emergent Wetland, Riparian (CDFW 2020)
- Subterranean refuges: Terrestrial individuals use surface objects, such as rocks and logs, mammal burrows, or rock fissures, and the inside of the base of standing trees (CDFW 2018f, 2019)
- Breeding habitat: Intermittent streams, rivers, permanent and semi-permanent ponds, lakes, and large reservoirs with emergent or submerged vegetation (CDFW 2018f, 2019)
- Migration: With first rains of fall, migration initiated up to one kilometer to breeding localities (CDFW 2018f, 2019)
- Full species account available: California Newt Life History Account (CDFW 2018f)
- RCIS Conservation Target: Moderate (not-listed, large range and suitable habitat)

Associated Non-Focal Species

- Least Bell's vireo (Vireo bellii pusillus)
- Little willow flycatcher (Empidonax traillii brewsteri)
- Clare's pogogyne (Pogogyne clareana)
- Coast live oak woodland (Quercus agrifolia Alliance)

Climate Change Vulnerability Assessment

California newt (CN) is at "neutral risk" from climate change across the state, based on the likely persistence of current populations through 2050 and the amount of current climatically suitable habitat likely to remain suitable (Wright et al. 2013) (Table 5-10.). Projections indicate that in 2050, more than 80 percent of the current distribution of California newt will remain and there will be no greater than a 20 percent change in available suitable habitat under low and high emission scenarios, and thus most of the climatically suitable habitat in the RCIS area is likely to remain suitable in 2050. Despite these projections, non-climate pressures still threaten California newt. Climate change will exacerbate the threats listed in Table 5-11.

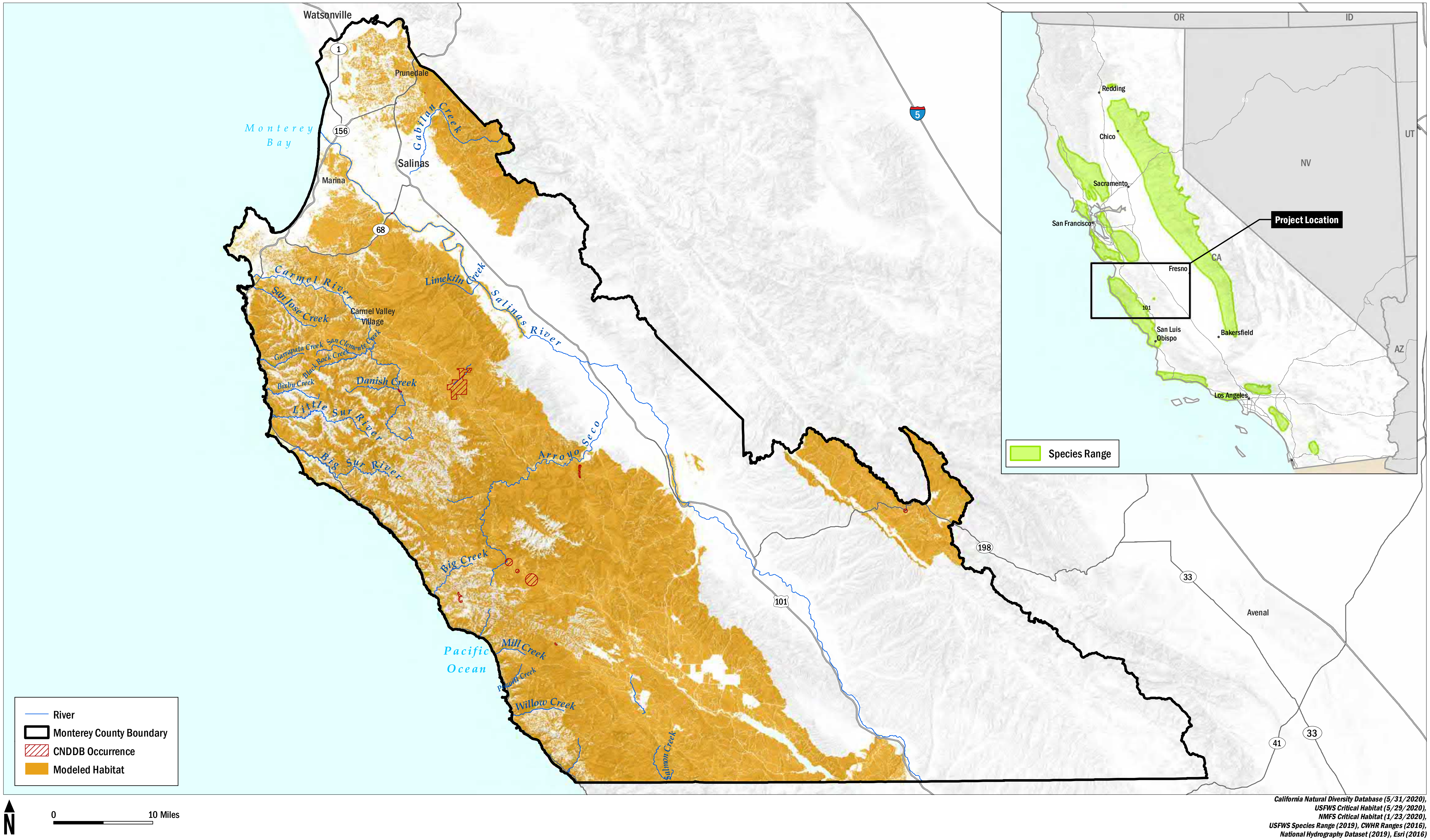
Table 5-10. California Newt Climate Change Vulnerability Ranking

Type of Analysis	Low Emissions (RCP4.5)	High Emissions (RCP8.5)
Point Ranking (habitat)	Slightly Reduced–Low	Slightly Reduced–Low
Area Ranking (distribution)	Neutral–Low	Neutral–Low
Source: Wright et al. 2013		

The goals, objectives, and actions shown in Table 5-11. aim to protect, enhance, and restore present day suitable habitats for California newt, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as controlling non-native predators in breeding habitat, which may allow individuals to move to newly suitable habitats in the future.

A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-4 shows the range and modeled suitable habitat for the California newt.

Table 5-11. summarizes the goals, objectives, and actions for the species.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-4
California Newt

California Newt Conservation Priorities, Goals, Objectives, and Actions

All RC and Amphibian goals, objectives, and actions apply California newt. Water actions Water 1.1.1, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, and Water Objective 1.2 apply. Table 5-11. summarizes specific goals, objectives, and actions for this species.

Conservation Priorities

- Protect habitat sourounding known occurences, encourage habitat connectivity between occupied and suitable but unoccupied habitat (RC Objective 1.1), to promote resilience to climate change.
- Manage aquatic breeding habitat hydrology, including water quality, to create climate change resilience, particularly near known occurences near the upper watersheds of Arroyo Seco, the Carmel River, and the San Antonio River (Water Objective 1.2).

Table 5-11. California Newt Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
CN Goal 1: Promote persistence of California newt populations in the RCIS area through habitat protection, restoration, and enhancement.	CN Objective 1.1: Protect known occurrences and allow expansion by protecting 126,000 acres of suitable habitat. Measure progress toward achieving this objective by the number of breeding locations, acres of adjacent upland habitat, and associated/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions
Sources: CDFW 2015, 2018, 2020				

5.3.10 California Red-legged Frog (Rana draytonii)

California red-legged frog
Photo Credit: Ivan Parr

Status

- Federally Threatened
- State Species of Special Concern

Ecological Requirements

- RCIS Regions: All Terrestrial Regions
- RCIS Natural Communities: Freshwater Emergent. Wetland, Coastal Oak Woodland, Valley Oak Woodland, Annual Grassland (CDFW 2020)
- Breeding aquatic habitat: Aquatic habitats include freshwater streams, deep pools, and backwaters within streams and creeks, ponds, marshes, sag ponds, dune ponds, and lagoons. The species frequently breeds in artificial impoundments such as stock ponds. Breeding adults are often associated with deep (greater than 2 feet), still, or slow-moving water and dense, shrubby riparian or emergent vegetation. Requires 11 to 20 weeks of permanent water for larval development (CDFW 2020, USFWS 2002).
- Upland habitat: If water is not available during summer months, will often disperse from breeding habitat. Suitable habitat includes spaces under rocks and organic debris, agricultural features, small mammal burrows, incised stream channels, and moist leaf litter (USFWS 2002).

- Dispersal: During the wet season, some individuals may disperse (up to two miles) through upland habitats to return to breeding sites (USFWS 2002).
- Susceptible to competition and predation from non-native species, as well as mortality from fungal diseases (Padgett-Flohr 2008, USFWS 2002)
- Full species account available: Recovery Plan for the California Red-legged Frog (Rana aurora draytonii) (USFWS 2002)
- RCIS Conservation Target: High (federally listed, limited distribution of breeding habitat)

Associated Non-Focal Species

- Two-striped garter snake (Thamnophis hammondii)
- Western spadefoot (Spea hammondii)
- Jolon clarkia (Clarkia jolonensis)
- Coast live oak woodland (Quercus agrifolia Alliance)

Climate Change Vulnerability Assessment

California red-legged frog (CRLF) is at "neutral risk" from climate change across the state (Wright et al. 2013) (Table 5-12.). Most of the climatically suitable habitat in the RCIS area is likely to remain suitable in 2050 (Wright et al. 2013). Although current distribution and habitat suitability is likely to persist, climatic conditions are projected to change enough to reduce habitat suitability on average to make the California red-legged frog a high conservation priority (Wright et al. 2013). The magnitude of these projections in the RCIS area will likely vary based on local conditions.

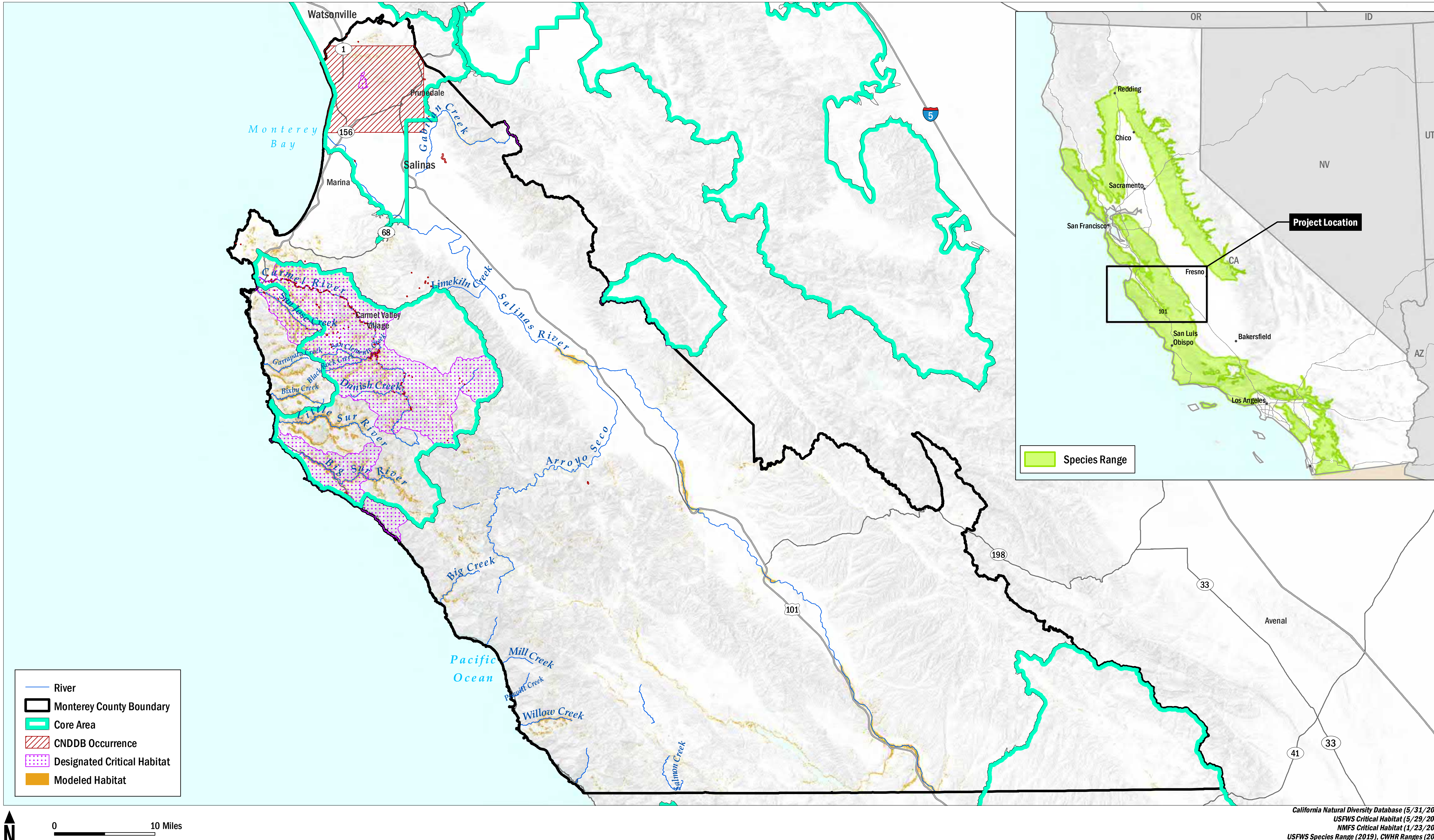
Climate stressors that may impact the California red-legged frog include increased drought duration and severity as well as extreme precipitation events (USFWS 2002). Early drying of breeding habitat may lead to increased mortality for eggs and larvae, and reduced survival of adults (USFWS 2002). Decreased flows, coupled with agricultural and urban water demands, may result in increased water salinity (USFWS 2002). Climate change will also exacerbate other threats listed in Table 5-13.

Table 5-12. California Red-legged Frog Climate Vulnerability Ranking

Type of Analysis	Low Emissions (RCP4.5)	High Emissions (RCP8.5)
Point Ranking (distribution)	Slightly Reduced - Low	Slightly Reduced - Low
Area Ranking (habitat)	Neutral - Low	Neutral - Low
Source: Wright et al. 2013		

The goals, objectives, and actions shown in Table 5-13. aim to protect, enhance, and restore present day suitable habitats for California red-legged frog, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as monitoring for disease and sources of road mortality, which may allow individuals to move to newly suitable habitats in the future.

A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-5 shows the range and modeled suitable habitat for the California red-legged frog.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-5
California Red-legged Frog

California Red-legged Frog Conservation Priorities, Goals, Objectives, and Actions

All RC and Amphibian goals, objectives, and actions apply to California-red legged frog. Water 1.1.1, 1.1.3, 1.1.5, 1.1.6, 1.1.7, 1.1.8, Water Objective 1.2 apply. Table 5-13. summarizes the specific goals, objectives, and actions for this species.

Conservation Priorities

- Acquire and protect habitat in USFWS core areas (Elkhorn Slough, Carmel River–Santa Lucia, and Gabilan Range) to encourage habitat connectivity between occupied and suitable but unoccupied habitat (USFWS 2002) (RC Objective 1.1).
- Control non-native species in Fort Hunter Ligget (San Antonio and Nacimiento drainages) (USFWS 2002) to promote population sustainability for all life stages of the species (CRLF 1.2.1).
- Increase the amount of California red-legged frog breeding habitat in creeks through creation of more plunge pools and slow-water habitats by incorporating these features in restoration designs in breeding habitat in creeks, as well as nu creation of artificial ponds in areas with suitable upland habitat. Promote natural water flow regimes and vegetative cover in streams and creeks (USFWS 2002) (CRLF 1.3.1).

Table 5-13. California Red-legged Frog Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
CRLF Goal 1: Promote persistence of California red-legged frog populations in the RCIS area through protection, restoration, and enhancement of habitat.	CRLF Objective 1.1: Protect known occurrences and allow expansion by protecting 8,200 acres of suitable habitat. Measure progress toward achieving this objective by the number of breeding creeks and ponds, acres of adjacent upland habitat, and associated/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Water quality	CRLF 1.1.1: Support local zoning regulations that prevent incompatible uses of occupied and unoccupied suitable breeding and upland habitat (USFWS 2002).

Goal	Objective	Threats	Co-Benefits	Action
	CRLF Objective 1.2: Enhance occupied, suitable, and U.S. Fish and Wildlife Service -designated critical habitat for California red-legged frog throughout the RCIS area, especially in U.S. Fish and Wildlife Service core areas (Elkhorn Slough, Carmel River–Santa Lucia, and Gabilan Range) (USFWS 2002). Measure progress toward achieving this objective by acres of breeding, dispersal, and upland habitat and adjacent/equivalent acres enhanced and occupied by California red-legged frog.	• Non-native species	• Non-native invasive species • Other focal/ non-focal species • Biodiversity	CRLF 1.2.1: Remove non-native invasive species, by making changes to pond hydrology or by temporarily draining ponds. Areas that may benefit include Fort Hunter Ligget (San Antonio and Nacimiento drainages) (USFWS 2002).
		• Wildfire • Climate change	• Fire management • Other focal/ non-focal species • Biodiversity • Climate change resilience	CRLF 1.2.2: Develop and implement fire management guidelines that promote California red-legged frog habitat and populations (USFWS 2002).

Goal	Objective	Threats	Co-Benefits	Action
		• Increased salinity and saltwater intrusion • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity • Water quality	CRLF 1.2.3: Improve management of breeding habitat to prevent sea water inundation by restoring natural hydrology to coastal sloughs (USFWS 2002).
		• Flood control infrastructure (e.g., channelization, vegetation management)	• Other focal/ non-focal species • Water quality • Water recharge	CRLF 1.2.4: Improve management of flood control infrastructure to reduce negative impacts, such as channelization and vegetation management, on California red-legged frog breeding and dispersal habitat.
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity	CRLF 1.2.5: Manage upland vegetation structure and density to support California red-legged frogs.

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity • Water quality • Water recharge	CRLF 1.2.6: Manage aquatic pond vegetation to support California red-legged frogs.

Goal	Objective	Threats	Co-Benefits	Action
	CRLF Objective 1.3: Restore occupied, suitable, or U.S. Fish and Wildlife Service - designated habitat for California red-legged frog and create new habitat. Measure progress toward achieving this objective by acres of restored or created habitat and adjacent/equivalent acres, and by the number of breeding ponds restored or created.	• Habitat loss, degradation, fragmentation • Climate change	• Water quality • Water recharge • Other focal/ non-focal species • Biodiversity • Climate change resilience	CRLF 1.3.1: Increase the amount of California red-legged frog breeding habitat in creeks through creation of more plunge pools and slow-water habitats, by incorporating these features in restoration designs in breeding habitat in creeks, as well as by creation of artificial ponds in areas with suitable upland habitat. Promote natural water flow regimes and vegetative cover in streams and creeks (USFWS 2002).

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	CRLF 1.3.2: At Fort Ord, restore and manage East Garrison Pond, and at least one additional aquatic feature, totaling at least 2 acres (FORA 2018).
CRLF Goal 2: Support stability and recovery of California red-legged frog populations in the RCIS area through measures to reduce direct mortality.	CRLF Objective 2.1: Reduce vehicle-related mortality factors. Measure progress toward achieving this objective by the reduction of vehicle-related California red-legged frog deaths detected, compared to present day.	• Vehicle-impact mortality • Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Connectivity • Biodiversity • Climate change resilience	CRLF 2.1.1: Install infrastructure to promote wildlife movement through roadways (e.g., wildlife tunnels, overpasses), to reduce road mortality in transportation corridors with high numbers of vehicle-related California red-legged frog mortality. Focus on areas adjacent to known breeding locations and protected habitats.

Goal	Objective	Threats	Co-Benefits	Action
	CRLF Objective 2.2: Reduce pathogen-related mortality. Measure progress toward achieving this objective by the reduction of disease-related California red-legged frog deaths detected, compared to present day (USFWS 2002).	• Disease • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	CRLF 2.2.1: Monitor for diseases that affect California red-legged frog populations and implement management actions to reduce their transmission and impact on the species.
		• Disease • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	CRLF 2.2.2: Sterilize all equipment entering known or suitable California red-legged frog breeding habitat, to prevent introduction of disease.
		• Disease • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	CRLF 2.2.3: Monitor known and potential breeding habitats for presence of pathogens, through traditional and environmental DNA (eDNA) methods.
Sources: CDFW 2015, 2020; USFWS 2002; FORA 2018				

5.3.11 California Tiger Salamander (Central California DPS) (Ambystoma californiense)

California Tiger Salamander
Photo Credit: Ivan Parr

Status

- Federally Threatened
- California Threatened

Ecological Requirements

- RCIS Regions: Salinas Valley, Gabilan Range and Pinnacles National Park, and Inner Coast Range (Figure 5-6)
- RCIS Natural Communities: Freshwater Emergent Wetland, Valley Oak Woodland, Mixed Chaparral, Annual Grassland, Vernal Pool (CDFW 2020)
- Breeding aquatic habitat: Vernal pools and ponds, livestock ponds, other modified ephemeral and permanent ponds. Optimal breeding habitat is ephemeral and should dry for at least 30 days before rains begin in the fall (CDFW 2020, USFWS 2017).
- Upland habitat: Spend most of time as adults in upland subterranean refugia. Require small mammal burrows in upland areas surrounding breeding pools (USFWS 2017). Prime terrestrial habitat is found in annual grassland (CDFW 2005, 2019).

- Dispersal: Adults engage in mass migrations (up to 1.5 miles) during rain events from November to April, from upland habitat to breeding ponds (USFWS 2017).
- Monterey is the epicenter of hybridzation with non-native barred salamanders which threatens species genetic integrity (USFWS 2017).
- Susceptible to fungal diseases (Padgett-Flohr 2008)
- Full species account available: Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (Ambystoma californiense) (USFWS 2017)
- RCIS Conservation Target: High (listed species, Monterey County is epicenter for hybridization and competition with barred salalamander, limited distribution of breeding habitat)

Associated Non-Focal Species

- Western spadefoot (Spea hammondii)
- Contra Costa goldfields (Lasthenia conjugens)
- Jolon clarkia (Clarkia jolonensis)

Climate Change Vulnerability Assessment

California tiger salamander (CTS) is at 'intermediate risk' from climate change across the state (Wright et al. 2013) (Table 5-14.). Some of the climatically suitable habitat in the southern portion of the RCIS area is likely to remain suitable in 2050 under high emission scenarios, while areas in the Salinas Valley may become unsuitable. Species distribution, however, is projected to be reduced in both high and low emissions scenarios.

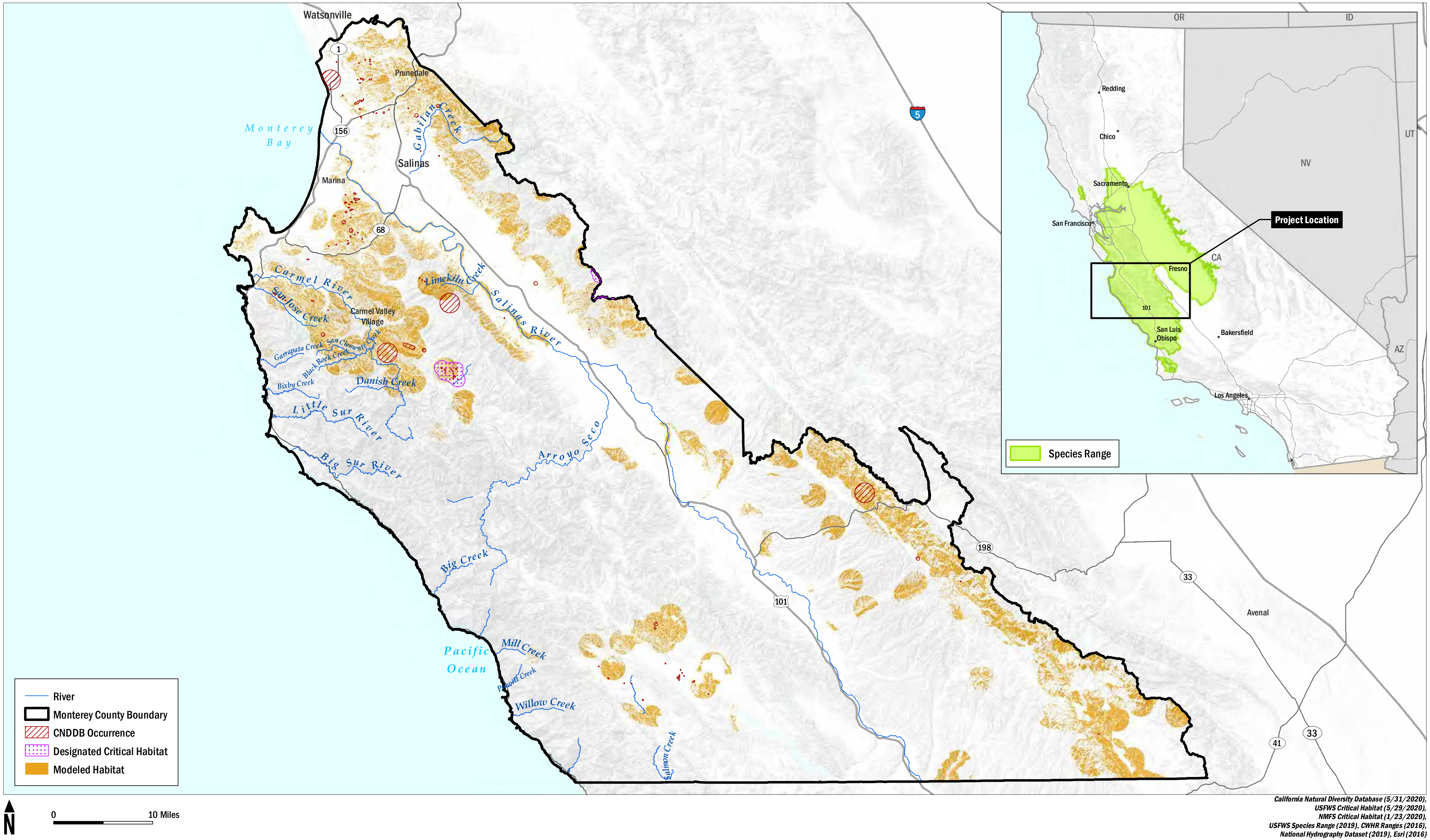
Although California tiger salamander life history strategies are adapted to drought conditions, climate change is projected to result in erratic weather patterns that the species is not likely to adapt quickly enough to (USFWS 2017). Increased durations of drought conditions may result in breeding ponds drying out before larvae can metamorphose, and increased water temperatures and fluctuations in water levels during the breeding season may results in embryo mortality (USFWS 2017). Drought conditions also favor the life history strategies of non-native hybrid tiger salamanders, which have been shown to travel further and faster than native California tiger salamanders at higher temperatures (USFWS 2017).

Table 5-14. California Tiger Salamander Climate Vulnerability Ranking

Type of Analysis	Low Emissions (RCP4.5)	High Emissions (RCP8.5)
Point Ranking (distribution)	Moderately Reduced - Moderate	Greatly Reduced – Mid-high
Area Ranking (habitat)	Somewhat Increased Vulnerability - Moderate	Increased Vulnerability – Mid-high
Source: Wright et al. 2013		

The goals, objectives, and actions shown in Table 5-15. aim to protect, enhance, and restore present day suitable habitats for California tiger salamander, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as monitoring for disease and sources of road mortality, which may allow individuals to move to newly suitable habitats in the future.

A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-6 shows the range and modeled suitable habitat of the California tiger salamander.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-6
California Tiger Salamander

California Tiger Salamander Conservation Priorities, Goals, Objectives, and Actions

All RC and Amphibian goals, objectives, and actions apply to California tiger salamander. Water action 1.1.1, 1.1.3, 1.1.5, 1.1.7, 1.1.8, and Water Objective 1.2 apply. Table 5-15. summarizes the specific goals, objectives, and actions for this species.

Conservation Priorities

- Establish preserves of habitat suitable for all life stages in the five management units of the Central Coast Range Recovery Unit that occur in the RCIS area—Fort Ord, Carmel Valley, Fort Hunter-Liggett, Salinas Valley, and Peachtree Valley—and establish corridors between metapopulations (USFWS 2017) (CTS 1.1.2).
- Target eradication of hybrid and non-native barred tiger salamanders, which threaten genetic diversity, in Fort Ord and the Peachtree Valley, through management of breeding pond hydrology (USFWS 2017) (CTS 2.3.2).

Table 5-15. California Tiger Salamander Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
CTS Goal 1: Promote persistence of California tiger salamander populations in the RCIS area through protection, restoration, and enhancement of habitat.	CTS Objective 1.1: Protect known occurrences and allow expansion by protecting 109,000 acres of suitable habitat. Measure progress toward achieving this objective by the number of breeding locations, acres of adjacent upland habitat, and associated/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	CTS 1.1.1: Acquire parcels with known breeding occurrences and adjacent dispersal/terrestrial habitat as well as parcels with unoccupied suitable habitat for California tiger salamander through fee title purchase of conservation easement. Prioritize habitats with vernal pools or other ephemeral breeding ponds and habitat that creates corridors between metapopulations (USFWS 2017).

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation • Climate change	• Connectivity • Other focal/ non-focal species • Biodiversity • Climate change resilience	CTS 1.1.2: Create California tiger salamander habitat preserves with suitable breeding and upland characteristics, totally a minimum of 3,398 acres. Prioritize habitats with vernal pools or other ephemeral breeding ponds and habitats that create corridors between metapopulations, especially in the five management units of the Central Coast Range Recovery Unit that occur in the RCIS area, Fort Ord, Carmel Valley, Fort Hunter-Liggett, Salinas Valley, and Peachtree Valley (USFWS 2017).

Goal	Objective	Threats	Co-Benefits	Action
	CTS Objective 1.2: Enhance occupied, suitable, and U.S. Fish and Wildlife Service-designated California tiger salamander habitat throughout the RCIS area. Measure progress toward achieving this objective by acres of breeding, dispersal, and upland habitat and adjacent/equivalent acres enhanced and occupied by California tiger salamander.	• Non-native species	• Other focal/ non-focal species • Biodiversity • Non-native invasive species	CTS 1.2.1: Remove non-native plant and wildlife species and hybrid tiger salamanders from breeding ponds, by draining perennial ponds annually (USFWS 2017).
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity	CTS 1.2.2: Reduce/eliminate small mammal control efforts. Implement programs to increase small mammal populations in areas where they have been eradicated (USFWS 2017).
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity	CTS 1.2.3: Manage upland vegetation structure and density to support California tiger salamanders.

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity • Water quality • Water recharge	CTS 1.2.4: Manage aquatic pond vegetation to support California tiger salamanders.
	CTS Objective 1.3: Restore occupied, suitable, and U.S. Fish and Wildlife Service - designated California tiger salamander habitat and create new habitat. Measure progress toward achieving this objective by acres of breeding habitat and associated/equivalent acres restored or created and by the number of breeding ponds restored or created.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	CTS 1.3.1: At Fort Ord, restore and manage East Garrison Pond, and at least one additional aquatic feature, totaling at least 2 acres (FORA 2018).

Goal	Objective	Threats	Co-Benefits	Action
CTS Goal 2: Support stability and recovery of California tiger salamander populations in the RCIS area through measures to reduce direct mortality.	CTS Objective 2.1: reduce vehicle-related mortality. Measure progress toward achieving this objective by the reduction of vehicle-related California tiger salamander deaths detected, compared to present day.	• Transportation infrastructure construction and maintenance • Vehicle-impact mortality • Climate change	• Other focal/ non-focal species • Biodiversity • Connectivity • Climate change resilience	CTS 2.1.1: Implement measures to reduce road mortality, by creating wildlife crossing infrastructure (tunnels or overpasses) that promote California tiger salamander movement through transportation corridors (USFWS 2017). Focus on areas adjacent to known locations and protected habitats.
	CTS Objective 2.2: Reduce pathogen-related mortality. Measure progress toward achieving this objective by the reduction of disease-related California salamander deaths detected, compared to present day.	• Disease • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	CTS 2.2.1: Monitor for diseases that affect California tiger salamander populations, using traditional and eDNA methods, and implement management actions to reduce their transmission and impacts on the species.

Goal	Objective	Threats	Co-Benefits	Action
		• Disease • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	CTS 2.2.2: Sterilize all equipment entering known or suitable California salamander breeding habitat, to prevent the introduction of pathogens.
	CTS Objective 2.3: Reduce the rates of hybridization with non-native tiger salamanders. Measure progress toward achieving this objective by the reduction of hybrid tiger salamanders detected, compared to present day.	• Hybridization with non-native tiger salamanders • Climate change	• Other focal/ non-focal species • Climate change resilience • Biodiversity • Non-native invasive species	CTS 2.3.1: Conduct genetic testing for hybrid and non-native tiger salamanders.

Goal	Objective	Threats	Co-Benefits	Action
		• Hybridization with non-native tiger salamanders • Climate change	• Other focal/ non-focal species • Climate change resilience • Biodiversity • Non-native invasive species	CTS 2.3.2: Implement targeted eradication of hybrid and non-native tiger salamanders, through management of breeding pond hydrology (USFWS 2017).
Sources: CDFW 2015, 2020; USFWS 2017; FORA 2018				

5.3.12 Coast Horned Lizard (Phrynosoma blainvillii)

Coast Horned Lizard
Photo Credit: Ivan Parr

Status

- State Species of Special Concern

Ecological Requirements

- RCIS Regions: Monterey Bay Coastline, Inner Coast Range, Mid-Inner Coast Range, Outer Coast Range (Figure 5-7)
- RCIS Natural Communities: Coastal Dune, Coastal Scrub, Mixed Chaparral, Montane Chaparral (CDFW 2020)
- Found in open areas, especially sandy areas, washes, floodplains, and wind-blown deposits with scattered low shrubs (CDFW 2000a, 2020
- Hibernation: Burrows into the soil under surface objects such as logs or rocks, in mammal burrows, or in crevices during fall and winter months (CDFW 2000a)
- Feeds primarily on native ant species, whose populations are threatened by non-native invasive Argentine ants (CDFW 2020).
- Full species account available: Blainville's Horned Lizard Life History Account (CDFW 2000a)
- RCIS Conservation Target: Moderate (not listed; steep declines in Monterey County)

Associated Non-Focal Species

- Monterey larkspur (Delphinium hutchinoniae)

Climate Change Vulnerability Assessment

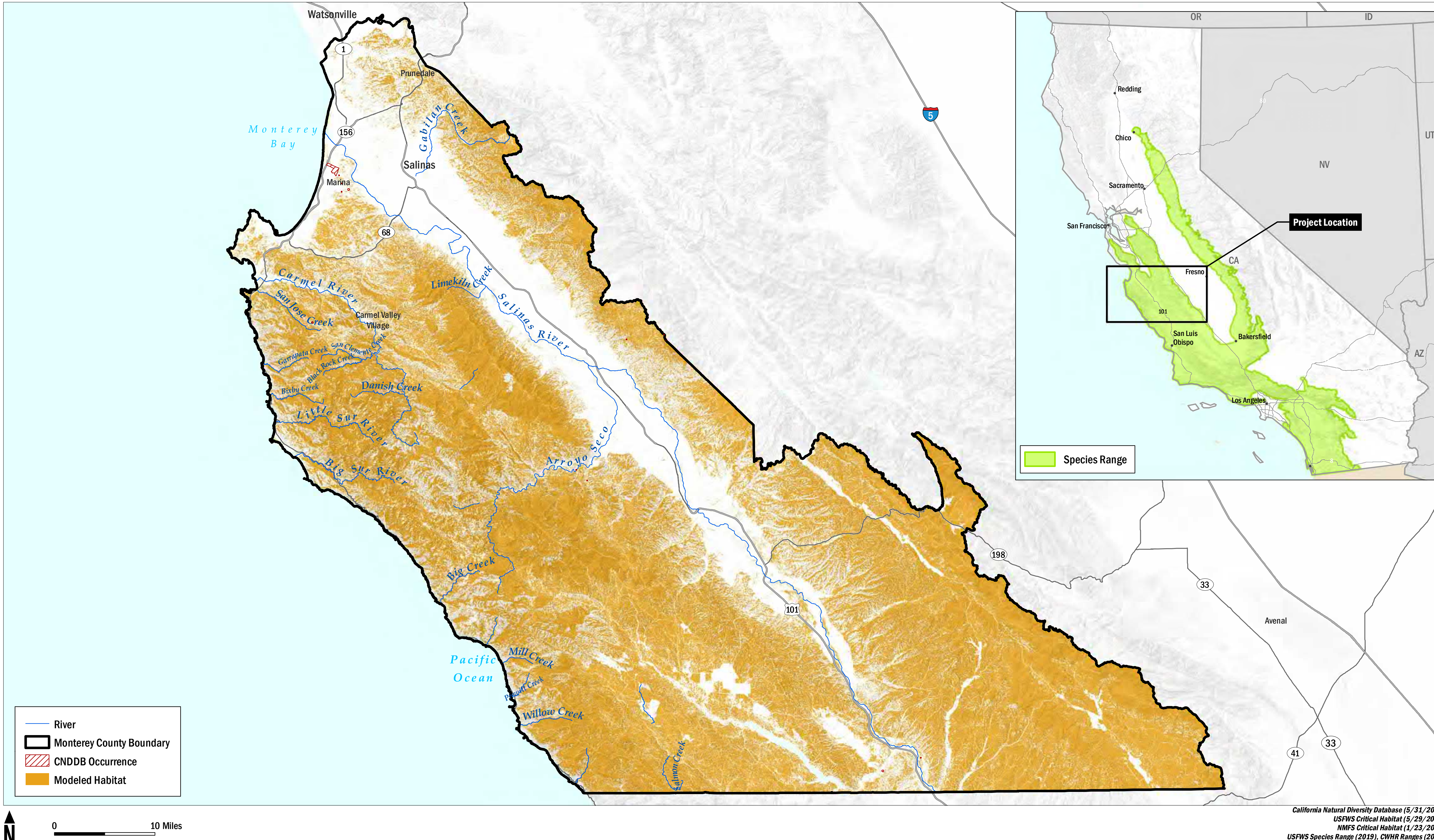
Coast horned lizard (CHL) is at “neutral risk” from climate change across the state, based on the likely persistence of current populations through 2050 and the amount of currently climatically suitable habitat likely to remain suitable (Wright et al. (2013) (Table 5-16). Projections indicate that in 2050, more than 80 percent of the species current distribution will remain and no greater than a 20 percent change in available suitable habitat will occur under low and high emission scenarios. Most of the climatically suitable habitat in the RCIS area is likely to remain suitable in 2050. Despite these projections, non-climate pressures still threaten coast horned lizard. Climate change will exacerbate the threats listed in Table 5-17..

Table 5-16. Coast Horned Lizard Climate Vulnerability Ranking

Type of Analysis	Low Emissions (RCP4.5)	High Emissions (RCP8.5)
Point Ranking (habitat)	Slightly Reduced–Low	Slightly Reduced–Low
Area Ranking (distribution)	Neutral–Low	Neutral–Low
Source: Wright et al. 2013		

The goals, objectives, and actions shown in Table 5-17. aim to protect, enhance, and restore present day suitable habitats for coast horned lizard, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as removal of non-native invasive Argentine ants, which may allow individuals to move to newly suitable habitats in the future.

A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-7 shows the range and modeled suitable habitat for the coast horned lizard.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-7
Coast Horned Lizard

Coast Horned Lizard Conservation Priorities, Goals, Objectives, and Actions

All RC goals, objectives, and actions apply to coast horned lizard. Table 5-17. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect habitat surrounding known occurences near Marina, the southern Salinas Valley, and in the Coast Range (RC Objective 1.1).
- Because non-native prey species are a threat to the coast horned lizard (CHL 1.2.1), control the spread of Argentine ants into occupied and suitable habitats.

Table 5-17. Coast Horned Lizard Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
CHL Goal 1: Promote persistence of coast horned lizard populations in the RCIS area through protection, restoration, and enhancement of habitat.	CHL Objective 1.1: Protect known occurrences and allow expansion by protecting 258,000 acres of suitable habitat. Measure progress toward achieving this objective by the number of known locations, acres of adjacent habitat, and associated/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions.

Goal	Objective	Threats	Co-Benefits	Action
	CHL Objective 1.2: Enhance occupied and suitable coast horned lizard habitat throughout the RCIS area. Measure progress toward achieving this objective in acres of habitat and adjacent/equivalent acres enhanced and occupied by coast horned lizard.	• Non-native species (e.g., argentine ants)	• Non-native invasive species	CHL 1.2.1: Prevent the invasion and spread of Argentine ants into occupied habitat by controlling soil moisture (e.g., drainage runoff, revegetation, irrigation).
Sources: CDFW 2000a, 2015, 2019				

5.3.13 Foothill Yellow-legged Frog (Southwest/South Coast Clade) (Rana boylii)

Foothill yellow-legged frog
Photo Credit: Ivan Parr

Status

- California Endangered
- State Species of Special Concern

Ecological Requirements

- RCIS Regions: Gabilan Range and Pinnacles National Park, Outer Coast Range
- RCIS Natural Communities: Riverine, Riparian (CDFW 2000b, 2019)
- Occupies a diverse range of ephemeral and permanent streams, rivers, and adjacent terrestrial stream margins various vegetation types, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, mixed chaparral, and wet meadows (Hayes et al. 2016)
- Perfers partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats (CDFW 2020; Hayes et al. 2016)
- Breeding and rearing habitat: Gently flowing, low-gradient stream sections with variable substrates predominantly composed of cobble and boulder (Hayes et al. 2016)
- Rarely encountered far from permanent water (CDFW 2000b)

- Information lacking on on threats such as fire management and livestock grazing (Hayes et al. 2016)
- Full species account available: Foothill yellow-legged frog conservation assessment in California (Hayes et al. 2016)
- RCIS Conservation Target: Highest (very rare clade in RCIS area, limited distribution of breeding habitat)

Associated Non-Focal Species

- Least Bell's vireo (Vireo bellii pusillus)
- Little willow flycatcher (Empidonax traillii brewsteri)

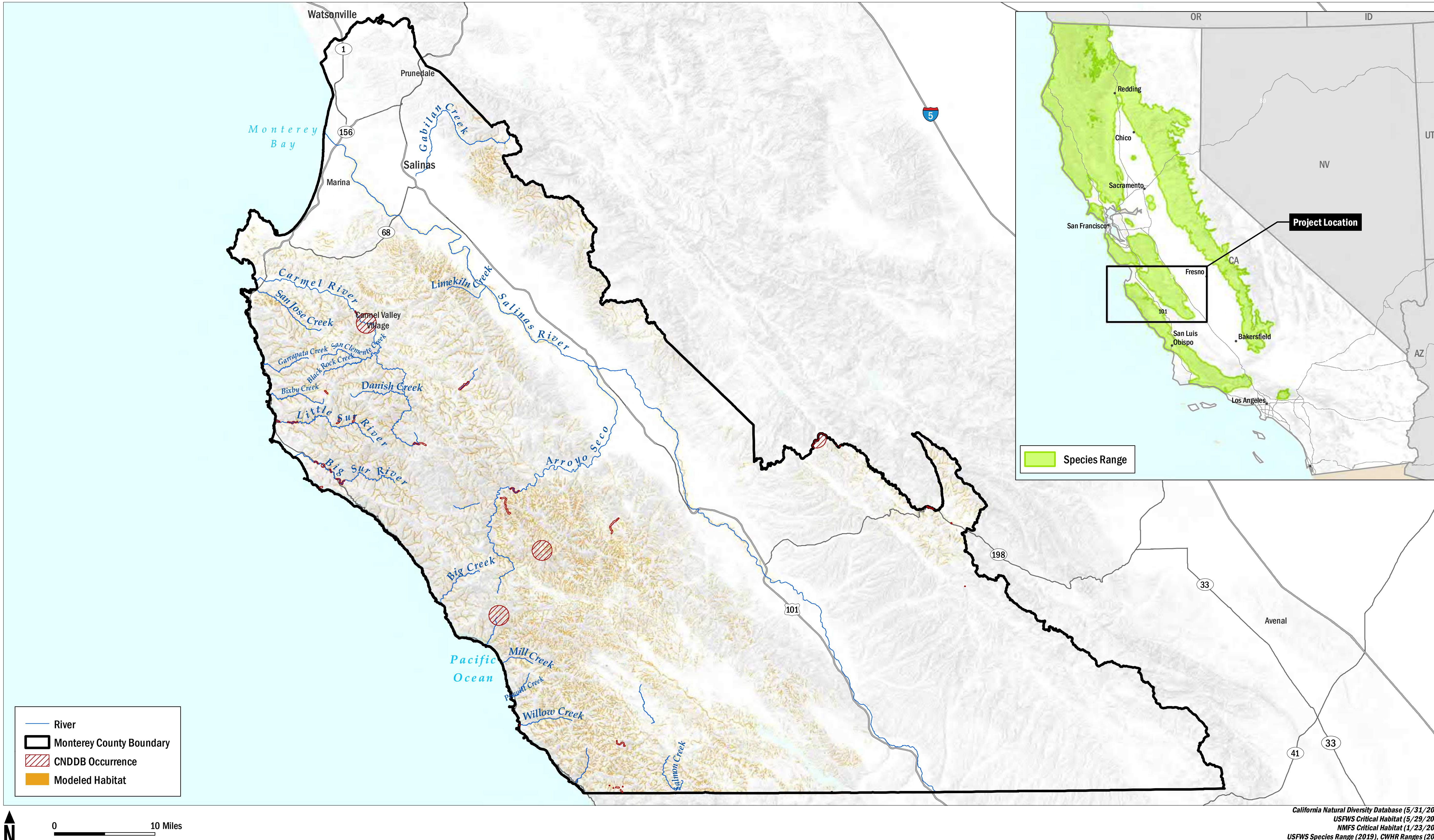
Climate Change Vulnerability Assessment

Foothill yellow-legged frog (FYLF) is estimated to be at "neutral risk" from climate change across the state (Wright et al. 2013) (Table 5-18.), based on the likely persistence of current populations through 2050 and the amount of currently climatically suitable habitat likely to remain suitable. Projections indicate that in 2050 most of the currently climatically suitable habitat in the RCIS area is likely to remain suitable. Despite these projections, increased frequencies in extreme weather may have negative impacts (Hayes et al. 2016). Extended droughts and changes to precipitation patterns may lead to further changes to flow regimes (Hayes et al. 2016). Changes in air and water temperatures may lead to increases in disease prevalence and virulence and to decreased prey availability (Hayes et al. 2016).

Table 5-18. Foothill Yellow-Legged Frog Climate Vulnerability Ranking

Type of Analysis	Low Emissions (RCP4.5)	High Emissions (RCP8.5)
Point Ranking (distribution)	Slightly Reduced–Low	Slightly Reduced–Low
Area Ranking (habitat)	Neutral–Low	Neutral–Low
Source: Wright et al. 2013		

The goals, objectives, and actions shown in Table 5-19. aim to protect, enhance, and restore present day suitable habitats for foothill yellow-legged frog, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as research into potential threats, which may allow individuals to move to newly suitable habitats in the future. A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-8 shows the range and modeled habitat for the foothill yellow-legged frog.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-8

Foothill Yellow-legged Frog (Southwest/South Coast Clade)

Foothill Yellow-legged Frog Conservation Priorities, Goals, Objectives, and Actions

RC and Amphibian goals, objectives, and actions apply to foothill yellow-legged frog. Water Objective 1.1, Water Objective 1.2 apply. Table 5-19. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Because this species relies on permanent water, prioritize acquiring, protecting, and enhancing the quality of aquatic, riparian, and adjacent upland habitat in the Coast and Gabilan Ranges, near known occurences on tributaries to the Carmel River, San Antonio River, and Arroyo Seco (RC Objective 1.1).

Table 5-19. Foothill Yellow-legged Frog Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
FYLF Goal 1. Promote persistence of foothill yellow-legged frog populations in the RCIS area through protection, restoration, and enhancement of habitat.	FYLF Objective 1.1: Protect known occurrences and allow expansion by protecting 45,000 acres of suitable habitat. Measure progress toward achieving this objective by the number of known locations, acres of adjacent habitat, and associated/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions
	FYLF Objective 1.2: Enhance occupied and suitable foothill yellow-legged frog habitat throughout the RCIS area. Measure progress toward achieving this objective in the acres of aquatic habitat, adjacent upland habitat, and adjacent/equivalent acres enhanced and occupied by foothill yellow-legged frog.	• Vegetation management activities	• Other focal/ non-focal species • Biodiversity • Fire management	FYLF 1.2.1: Investigate impacts of potential threats where information is lacking, such as fire management and livestock grazing, and identify and implement adjustments to management of these practices where needed (Hayes et al. 2016).
Sources: CDFW 2000b, 2015, 2019; Hayes et al. 2016				

5.3.14 Monarch Butterfly (Danaus plexippus pop. 1)

Monarch butterfly
Photo Credit: Ivan Parr

Status

- None

Ecological Requirements

- RCIS Regions: Big Sur Coastline, Monterey Bay Coastline, Monterey Peninsula to Point Lobos (CDFW 2020)
- RCIS Natural Communities: Montane Hardwood, Closed-Cone Pine-Cypress (CDFW 2020)
- Requires milkweed plants (Asclepias sp.) for egg laying and caterpillar development, adult nectar sources, and sites for roosting, thermoregulation, mating, and predator escape (Center for Biological Diversity and Center for Food Safety, 2014)
- Overwintering population roosts in wind-protected tree groves (non-native eucalyptus (Eucalyptus sp.) or native Monterey pine (Pinus radiata), Monterey cypress (Cupressus macrocarpa), western sycamore (Plantanus racemosa), coast redwood (Sequoia sempervirens), coast live oak (Quercus agrifolia), and other native species at low elevations (<300 feet) with nectar and water sources nearby. Most sites occur within 1.5 miles of the shoreline (CDFW 2020; Center for Biological Diversity and Center for Food Safety 2014)

- Threatened by tropical milkweed and anthropogenic threats such as tourism, solar facilities, and mosquito abatement (Center for Biological Diversity and Center for Food Safety 2014).
- Full species account available: California Natural Diversity Database, RareFind 5 (CDFW 2020) and Petition to Protect the Monarch Butterfly (Danaus plexippus plexippus) Under the Endangered Species Act, Before the Secretary of the Interior (Center for Biological Diversity and Center for Food Safety 2014)
- RCIS Conservation Target: Moderate (non-listed, large overwintering population; occurs on native Monterey pine in the RCIS area)

Associated Non-Focal Species

- None

Climate Change Vulnerability Assessment

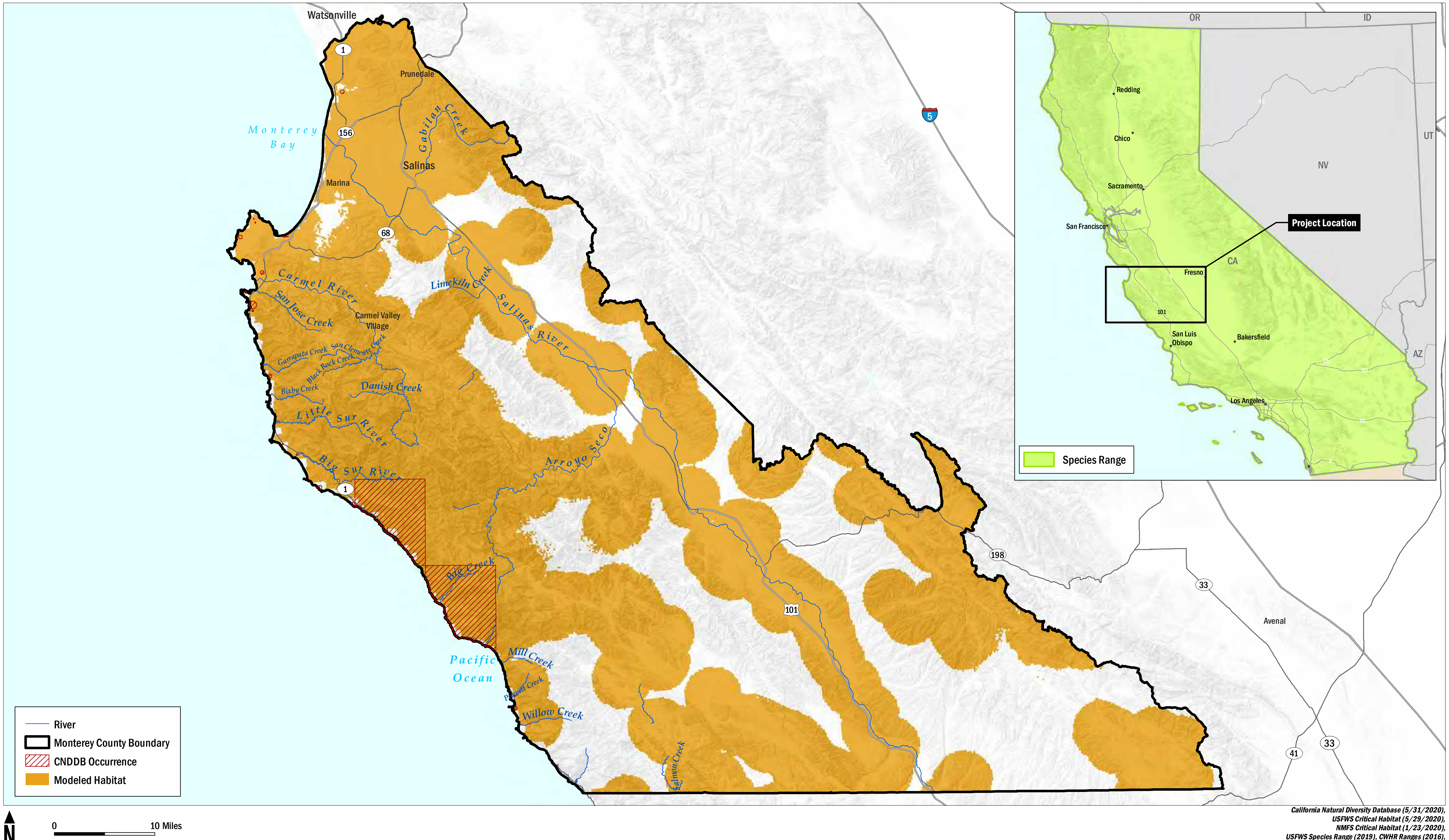
Possible climate change impacts on monarch butterflies (MB) include increased summer temperatures and decreased winter temperatures, which may make present-day habitat unsuitable. Increased storm events and droughts, reduced water availability, increased disease susceptibility, and a reduction in the population of milkweed larval host plants, nectar sources, and forests used for overwintering may lead to increased mortality and population reductions. It is likely that overwintering habitat, especially in Mexico, will become unsuitable by the end-of-century and that monarch butterflies will have to adjust their seasonal movement patterns to persist as a species (Center for Biological Diversity and Center for Food Safety 2014).

Table 5-20. summarizes the climate change exposure, spatial distribution, and vulnerability of montane hardwood communities statewide, which could experience a 0 to 25 percent reduction in habitat suitability, and closed-cone pine-cypress communities statewide, which could experience a 25 to 75 percent reduction in habitat suitability.

Table 5-20. Monarch Butterfly Natural Communities Climate Vulnerability Ranking

Natural Communities	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Closed-cone Pine-Cypress	Moderate	Mid-High	Moderate
Montane Hardwood	Low to Moderate	Mid-High	Moderate to Mid-High (Hot and Dry)
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-21. aim to protect, enhance, and restore present day suitable habitats for monarch butterfly, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as the removal of tropical milkweed species to decrease the transmission of pathogens, which may allow individuals to move to newly suitable habitats in the future. Figure 5-9 shows the range and modeled habitat for the monarch butterfly.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-9
Monarch Butterfly

Monarch Butterfly Conservation Priorities, Goals, Objectives, and Actions

RC Goals 1 applies to monarch butterfly. Table 5-21. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect habitat surrounding known occurences, along the coastline from Monterey Bay to Point Lobos and the Big Sur Coastline (CDFW 2020) (RC Objective 1.1).
- Enhance suitable or potential habitat by managing trees in overwintering sites and byplanting native milkweed, from Monterey Bay to Point Lobos (MB 1.2.1, 1.2.2). To reduce the transmission of pathogens, enhance habitat by removal of tropical milkweed species (MB 2.1.1).

Table 5-21. Monarch Butterfly Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
MB Goal 1. Promote the persistence of monarch butterfly populations in the RCIS area through protection, restoration, and	MB Objective 1.1: Protect known occurrences and allow expansion by protecting 246,000 acres of suitable habitat. Measure progress toward achieving this objective in acres of habitat and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
enhancement of habitat.	MB Objective 1.2: Enhance occupied and suitable monarch butterfly habitat in the RCIS area. Measure progress toward achieving this objective in acres of habitat and adjacent/equivalent acres enhanced and occupied by monarch butterfly.	• Aging, diseased dense tree stands • Non-native species	• Non-native invasive species • Other focal/ non-focal species • Biodiversity	MB 1.2.1: Manage trees and canopies in overwintering sites by removing old/aging trees, planting native trees, removing non-native eucalyptus, and conducting tree trimming where excess canopy density is a threat to monarch butterflies (Center for Biological Diversity and Center for Food Safety 2014).
		• Habitat loss, degradation, fragmentation • Climate change	• Biodiversity • Climate change resilience	MB 1.2.2: Plant native milkweed (Asclepias sp.) to improve breeding and larvae development habitat.
		• Recreational activities (e.g.,tourism)	• Public recreation	MB 1.2.3: Reduce negative impacts of tourism on monarch butterfly overwintering sites.

Goal	Objective	Threats	Co-Benefits	Action
		• Pesticide and insecticide use	• Other focal/ non-focal species • Biodiversity	MB 1.2.4: Reduce/eliminate negative impacts of mosquito abatement programs on monarch butterfly.
		• Solar energy facilities	• Biodiversity	MB 1.2.5: Manage solar energy facilities to ensure that they are compatible with monarch butterfly.
	MB Objective 1.3: Restore occupied and suitable monarch butterfly habitat and create new habitat in the RCIS area. Measure progress toward achieving this objective by acres of occupied, suitable, and potentially suitable habitat and adjacent/ equivalent acres, restored or created and occupied by monarch butterfly.	• Habitat loss, degradation, fragmentation • Non-native species • Overcrowding in available habitat • Climate change	• Focal/non-focal species • Habitat connectivity • Climate change resilience • Public recreation	MB 1.3.1: Restore native tree stands in areas with suitable micro-habitats.

Goal	Objective	Threats	Co-Benefits	Action
MB Goal 2. Support stability and recovery of monarch butterfly populations in the RCIS area through measures to reduce direct mortality.	MB Objective 2.1: Reduce pathogen-related mortality. Measure progress by the reduction of pathogen-related monarch butterfly deaths detected, compared to present day.	• Disease • Non-native species • Climate change	• Non-native invasive species • Climate change resilience	MB 2.1.1: Reduce the spread/ introduction of tropical milkweed species to decrease the transmission of pathogens, through education about the negative impacts on monarch butterfly (Center for Biological Diversity and Center for Food Safety 2014).
Sources: CDFW 2015, 2020; Center for Biological Diversity and Center for Food Safety 2014				

5.3.15 Mountain Lion (Southern California/Central Coast ESU) (Puma concolor)

Mountain lion
Photo Credit: Ivan Parr

Status

- State Specially Protected Mammal
- State Candidate for Listing

Ecological Requirements

- RCIS Regions: All terrestrial regions
- RCIS Natural Communities: All terrestrial communities (CDFW 1988a; Yap and Rose 2019)
- Large, nocturnal carnivore that requires extensive areas of riparian vegetation and brushy stages of various habitats, with interspersions of irregular terrain, rocky outcrops, and tree/brush edges (CDFW 1988a; Yap and Rose 2019)
- Territorial and solitary, requires large areas of relatively undisturbed habitats with adequate connectivity (Yap and Rose 2019)
- Large ungulates make up approximatley 70 percent of the mountain lion’s diet; however, as opportunistic predators, they will eat a variety of other larger and smaller prey (Yap and Rose 2019).

- Full species account available: CDFW Mountain Lion Life History Account (CDFW 1988a)
- RCIS Conservation Target: Moderate (widely distributed habitat, representative of terrestrial habitat connectivity, required large contiguous undisturbed habitats)

Associated Non-Focal Species

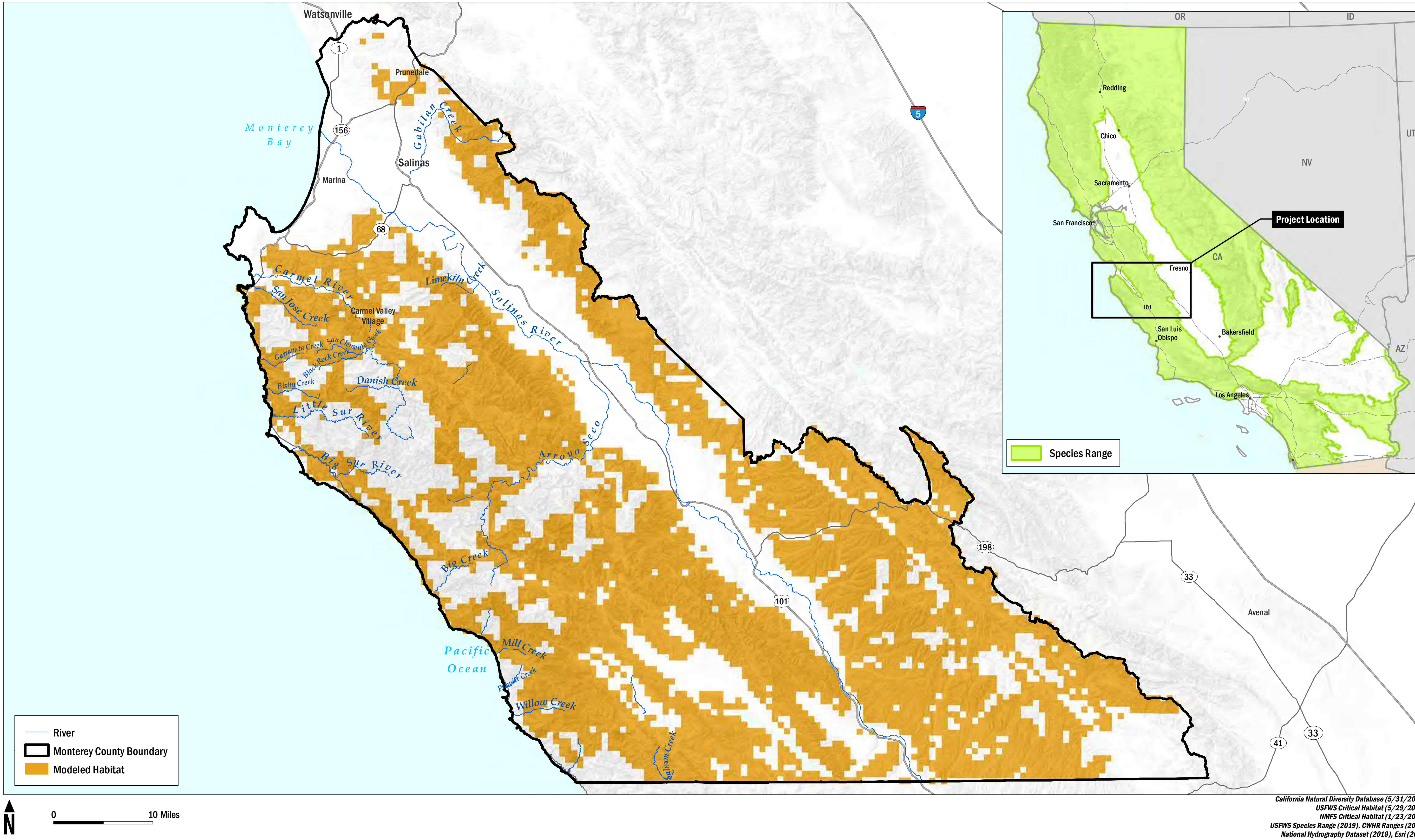
- American badger (Taxidea taxus)
- Jolon clarkia (Clarkia jolonensis)

Climate Change Vulnerability Assessment

Mountain lion southern California/central coast ESU (ML) occurs in all habitat types and all regions in the RCIS area and thus are less susceptible to changes in any one habitat type. Mountain lion has a high dispersal range (48.92 kilometers per year) and are likely able to keep pace with large-scale climate changes (Schloss et al. 2012). Despite being highly mobile, mountain lion is still likely susceptible to stochastic, catastrophic weather events such as severe, wind-driven fires (Yap and Rose 2019). Climate change will also likely exacerbate all threats listed in Table 5-22..

The goals, objectives, and actions shown in Table 5-22. aim to protect, enhance, and restore present day suitable habitats for mountain lion, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as promoting genetic diversity, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-10 shows the range and modeled habitat for the mountain lion.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-10

Mountain Lion (Southern California/Central Coast ESU)

Mountain Lion Conservation Priorities, Goals, Objectives, and Actions

All RC goals, objectives, and actions apply to mountain lion. Table 5-22. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect habitat that offers corridor linkages for mountain lion in the Coast and Gabilan Range, such as the Jolon Hills that connect the Salinas Valley to Fort Hunter Ligget, the Powell Canyon area, and Stockdale Mountain (RC Objective 1.1).

Table 5-22. Mountain Lion Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
ML Goal 1: Promote persistence of mountain lion populations in the RCIS area by improving habitat connectivity, prey habitats, and public awareness.	ML Objective 1.1: Protect known occurrences and allow expansion by protecting 335,600 acres of suitable habitat. Measure progress toward achieving this objective in the number of acres of habitat and adjacent/equivalent acres that are protected.	• Habitat loss, degradation, fragmentation	• Connectivity • Other focal/ non-focal species • Intraspecific competition because of limited habitat • Increased wildfire frequency and severity	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	ML Objective 1.2: Improve habitat connectivity for mountain lion. Measure progress toward achieving this objective in acres of corridor habitat protected and the number of barriers to movement modified, removed, or otherwise upgraded and used by mountain lion.	• Vehicle-impact mortality • Decreased habitat connectivity	• Connectivity • Other focal/ non-focal species • Intraspecific competition because of limited habitat • Increased wildfire frequency and severity	ML 1.2.1: Install, repair, and improve infrastructure (e.g., by adding large culverts, undercrossings, overcrossings, bridges, directional fencing, scuppers, barrier breaks, roadside wildlife detection systems), and remove existing barriers to promote wildlife movement and reduce road mortality (Yap and Rose 2019). Focus on areas with high numbers of vehicle-related mountain lion mortality and areas with high Area of Conservation Emphasis Terrestrial Connectivity rankings.
		• Vehicle-impact mortality	• Connectivity • Other focal/ non-focal species	ML 1.2.2: Work with transportation districts or others to collect and analyze roadkill data, to identify hotspots where mountain lions are killed, to inform the design of wildlife crossing infrastructure improvements (Yap and Rose 2019).

Goal	Objective	Threats	Co-Benefits	Action
		• Vehicle-impact mortality • Decreased habitat connectivity	• Connectivity • Other focal/ non-focal species	ML 1.2.3: Create and sustain long-term funding for long-term management of crossings, including exclusion fencing repairs, solar panels for roadside detectors, weed abatement, and culvert clean out.
	ML Objective 1.3: Support sustainable natural prey populations and habitat. Measure progress toward achieving this objective by increases in prey populations and health of prey habitats, compared to present day.	• Rodenticide poisoning	• Other focal/ non-focal species • Biodiversity	ML 1.3.1: Manage bait stations to prevent ingestion of poisoned prey species by mountain lion.
		• Decreased prey density	• Other focal/ non-focal species • Biodiversity	ML 1.3.2: Introduce native ungulates to historical ranges.
		• Power transmission corridors	• Other focal/ non-focal species • Biodiversity	ML 1.3.3: Manage utility transmission corridors to be compatible to mountain lion and its prey base.

Goal	Objective	Threats	Co-Benefits	Action
	ML Objective 1.4: Reduce human-mountain lion conflicts that negatively affect mountain lion and landowners. Measure progress toward achieving this objective by the number of outreach actions or a decrease in livestock depredation, compared to present day.	• Human-wildlife conflict (e.g., livestock depredation) • Poaching	• Other focal/ non-focal species • Biodiversity • Working lands	ML 1.4.1: Support outreach programs that educate landowners about non-lethal methods to decrease livestock depredation, such as use of predator-proof enclosures (Yap and Rose 2019).
	ML Objective 1.5: Increase the mountain lion population size above the minimum effective population size (100), to prevent inbreeding depression (Yap and Rose 2019). Measure progress toward achieving this objective by numbers of individuals and increases in genetic diversity.	• Low genetic diversity	• Connectivity	ML 1.5.1: Increase connectivity to other population segments outside the RCIS area, to increase gene flow (Yap and Rose 2019).

Goal	Objective	Threats	Co-Benefits	Action
ML Goal 2: Support stability and recovery of mountain lion populations in the RCIS area by reducing direct mortality.	ML Objective 2.1: Reduce toxin-related mortality. Measure progress toward achieving this objective by the reduction of toxin-related mountain lion deaths detected, compared to present day.	• Decreased prey density	• Other focal/ non-focal species • Biodiversity • Working lands	ML 2.1.1: Reduce/eliminate the use of second-generation anticoagulants, rodenticides, and other environmental toxicants (Yap and Rose 2019).
	ML Objective 2.2: Reduce pathogen-related mortality. Measure progress toward achieving this objective by the reduction of pathogen-related mountain lion deaths detected, compared to present day.	• Disease	• Other focal/ non-focal species • Biodiversity	ML 2.2.1: Monitor for diseases that affect mountain lion populations and implement management actions to reduce their transmission and impacts on the species.
Source: CDFW 1988a, 2015; Yap and Rose 2019				

5.3.16 Pallid Bat (Antrozous pallidus)

Pallid Bat
Photo Credit: Ivan Parr

Status

- State Species of Special Concern

Ecological Requirements

- RCIS Regions: All terrestrial regions
- RCIS Natural Communities: All terrestrial communities
- Prefers to day roost in rocky outcrops, cliffs, and tree crevices with access to open habitats for foraging (CDFW 1988b); these roosts must protect bats from high temperatures (CDFW 2020)
- Maternity roosts may have 12-100 individuals (CDFW 1988b)
- Hibernates in winter, in locations near summer day roost (CDFW 1988b)
- Preys on insects and is most commonly found in open, dry habitats with rocky areas for roosting (CDFW 2020)
- Urbanization has reduced roosting and foraging habitat in coastal California
- Potentially susceptible to fungal diseases (Langwig et al. 2015)
- Full species account available: Pallid Bat Life History Account (CDFW 1988b)

- RCIS Conservation Target: Moderate (widely distributed habitat, representative of bat species)

Associated Non-Focal Species

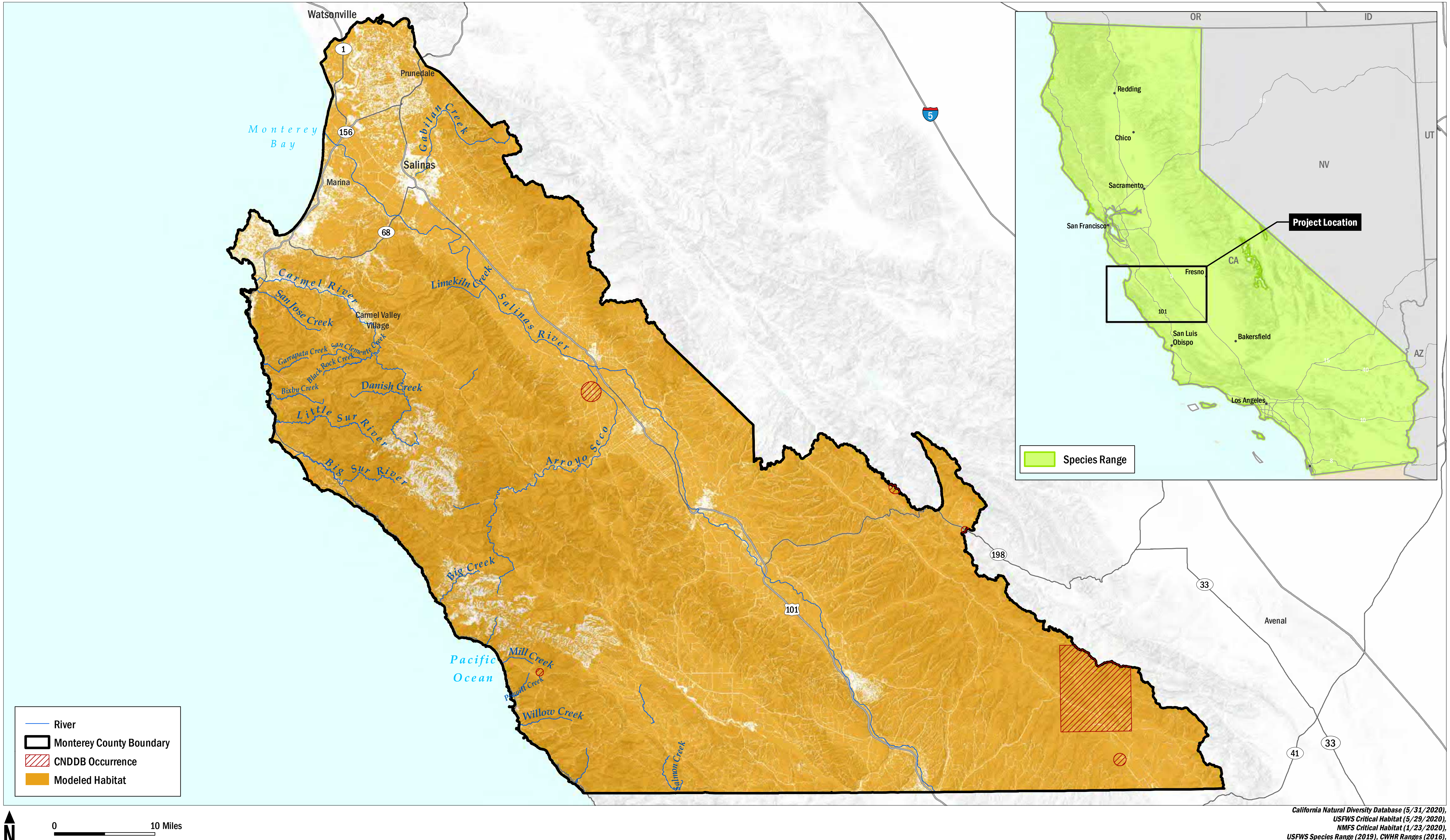
- Townsend's big-eared bat (Corynorhinus townsendii)
- Western mastiff bat (Eumops perotis californicus)

Climate Change Vulnerability Assessment

Overall, increased climate exposure is likely to have detrimental impacts on the pallid bat (PB). An increase in the number of severe storms (Fellers and Halstead 2015) and increased periods of drought (Jones et al. 2009) may have detrimental effects on insect populations, leading to lower prey availability. An increase in overall winter temperatures could lead to negative effects during hibernation by increasing energy needs, depleting fat reserves, and making bats more susceptible to fungal infections (Jones et al. 2009). Increasing temperatures may cause some species to move farther north (Jones et al. 2009) and increasing incidences of heat waves may threaten bats with direct and mass mortality (Sherwin et al. 2013). Climate change will exacerbate all the threats listed in Table 5-23..

The goals, objectives, and actions shown in Table 5-23. aim to protect, enhance, and restore present day suitable habitats for pallid bat, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as monitoring for pathogens, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-11 shows the range and modeled habitat for the pallid bat.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-11
Pallid Bat

Pallid Bat Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1 applies to pallid bat. Table 5-23. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protecte habitat surrounding known occurences in the Cholame Hills area and the Salinas Valley (RC Objective 1.1). Enhance habitats to provide a stable prey base in areas that may become suitable in the future because of projected climate changes.

Table 5-23. Pallid Bat Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
PB Goal 1: Promote persistence of pallid bat populations in the RCIS area through protection, restoration, and enhancement of habitat.	PB Objective 1.1: Protect known occurrences, maternity, night , and hibernation roosts, and allow expansion by protecting 376,000 acres of suitable habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres protected, and by the number of maternity roosts and hibernation sites protected, compared to present day.	• Habitat loss, degradation, fragmentation • Climate change	• Working lands • Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	PB Objective 1.2: Create, restore, and enhance occupied and suitable habitat for pallid bat in the RCIS area. Measure progress toward achieving this objective in the number of roosts and hibernation sites created, restored, enhanced, and occupied by pallid bat.	• Habitat loss, degradation, fragmentation • Climate change	• Working lands • Other focal/ non-focal species • Biodiversity • Climate change resilience	PB 1.2.1: Install artificial roost boxes in suitable habitat with nearby suitable foraging habitat, where roost site availability is unnaturally limiting the population.
		• Renewable energy projects	• Working lands • Other focal/ non-focal species • Biodiversity	PB 1.2.2: Design infrastructure projects, including culverts, to encourage roosting, and ensure that they are compatible with pallid bats.
		• Disturbance and/or destruction of roosting sites	• Working lands • Other focal/ non-focal species • Biodiversity	PB 1.2.3: Limit recreational activities near caves and other roosting sites, including culverts and other transportation infrastructure.

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation • Disturbance and/or destruction of roosting sites	• Working lands • Other focal/ non-focal species • Biodiversity	PB 1.2.4: Conduct acoustic studies, to determine distribution and identify different types of roosts.
PB Goal 2: Support stability and recovery of pallid bat populations in the RCIS area through measures to reduce direct mortality.	PB Objective 2.1: Reduce pathogen-related mortality. Measure progress toward achieving this objective by the reduction of pathogen-related pallid bat deaths detected, compared to present day.	• Disease (e.g., future fungal pathogen introductions)	• Working lands • Other focal/ non-focal species • Biodiversity	PB 2.1.1: Sanitize all equipment before entering transportation infrastructure, including culverts, occupied by roosting bats, to prevent the spread of fungal diseases.
		• Disease (e.g., future fungal pathogen introductions)	• Working lands • Other focal/ non-focal species • Biodiversity	PB 2.1.2: Fund disease monitoring, surveillance, and testing of pallid bat carcasses.

Sources: CDFW 1988, 2015, 2019

5.3.17 San Joaquin Kit Fox (Vulpes macrotis mutica)

San Joaquin Kit Fox
Photo Credit: U.S. Fish and Wildlife Service

Status

- Federally Endangered
- State Threatened

Ecological Requirements

- RCIS Regions: San Antonio Valley, Mid-Inner Coast Range
- RCIS Natural Communities: Annual Grassland, Valley Oak Woodland, Blue Oak Woodland (CDFW 2020; USFWS 1998a)
- Use and modify dens constructed by other mammals and human-made structures (culverts, roadbeds, etc.) for breeding and shelter (USFWS 1998a)
- Prefer loose-textured sandy soils in open areas for burrowing and to support a suitable prey population (CDFW 2020; USFWS 1998a)
- Can be found in heavily modified habitats such as irrigated pastures, vineyards, and grazed grasslands, and are known to live in and adjacent to towns (USFWS 1998a)
- Nocturnal carnivore that requires a stable prey base consisting of kangaroo rats, California ground squirrels, insects, etc. (USFWS 1998a, 2010)

- Requires large areas (average home range in Monterey County is 5,782 acres) of relatively undisturbed habitats with adequate connectivity (USFWS 2010)
- Full species account available: USFWS Recovery Plan for Upland Species of the Upland San Joaquin Valley, California (USFWS 1998a)
- RCIS Conservation Target: High (wide ranging species, requires large home range)

Associated Non-Focal Species

- American badger (Taxidea taxus)

Climate Change Vulnerability Assessment

San Joaquin kit fox (SJKF) is estimated to have an Overall Climate Change Vulnerability Score of "Less Vulnerable" under low emission scenarios (RCP4.5), and of "Moderately Vulnerable" under high emission scenarios (RCP8.5) (Stewart et al. 2016), as shown in Table 5-24.. By 2070–2099, approximately 26 to 99 percent of known occurrence locations may remain suitable, and potential suitable dispersal area could increase by approximately 13 to 33 percent (Stewart et al. 2016) (Table 5-24.). Species distribution models show stability and increases in habitat suitability for San Joaquin kit fox in the southern portions of the RCIS area. However, climate change will exacerbate threats listed in Table 5-25.

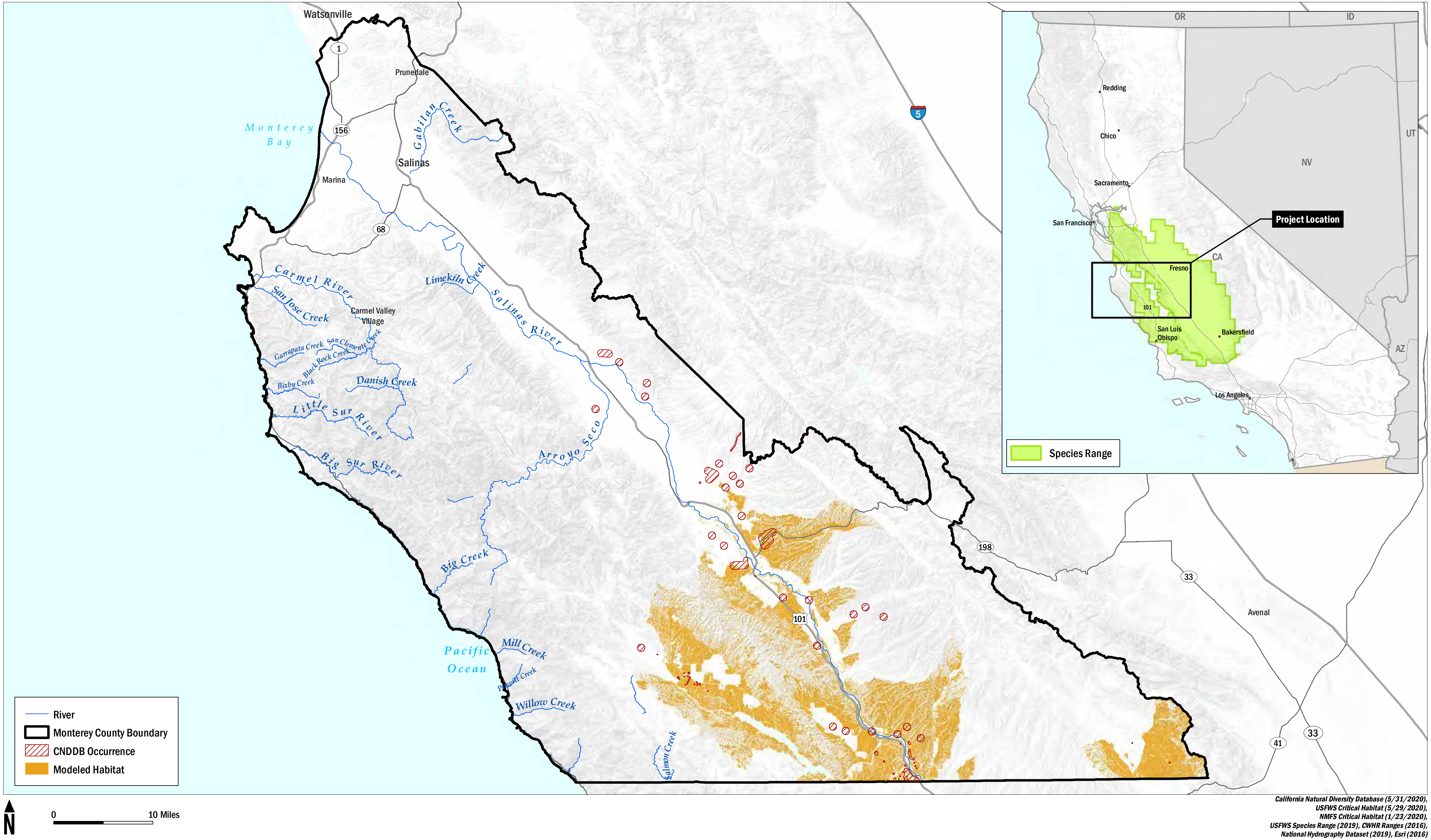
Table 5-24. San Joaquin Kit Fox Climate Vulnerability Ranking

Climate Change Scenario	Species Distribution Model Results-Occurrence Locations Remaining Suitable	Species Distribution Model Results-Area Remaining Suitable	Climate Change Vulnerability Score-Exposure	Climate Change Vulnerability Score-Sensitivity and Adaptive Capacity	Climate Change Vulnerability Score-Overall Vulnerability Score
Low Emission (RCP4.5) Warm and Wet	99.13%	118.04%	Moderately Vulnerable	Less Vulnerable	Less Vulnerable

Climate Change Scenario	Species Distribution Model Results- Occurrence Locations Remaining Suitable	Species Distribution Model Results- Area Remaining Suitable	Climate Change Vulnerability Score- Exposure	Climate Change Vulnerability Score- Sensitivity and Adaptive Capacity	Climate Change Vulnerability Score- Overall Vulnerability Score
Low Emission (RCP4.5) Hot and Dry	92.15%	132.61%	Moderately Vulnerable	Less Vulnerable	Less Vulnerable
High Emission (RCP8.5) Warm and Wet	75.73%	131.80%	Highly Vulnerable	Less Vulnerable	Moderately Vulnerable
High Emission (RCP8.5) Hot and Dry	26.01%	114.53%	Highly Vulnerable	Less Vulnerable	Moderately Vulnerable
Source: Stewart et al. 2016					

The goals, objectives, and actions shown in Table 5-25. aim to protect, enhance, and restore present day suitable habitats for San Joaquin kit fox, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as supporting sustainable prey populations and decreasing sources of road mortality, which may allow individuals to move to newly suitable habitats in the future.

A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-12 shows the range and modeled habitat for the San Joaquin kit fox.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-12

San Joaquin Kit Fox

San Joaquin Kit Fox Conservation Priorities, Goals, Objectives, and Actions

All RC goals, objectives, and action apply to San Joaquin kit fox. Table 5-25. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Protect habitat from Camp Roberts and Fort Hunter Liggett (Salinas–Pajaro Region) to U.S. Fish and Wildlife Service-designated core populations in the Carrizo Plain Natural Area and San Joaquin Valley (SJKF 1.1.2).
- Enhance habitat in the Salinas–Pajaro region to provide linkages from Camp Roberts and Fort Hunter Liggett to the Carrizo Plain and San Joaquin Valley (SJKF Objective 1.2).

Table 5-25. San Joaquin Kit Fox Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
SJKF Goal 1. Promote persistence of San Joaquin kit fox population in the RCIS area through protection, restoration, and enhancement of habitat and habitat corridors. SJKF Goal 2: Support stability and recovery of San Joaquin kit	SJKF Objective 1.1: Protect known occurrences and allow expansion by protecting 107,000 acres of suitable habitat. Measure progress toward achieving this objective in the acres of habitat and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Recreation • Connectivity • Climate change resilience	SJKF 1.1.1 Acquire parcels with known breeding occurrences and suitable habitat for San Joaquin kit fox and adjacent fox and adjacent dispersal habitat through fee title purchase or conservation easement. Focus acquisitions on large blocks of land that are at least 10,000 acres in size (USFWS 2010).

fox populations in the RCIS area through measures to reduce direct mortality.		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity • Recreation • Connectivity	SJKF 1.1.2: Acquire parcels to protect broad dispersal corridors (landscape linkages) through large landscape blocks supporting known breeding occurrences of San Joaquin kit fox and adjacent dispersal habitat through fee title purchase or conservation easement (USFWS 1998a, 2010). Focus acquisitions on areas near Camp Roberts and Fort Hunter Liggett (Salinas-Pajaro Region) connecting to U.S. Fish and Wildlife Service-designated core populations in the Carrizo Plain Natural Area and San Joaquin Valley, to enhance habitat

Goal	Objective	Threats	Co-Benefits	Action
				connectivity (USFWS 1998a).
	SJKF Objective 1.2: Enhance occupied and suitable San Joaquin kit fox habitat in the RCIS area. Measure progress toward achieving this objective in acres of habitat and adjacent/equivalent acres enhanced and occupied by San Joaquin kit fox. Habitat enhancements should focus on the Salinas–Pajaro Region, centered on Camp Roberts and Fort Hunter Liggett, and corridors from this region to the Carrizo	• Decreased prey population	• Other focal/ non-focal species • Biodiversity • Working lands	SJKF 1.2.1: Support stable mammalian and insect prey populations by reducing small mammal eradication efforts and modifying grazing practices (USFWS 2010).
		• Habitat loss, degradation, fragmentation	• Connectivity	SJKF 1.2.2: Conduct movement studies of San Joaquin kit fox to identify areas to improve population connectivity (USFWS 2010).

Goal	Objective	Threats	Co-Benefits	Action
	Plain and San Joaquin Valley (USFWS 1998a, 2010).	• Climate change • Transportation infrastructure construction • Renewable energy projects • Decreased habitat connectivity	• Other focal/ non-focal species • Biodiversity • Connectivity • Climate change resilience	SJKF 1.2.3: Design new infrastructure projects, such as renewable energy facilities, to ensure maintenance of enough prey base, den sites, and habitat connectivity (USFWS 1998a).
		• Habitat loss, degradation, fragmentation • Decreased habitat connectivity	• Other focal/ non-focal species • Biodiversity • Working lands	SJKF 1.2.4: Manage suitable vegetation structure (e.g., mowing, revegetation with low-growing and less dense native plants, controlled grazing) to encourage San Joaquin kit fox occupancy.

	SJKF Objective 2.1: Reduce predation-related mortality. Measure progress toward achieving this objective by the reduction of predation-related San Joaquin kit fox deaths detected, compared to present day.	• Predation/competition from other canids (primarily coyotes)	• Other focal/ non-focal species • Biodiversity	SJKF 2.1.1: When designing creation, restoration, or enhancement projects, consider creating different levels of vegetation cover, to prevent competition (and possible predation) from coyotes and red fox (USFWS 2010). Because dense shrub cover leads to increased vulnerability of San Joaquin kit fox to coyote detection and because the two species consume similar prey but in different proportions, reduce resource competition by supporting sustainable prey populations, which will reduce predation

Goal	Objective	Threats	Co-Benefits	Action
				on the San Joaquin kit fox. (USFWS 2010).
	SJKF Objective 2.2: Minimize vehicle-related mortality. Measure progress toward achieving this objective by the reduction of vehicle-related San Joaquin kit fox deaths detected.	• Transportation infrastructure construction; vehicle-impact mortality	• Other focal/ non-focal species • Biodiversity • Connectivity	SJKF 2.2.1: Develop and install wildlife crossing infrastructure improvements in transportation corridors with high number of vehicle-related San Joaquin kit fox interactions.
	SJKF Objective 2.3: Minimize pathogen-related mortality. Measure progress toward achieving this objective by the reduction of pathogen-related San Joaquin kit fox deaths detected.	• Disease (e.g., canine distemper, parvovirus)	None	SJKF 2.3.1: Fund disease monitoring, surveillance, and testing of San Joaquin kit fox carcasses that are detected.
Sources: CDFW 2015, 2020; USFWS 1998a, 2010				

5.3.18 Santa Cruz Long-toed Salamander (Ambystoma macrodactylum croceum)

Santa Cruz long-toed salamander
Photo Credit: U.S. Fish and Wildlife Service

Status

- Federally Endangered
- State Endangered
- State Fully Protected

Ecological Requirements

- RCIS Regions: Monterey Bay Coastline, Salinas River and Associated Corridor (USFWS 1999)
- RCIS Natural Communities: Chaparral, Valley Oak Woodland, Coastal Oak Woodland, Freshwater Emergent Wetland (CDFW 2020; USFWS 1999, 2004a, 2019a)
- Breeding habitat: Shallow, usually ephemeral freshwater ponds with clumps of vegetation or debris (CDFW 2020; USFWS 1999, 2004a)
- Upland habitat: Spend a majority of life underground in small mammal burrows, under leaf litter and organic debris, in root systems of plants in upland coastal scurb, and in woodland areas of coast live oak (Quercus agrifolia) or Monterey pine (Pinus radiata),

and in strips of riparian vegetation, such as arroyo willows (Salix lasiolepis) (CDFW 2020; USFWS 1999, 2004a, 2009b)

- Can disperse to upland habitat up to 1 mile from breeding site (USFWS 1999)
- Extremely limited natural distribution (approximately 15 miles) restricted to Santa Cruz and Monterey counties (CDFW 2020; USFWS 1999, 2004a, 2019a)
- Susceptible to fungal diseases (USFWS 2009b)
- Full species account available: U.S. Fish and Wildlife Service Santa Cruz Long-toed Salamander (Ambystoma macrodactylum croceum) Draft Revised Recovery Plan (1999) and 5-Year Review: Santa Cruz Long-Toed Salamander (Ambystoma macrodactylum croceum), Summary and Evaluation (USFWS 2009b)
- RCIS Conservation Target: Highest (very rare species, limited distribution of breeding habitat)

Associated Non-Focal Species

- None

Climate Change Vulnerability Assessment

A species-specific climate change vulnerability assessment has not been conducted for the Santa Cruz long-toed salamander (SCLTS); however, climate change projections for Santa Cruz long-toed salamander are likely similar to those for the Santa Lucia slender salamander because of its similar ecological requirements and restricted present-day range. Thus, it is likely that Santa Cruz long-toed salamander is at "high risk" from climate change. This estimate is based on the likely persistence of current populations through 2050 and the amount of current climatically suitable habitat likely to remain suitable. Wright et al. (2013) projects that in 2050 there will be a 40 to 80 percent reduction in the Santa Lucia slender salamander species distribution and a 20 to 50 percent decrease in available suitable habitat under low emission scenarios. High emission scenarios project a more than 80 percent reduction to the current species distribution, with a 50 to 99 percent decrease in suitable habitat. This limited and fragmented distribution of natural suitable habitat increases the impacts of local extirpations on long-term species viability (USFWS 2009a). Climate change will likely exacerbate all the threats listed in

Table 5-27.

Table 5-26. summarizes the climate change exposure, spatial distribution, and vulnerability of mixed chaparral communities statewide, which could experience a 0 to 25 percent decrease in habitat suitability. Coastal oak woodland and valley oak woodland communities could experience a 25 to 75 percent decrease in habitat suitability, and freshwater emergent wetland communities are projected to experience a 75 to 100 percent decrease in habitat suitability.

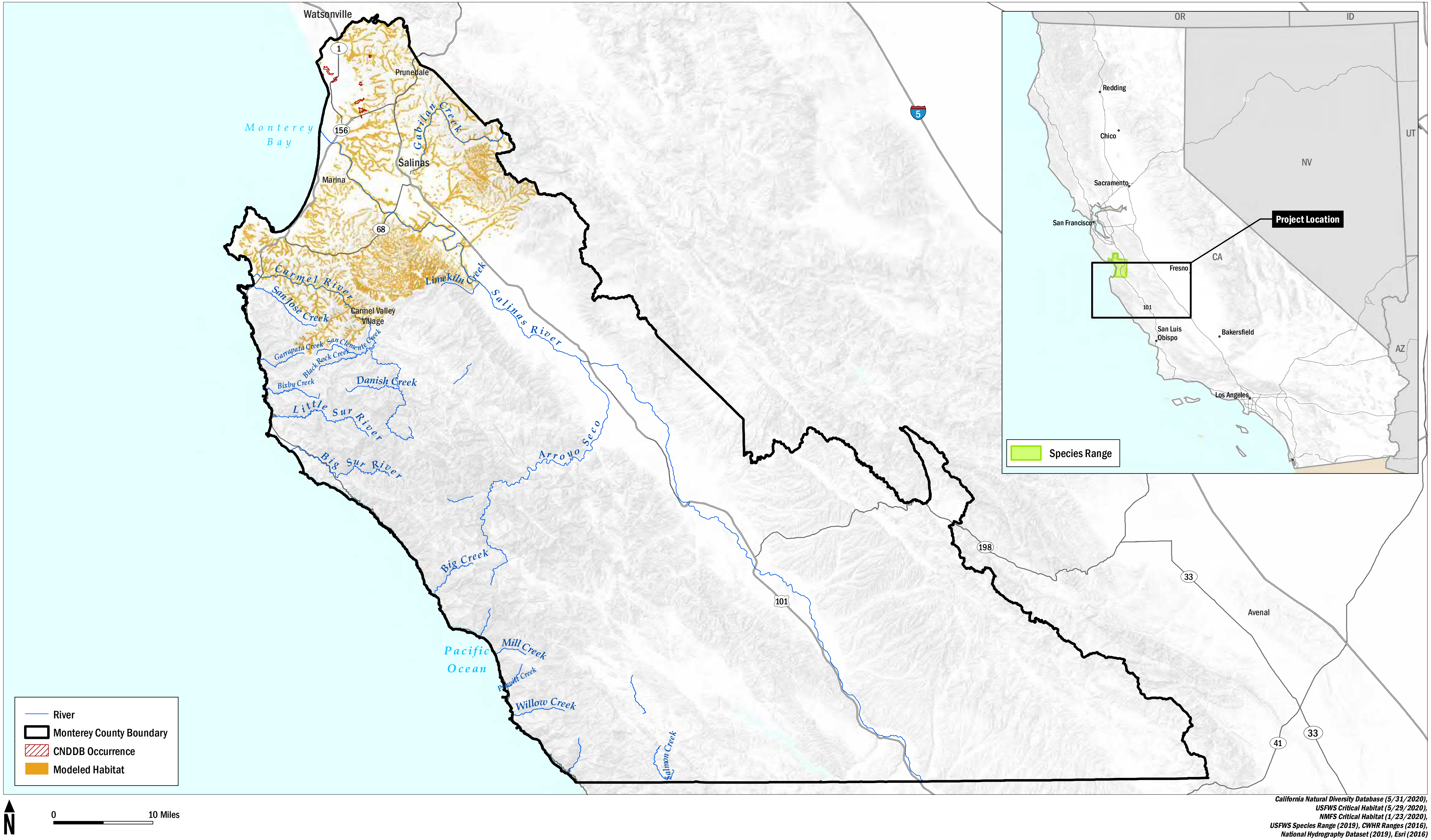
Table 5-26. Santa Cruz Long-toed Salamander Natural Community Vulnerability Ranking

Natural Communities	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Mixed Chaparral	Low to Moderate	Moderate to Mid-High	Moderate to Mid-High
Coastal Oak Woodland	Moderate	Mid-High	Moderate
Valley Oak Woodland	Moderate	Mid-High	Moderate
Freshwater Emergent Wetland	High	High	High
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in

Table 5-27 aim to protect, enhance, and restore present day suitable habitats for Santa Cruz long-toed salamander, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as monitoring for disease and sources of road mortality, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-13 shows the range and modeled suitable habitat for the Santa Cruz long-toed salamander.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-13
Santa Cruz Long-toed Salamander

Santa Cruz Long-toed Salamander Conservation Priorities, Goals, Objectives, and Actions

All RC and Amphibian goals, objectives, and actions apply to Santa Cruz long-toed salamander. Water 1.1.1, 1.1.3, 1.1.5, 1.1.7. 1.1.8, and Water Objective 1.2 apply.

Table 5-27 summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire, protect, and enhance habitat at or adjacent to the inner dune face, from Pajaro River to Salinas River, Upper Moro Cojo Slough drainages (between Dolan Road and Castroville Boulevard to the north and Tembladero Slough to the south), areas along Elkhorn Road east of Elkhorn Slough Reserve, and the upper reaches of Elkhorn Slough (USFWS 1999) (SCLTS 1.1, 1.2).

Table 5-27. Santa Cruz Long-toed Salamander Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
SCLTS Goal 1. Promote persistence of Santa Cruz long-toed salamander populations in the RCIS area through	SCLTS Objective 1.1: Protect known occurrences and allow expansion by protecting 45,000 acres of suitable habitat. Measure progress toward achieving this objective by the number	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
protection, restoration, and enhancement of habitat.	of breeding locations, acres of adjacent upland habitat, and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species	SCLTS 1.1.2: Conduct surveys in suitable habitat to identify opportunities for habitat protection, enhancement, restoration, and/or creation. Focus surveys in areas identified in the U.S. Fish and Wildlife Service 1999 Recovery Plan, namely the inner dune face from Pajaro River to Salinas River, Upper Moro Cojo Slough drainages (between Dolan Road and Castroville Boulevard to the north and Tembladero Slough to the south), areas along Elkhorn Road east of Elkhorn Slough Reserve, and the upper reaches of Elkhorn Slough (USFWS 1999).

Goal	Objective	Threats	Co-Benefits	Action
	SCLTS Objective 1.2: Enhance occupied and suitable Santa Cruz long-toed salamander habitat throughout the RCIS area. Measure progress toward achieving this objective in acres of habitat and adjacent/equivalent acres enhanced and occupied by Santa Cruz long-toed salamander.	• Increased salinity and saltwater intrusion • Degraded water quality • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity • Water quality	SCLTS 1.2.1: Manage saltwater intrusion by maintaining tide gates in proximity of suitable Santa Cruz long-toed salamander breeding habitat, and install new tide gates as sea levels rise, where feasible (USFWS 2019a).
		• Increased salinity and saltwater intrusion • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity • Water quality	SCLTS 1.2.2: Conduct monitoring of ponds connected with tidally influenced marshes, and translocate larvae when salinity levels are harmful (currently, three parts per thousand), in coordination with scientific advisors, land managers, universities, and/or regulatory agencies (USFWS 2019a).

Goal	Objective	Threats	Co-Benefits	Action
SCLTS Goal 2: Support stability and recovery of Santa Cruz long-toed salamander populations in the RCIS area through measures to reduce direct mortality.	SCLTS Objective 2.1: Reduce vehicle-related mortality. Measure progress toward achieving this objective by the reduction of vehicle-related Santa Cruz long-toed salamander deaths detected, compared to present day.	• Transportation infrastructure construction and maintenance; vehicle-impact mortality	• Other focal/ non-focal species • Biodiversity • Connectivity	SCLTS 2.1.1: Develop wildlife crossing infrastructure improvements, such as drift fences, wildlife tunnels, or construction of elevated roads, in transportation corridors with high numbers of vehicle-related Santa Cruz long-toed salamander mortality. Focus on areas adjacent to known locations and protected habitats (USFWS 1999, 2009, 2019a).
	SCLTS Objective 2.2: Reduce pathogen-related mortality. Measure progress toward achieving this objective by the reduction of pathogen-related Santa Cruz long-toed	• Disease		SCLTS 2.2.1: Monitor known and potential breeding ponds for the presence of pathogens by traditional and eDNA methods.

Goal	Objective	Threats	Co-Benefits	Action
	salamander deaths detected, compared to present day.	• Disease		SCLTS 2.2.2: Sterilize all equipment entering known or suitable Santa Cruz long-toed salamander breeding habitat, to prevent introduction of disease.
Sources: CDFW 2015, 2020; USFWS 1999, 2009b, 2019a				

5.3.19 Smith's Blue Butterfly (Euphilotes enoptes smithi)

Smith's blue butterfly
Photo Credit: Joe Broberg

Status

- Federally Endangered

Ecological Requirements

- RCIS Regions: Big Sur Coastline, Monterey Bay Coastline, Mounterey Peninsula to Point Lobos (CDFW 2020)
- RCIS Natural Communities: Coastal Scrub, Coastal Dune, Perennial Grassland, Mixed Chaparral (CDFW 2020)
- All life stages dependent on host plants, seacliff buckwheat (Eriogonum parvifolium) and coast buckwheat (E. latifolium) (USFWS 1984, 2006).
- Near-endemic to RCIS area (CDFW 2020; USFWS 1984)
- Full species account available: California Natural Diversity Database, RareFind 5 (CDFW 2020) and Smith's Blue Butterfly Recovery Plan (USFWS 1984)
- RCIS Conservation Target: Highest (Federally listed, near-endemic to RCIS area, fragmented populations)

Associated Non-Focal Species

- Little Sur manzanita (Arctostaphylos edmundsii)

- Monterey larkspur (Delphinium hutchinsoniae)

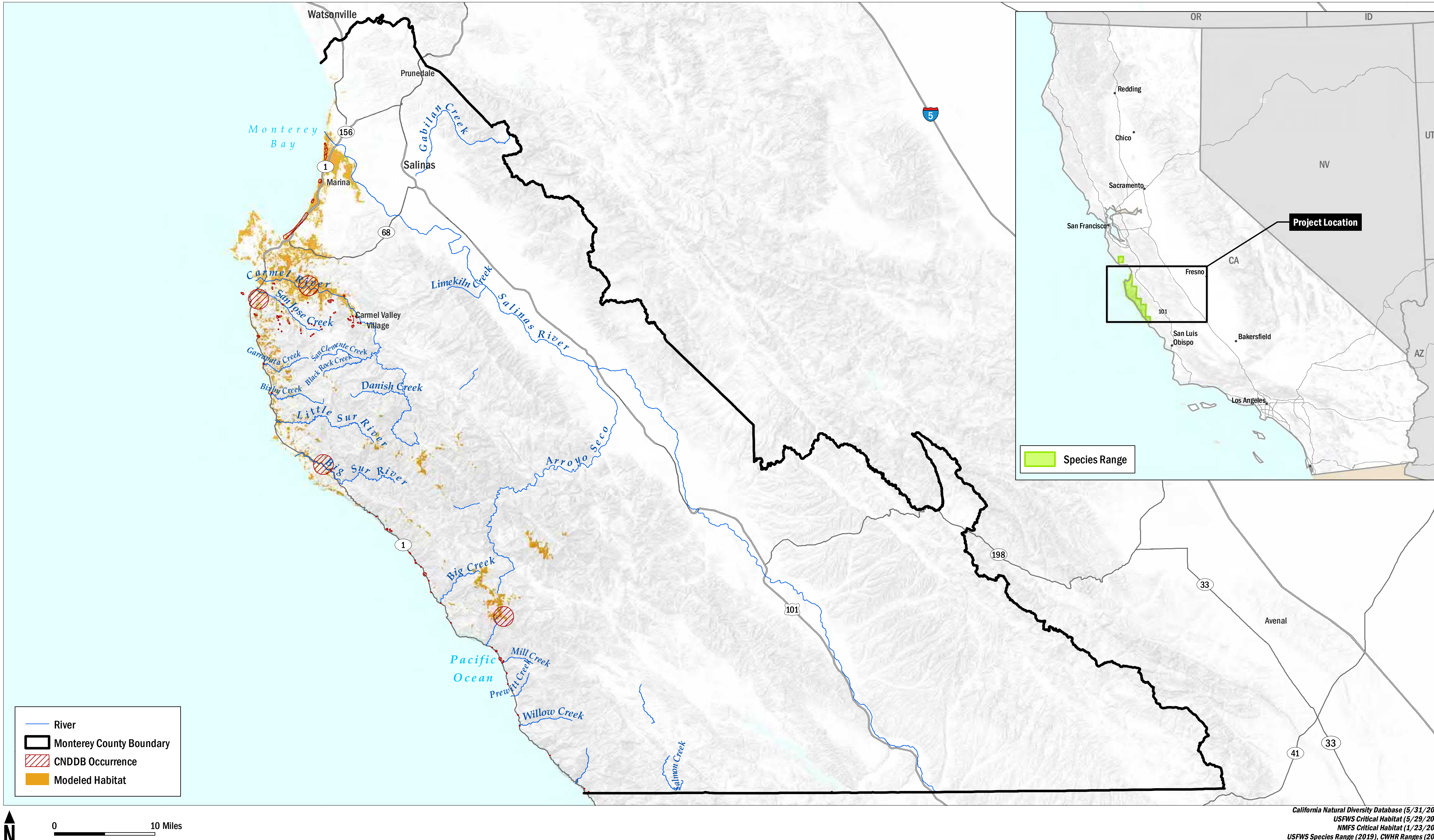
Climate Change Vulnerability Assessment

Smith's blue butterfly (BLUE) is particularly vulnerable to stochastic weather events, which lead to local extirpations that may negatively impact the species (USFWS 2006). Because of habitat fragmentation, the distance adults would have to travel to reach patches of host plants has likely increased in many areas, making it less likely that suitable habitat will be recolonized (USFWS 2006). Table 5-28. summarizes the climate change exposure, spatial distribution, and vulnerability of mixed chaparral communities statewide, which could experience a 0 to 25 percent reduction in habitat suitability, and of perennial grassland, coastal scrub, and coastal dune communities statewide, which could experience a 25 to 75 percent reduction in habitat suitability.

Table 5-28. Smith's Blue Butterfly Natural Communities Climate Vulnerability Ranking

Natural Communities	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Perennial Grassland	Moderate to Mid-High	Mid-High	Moderate(Warm and Wet) to Mid-High
Coastal Dune	Moderate	Mid-High	Mid-High
Coastal Scrub	Moderate to Mid-High	Mid-High	Moderate to Mid-High
Mixed Chaparral	Low to Moderate	Moderate to Mid-High	Moderate to Mid-High
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-29. aim to protect, enhance, and restore present day suitable habitats for Smith's blue butterfly, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as increasing presence of host plants and reducing non-native plants, which may outcompete native plants, may allow individuals to move to newly suitable habitats in the future. Figure 5-14 shows the range and modeled habitat for Smith's blue butterfly.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-14
Smith's Blue Butterfly

Smith's Blue Butterfly Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1 applies to Smith's blue butterfly. Table 5-29. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect habitat in areas identified in the U.S. Fish and Wildlife Service Recovery Plan (1984), including the Seaside-Marina dune complex and Fort Ord (RC Objective 1.1).
- Enhance dune and chapparal habitats, by control of non-native plants, and planting the species host plants seacliff buckwheat (Eriogonum parvifolium) and coast buckwheat (E. latifolium) in existing suitable and potential future habitats that may become suitable after projected climate changes (BLUE Objective 1.2).

Table 5-29. Smith's Blue Butterfly Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
BLUE Goal 1. Promote persistence of Smith's blue butterfly populations in the RCIS area through protection, restoration, and the enhancement of habitat.	BLUE Objective 1.1: Protect known occurrences and allow expansion by protecting 13,000 acres of suitable habitat. Measure progress toward achieving this objective in acres of habitat protected and adjacent/equivalent acres. Focus on protection of coastal dune and coastal scrub habitats, as discussed in the U.S. Fish and Wildlife Service Recovery Plan(1984).	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	BLUE Objective 1.2: Enhance occupied and suitable Smith's blue butterfly habitat in the RCIS area. Measure progress toward achieving this objective in the amount of area enhanced and occupied by Smith's blue butterfly.	• Non-native species	• Non-native invasive species • Other focal/ non-focal species • Biodiversity	BLUE 1.2.1: Improve habitat by removal of non-native plants and replace them with native plants, including the Smith's blue butterfly host plants, seaside buckwheat and coast buckwheat (USFWS 1984, 2006).
		• Habitat loss, degradation, fragmentation		BLUE 1.2.2: Protect or plant host plants in suitable habitat (USFWS 1984).
		• Recreational activities (e.g., off-road vehicles, foot traffic	• Other focal/ non-focal species • Biodiversity	BLUE 1.2.3: Increase law enforcement activity and employ a caretaker at known population sites, in locations where needed to promote compliance with regulations (USFWS 1984).

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation		BLUE 1.2.4: Improve propagation methods and research for host plants, seacliff buckwheat (Eriogonum parvifolium) and coast buckwheat (E. latifolium).
		• Habitat loss, degradation, fragmentation • Climate change	• Fire management • Other focal/ non-focal species • Biodiversity • Climate change resilience	BLUE 1.2.5: Implement prescribed fires to support host plant establishment (USFWS 2006).

Goal	Objective	Threats	Co-Benefits	Action
		• Agricultural practices (e.g., grazing)	• Other focal/ non-focal species • Biodiversity	BLUE 1.2.6: Implement conservation grazing, following practices that can promote establishment and growth of seaside buckwheat and common buckwheat while reducing direct negative impacts on Smith's blue butterfly (USFWS 2006).
	BLUE Objective 1.3: Restore occupied and suitable Smith's blue butterfly habitat in the RCIS area. Measure progress toward achieving this objective in the amount of the area of habitat restored and occupied by Smith's blue butterfly.	• Non-native species	• Other focal/ non-focal species • Biodiversity • Non-native invasive species	BLUE 1.3.1: Restore habitat by the removal of non-native plants and replace with native plants, including seaside buckwheat and/or coast buckwheat (USFWS 1984, 2006).
Sources: CDFW 2015, 2020; USFWS 1984, 2006				

5.3.20 Southern Sea Otter (Enhydra lutris neries)

Southern sea otter
Photo Credit: Marianne Rogers

Status

- Federally Threatened
- State Fully Protected

Ecological Requirements

- RCIS Regions: Big Sur Coastline, Monterey Bay Coastline, Monterey Peninsula to Point Lobos (USFWS 2003a)
- RCIS Natural Communities: Marine, Estuarine (USFWS 2003a)
- Occurs in marine habitats from the littoral zone to depths of less than 100 meters, including protected bays and exposed outer coasts. Most individuals occur between the shore and the 40-meter depth contour (USFWS 2003a, 2015)
- Foraging habitat includes both rocky and soft-sediment communities generally in water depths of less than 25 meters (USFWS 2015)
- Rocky substrates that support kelp forests provide the greatest abundance of food resources (USFWS 2015).
- Will haul out onto land, although opportunities vary spatially and temporally (USFWS 2015)

- Nutritional distress increases susceptibility to disease (USFWS 2015)
- Full species account available: California Natural Diversity Database, RareFind 5 (CDFW 2020) and USFWS 5-Year Review: Southern Sea Otter (Enhydra lutris nereis), Summary and Evaluation (USFWS 2015)
- Susceptibility to disease is increased because of pathogens, contaminants, and lack of food availability.
- Populations in the RCIS are at or near carrying capacity, however, the species is sensitive to climate related threats.
- RCIS Conservation Target: High (listed, representative of marine habitats, limited distribution of suitable habitat)

Associated Non-Focal Species

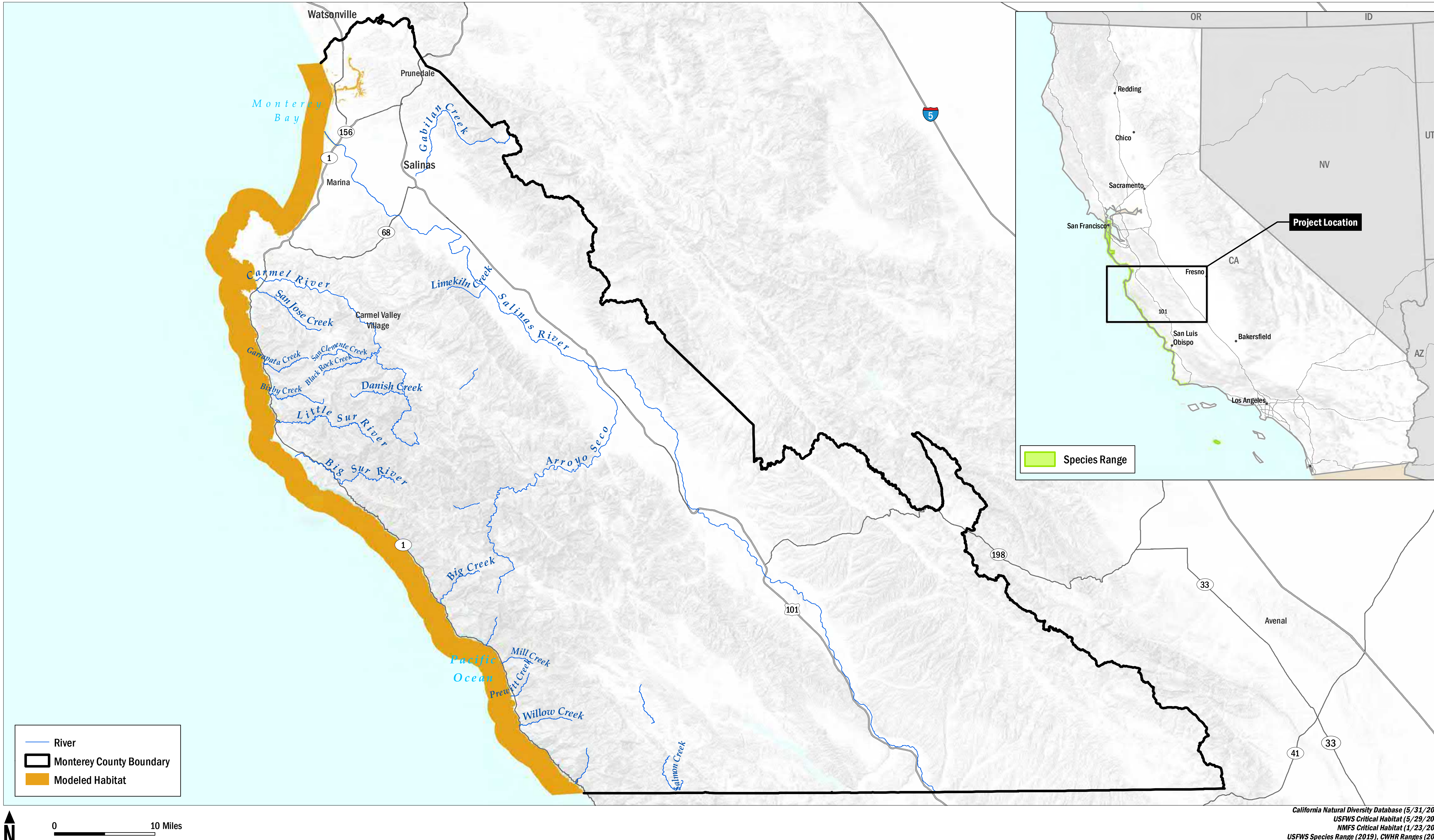
- Eelgrass (Zostera marina)

Climate Change Vulnerability Assessment

Southern sea otter (SSO) and its estuarine and marine habitat are sensitive to climate-related threats, including precipitation changes, decreased pH, and wave action (Hutto et al. 2015). Decreased pH (ocean acidification) is of concern, as it poses a serious threat to the marine organisms that make up otter's prey base (USFWS 2015). Increased sea surface temperature and dynamic ocean conditions can influence abundance of giant kelp, which is important sea otter habitat. Resulting declines in food availability may result in an increased susceptibility to disease (USFWS 2015). Climate-related modifications of freshwater hydrological processes could influence the transport of pathogens and contaminants from land to the nearshore marine environment, and algal and cyanobacterial blooms may increase in frequency (USFWS 2015).

The goals, objectives, and actions shown in Table 5-30. aim to protect, enhance, and restore present day suitable habitats for southern sea otter, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as decreasing pathogenic infections, which may allow individuals to move to newly suitable habitats in the future.

A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-15 shows the range and modeled habitat of the southern sea otter.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-15
Southern Sea Otter

Southern Sea Otter Priorities, Goals, Objectives, and Actions

RC Goal 1, Water actions 1.1.1, 1.1.5, 1.1.6., Water Objective 1.2, and Water Objective 1.3 apply to southern sea otter. Table 5-30. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Although the species is at or near carrying capacity in the RCIS area, it is susceptibile to disease because of pathogens, contaminants, and lack of food availability, all of which are expected to be excaerbated because of climate change. Promote population stability by minimizing threats such as prey availability, contaminants, and pathogens that contribute to population decline (SSO 1.1.2, 1.2.2, SSO Goal 2).
- Add priorities to include expansion of suitable or potentially suitable habitat in the future, to support population growth (if not at carrying capacity), in the RCIS area and adjacent areas within the species' range.

Table 5-30. Southern Sea Otter Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
SSO Goal 1. Promote persistence of southern sea otter populations in the	SSO Objective 1.1: Continue to protect existing known occurrences and allow expansion of 530 acres of suitable and habitat potentially	• Habitat loss, degradation, fragmentation	• Biodiversity	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
RCIS area through protection, restoration, and enhancement of habitat.	suitable in the future (because of climate change). Measure progress toward achieving this objective by the number of acres of adjacent/equivalent suitable or potentially suitable coastal marine habitat for expansion .	• Prey availability	• Biodiversity	SSO 1.1.2: Protect and enhance habitats that support prey, such as giant kelp, to reduce nutritional stress and provide resiliency to changing ocean conditions because of climate change.
	SSO Objective 1.2: Enhance existing occupied and suitable southern sea otter habitat in the RCIS area. Measure progress toward achieving this objective by acres of habitat	• Petroleum exploration, extraction, tankering, and potential spills	• Water quality • Recreation • Biodiversity	SSO 1.2.1: Promote compliance of vessel traffic management systems to reduce the likelihood of oil spills (USFWS 2015).

Goal	Objective	Threats	Co-Benefits	Action
	and adjacent/equivalent acres enhanced and occupied by southern sea otter.	• Algal and/or cyanobacterial blooms	• Water quality • Recreation • Biodiversity • Other focal/ non-focal species	SSO 1.2.2: Reduce anthropogenic inputs of nitrogen, phosphorus, sediments, and other contaminants into coastal watersheds and nearshore marine habitats, to reduce the likelihood of harmful algal and cyanobacterial blooms (Sherman and DeBruyckere 2018; USFWS 2015).
SSO Goal 2: Support stability of southern sea otter populations in the RCIS area through measures to reduce direct mortality.	SSO Objective 2.1: Reduce pathogen-related mortality. Measure progress toward achieving this objective by the reduction of pathogen-related southern sea otter deaths detected, compared to present day.	• Contaminant spills and/or runoff	• Biodiversity	SSO 2.1.1: Support outreach program that educate the public about the importance of properly disposing domestic cat litter to reduce Toxoplasma gondii infections, which cause southern sea otter morbidity and mortality.

Goal	Objective	Threats	Co-Benefits	Action
		• Algal and/or cyanobacterial blooms	• Biodiversity	SSO 2.1.2: Investigate bacterial sources of infection and take actions to address anthropogenic factors that increase incident rates (USFWS 2003).
Sources: CDFW 2015; Hutto et al. 2015; Sherman and DeBruyckere 2018; USFWS 2003a, 2015				

5.3.21 Steelhead (South-Central California Coast DPS) (Oncorynchus mykiss irideus)

Steelhead
Photo Credit: National Marine Fisheries Service

Status

- Federally Threatened

Ecological Requirements

- RCIS Regions: Salinas River and Associated Corridor, Carmel River, Nacimiento River, Pajaro River (NMFS 2013)
- RCIS Natural Communities: River, Riparian (CDFW 2020; NMFS 2013)
- Highly migratory, adults spawn in coastal watersheds and juveniles rear in freshwater or estuarine habitats prior to migrating to the sea (NMFS 2013, 2016).
- Prefers cool, clear streams with abundant cover and well-vegetated banks, with relatively stable flows. Spawning habitat includes pool and riffle complexes and cold, gravelly streambeds (NMFS 2013)
- Full species account available: California Natural Diversity Database, RareFind 5 (CDFW 2020) and the NMFS 5-Year Review: Summary and Evaluation of South-Central California Coast Steelhead Distinct Population Segment (NMFS 2016)

- RCIS Conservation Target: High (Federally listed, near-endemic to RCIS area, representative of sensitive riparian corridors and aquatic connectivity)

Associated Non-Focal Species

- Least Bell's vireo (Vireo bellii pusillus)
- Little willow flycatcher (Empidonax traillii brewsteri)
- Clare's pogogyne (Pogogyne clareana)
- Eelgrass (Zostera marina)

Climate Change Vulnerability Assessment

Steelhead (South-Central California Coast Distinct Population Segment DPS) (SCCCS) are vulnerable to climate threats, including summer water deficit, flooding, sea-level rise, sea surface temperatures, and ocean acidification. Steelhead are likely to experience direct effects from increasing water temperatures, such as mortality from heat stress, changes in growth and development rates, and disease resistance (NMFS 2016). Changes in flow regime, especially from flooding and low flow events, are also likely to affect behavior and survival (NMFS 2016). SCCCS may behaviorally respond to these changes by shifting the seasonal timing of adult migration, spawning, fry emergence, and juvenile migration (NMFS 2016). Multiple climate change vulnerability assessments have been conducted for SCCCS and results vary from a "Highly Vulnerable" ranking by Moyle et al. (2012), as shown in Table 5-31., to a ranking of "Moderate" by Crozier et al. (2019). Crozier et al. (2019) also conducted climate vulnerability assessments of exposure and sensitivity factors:

Exposure Factors

- Ocean Acidification Exposure– High
- Flooding– Moderate-high
- Sea-Level Rise– Moderate-high
- Sea Surface Temperature–Moderate-high
- Upwelling– Moderate
- Ocean Currents– Moderate
- Stream Temperature– Moderate
- Summer Water Deficit–Moderate

- Hydrologic Regime–Low

Sensitivity Factors

- Other Stressors-Moderate-high
- Juvenile Freshwater Stage– Moderate
- Estuary Stage– Moderate
- Cumulative Life-Cycle Effects– Moderate
- Population Viability– Moderate
- Ocean Acidification Sensitivity– Moderate
- Early Life History-Low
- Marine Stage-Low
- Adult Freshwater Stage– Low
- Hatchery Influence– Low

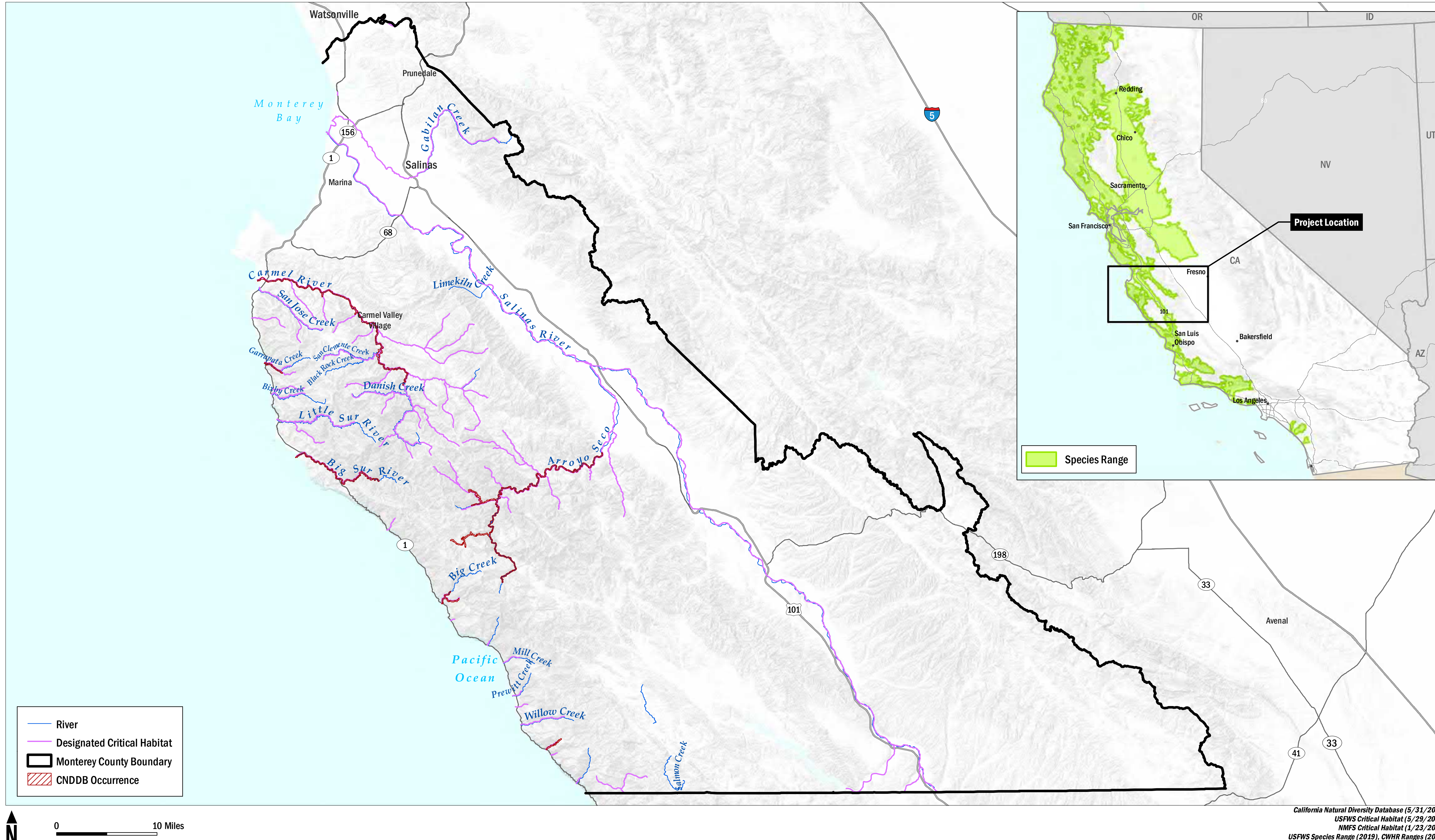
Overall Vulnerability

- Overall Sensitivity–Moderate
- Overall Exposure-Moderate-high
- Adaptive Capacity-Moderate
- Overall Vulnerability– Moderate

Table 5-31. Steelhead Summary of Climate Change Vulnerability Ranking

Present day Vulnerability	Climate Change Vulnerability	Combined Vulnerability Score
Approaching Extinction	Highly Vulnerable	On Path to Extinction
Source: Moyle et al. 2012		

The goals, objectives, and actions shown in Table 5-32. aim to protect, enhance, and restore present day suitable habitats for steelhead, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as population monitoring, which may allow individuals to move to newly suitable habitats in the future. A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-16 shows the range and modeled habitat of steelhead.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-16

Steelhead (South-Central California Coast DPS)

Steelhead Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1 and all Water goals, objectives, and actions apply to steelhead. Table 3-33 summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect habitat in NMFS-designated Core Population 1 (i.e., Pajaro River watershed, Salinas River watershed, Carmel River, San Jose Creek, Little Sur River, Big Sur River), and Core Population 2 (i.e., Garrapata Creek, Bixby Creek), and Core Population 3 (i.e., Rocky Creek, Big Creek, Limekiln Creek, Prewitt Creek, Willow Creek, and Salmon Creek) (NMFS 2013) (RC Objective 1.1).
- Modify or remove fish passage barriers on NMFS-designated Core Population 1, 2, and 3 watersheds, including Salinas Dam, San Antonio Dam, Nacimiento Dam, Los Padres Dam, Old Carmel River Dam (NMFS 2013), and throughout the RCIS area (NMFS 2013, 2016), using NMFS and CDFW priority rankings (SCCCS 1.3.1).
- Re-establish access to upper watersheds in both small coastal streams (i.e., San Jose, Pismo, and Arroyo Grande creeks), Big Sur River, and larger interior river systems (i.e., Salinas, Pajaro, and Carmel rivers) (NMFS 2016) (SCCCS 1.3.2).
- Remove barriers and restore fish access to historical spawning and rearing habitats throughout the DPS boundary (NMFS 2013, 2016), including historical watersheds that are anthropogenically blocked (i.e., riparian habitats above Hernandez Dam, San Antonio Dam, Nacimiento Dam, Salinas Dam, Lopez Dam, and North Fork Pacheco Creek Dam; NMFS 2016) (SCCCS 1.3.6).

Table 5-32. Steelhead Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
SCCCS Goal 1: Promote persistence of steelhead (South-Central California Coast DPS) populations in the RCIS area through protection, restoration, and enhancement of habitat.	SCCCS Objective 1.1: Protect known occurrences and allow expansion by protecting 6,400 acres of suitable habitat. Focus on protecting parcels in NMFS-designated Core Population 1 (Pajaro River watershed, Salinas River watershed, Carmel River, San Jose Creek, Little Sur River, Big Sur River), in Core Population 2 (Garrapata Creek, Bixby Creek), and Core Population 3 (Rocky Creek, Big Creek, Limekiln Creek, Prewitt Creek, Willow Creek, and Salmon Creek). Measure progress by the number of acres of NMFS-designated Core Population and RCIS area riparian, riverine, and estuarine habitat protected and associated/equivalent acres.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	SCCCS Objective 1.2: Enhance occupied and suitable steelhead (South-Central California Coast DPS) habitat, focusing on NMFS-designated Core Populations 1, 2 and 3 and throughout the RCIS area. Measure progress toward achieving this objective by the number of acres of Core Population and RCIS area riparian, riverine, and estuary habitat enhanced and occupied by steelhead.	• Modifications to natural flow regimes (e.g., water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic use, and hydropower) • Climate change	• Water quality • Climate change resilience • Other focal/ non-focal species • Biodiversity	SCCCS 1.2.1: Develop and implement operating criteria to ensure that the pattern and magnitude of groundwater extractions and water releases, including bypass flows around diversions, from Uvas Dam, Pacheco Dam, Salinas Dam, San Antonio Dam, Nacimiento Dam, San Clemente Dam, Los Padres Dam, Arroyo Seco, Lower Salinas River, San Jose Creek, Little Sur River, Big Sur River, to provide essential habitat functions (NMFS 2013).

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation • Climate change	• Water quality • Climate change resilience • Other focal/ non-focal species • Biodiversity	SCCCS 1.2.2: Enhance estuarine rearing habitat, including the management of artificial sandbar breaching at river mouths and enhancement of supplemental water in NMFS-designated Core Population 1, 2, and 3 watersheds and throughout the RCIS area (NMFS 2013).

Goal	Objective	Threats	Co-Benefits	Action
		• Modifications to natural flow regimes (e.g., water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic use, and hydropower)	• Water recharge • Water quality • Other focal/ non-focal species • Biodiversity • Connectivity	SCCCS 1.2.3: On the Carmel River, develop and implement an alternative off-channel water supply project, to eliminate or decrease water extraction from the channel, including subsurface extractions (NMFS 2013). Ensure provisional fish passage of adults and juveniles around dams and ensure that seasonal releases from dams support all life history phases (NMFS 2013).
		• Erosion and runoff (e.g., sedimentation, contaminants); Degraded water quality	• Water quality	SCCCS 1.2.4: On the Little Sur River, manage nearby roads to minimize sedimentation (NMFS 2013).

Goal	Objective	Threats	Co-Benefits	Action
		• Modifications to natural flow regimes (e.g., water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic use, and hydropower) • Climate change	• Water quality • Climate change resilience • Other focal/ non-focal species • Biodiversity	SCCCS 1.2.5: Collaborate with riverine habitat landowners and the State Water Resources Control Board to minimize and manage withdrawals from riparian wells, and develop rain and runoff collection facilities to address adequate bypass flows (NMFS 2013).
		• Potential genetic introgression with hatchery-raised fish	•	SCCCS 1.2.6: Investigate the impacts of breeding between hatchery-reared fish and steelhead (South-Central California DPS) and mitigate potential negative impacts by eliminating the stocking of hatchery-raised fish in non-anadromous waters (NMFS 2016).

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation	•	SCCCS 1.2.7: Implement population monitoring in Core Population watersheds where limited or no monitoring is occurring (NMFS 2016).
		• Recreational activities (e.g., off-road vehicles, illegal take)	•	SCCCS 1.2.8: Provide community education on the impacts of illegal take (NMFS 2013).
	SCCCS Objective 1.3: Restore occupied and suitable steelhead habitat throughout the RCIS area, focusing on NMFS-designated Core Populations 1, 2, and 3. Measure progress toward achieving this objective by acres of Core Population and RCIS area habitat and adjacent/equivalent acres restored and occupied by steelhead (NMFS 2013).	• Fish passage barriers • Increased number of impermeable surfaces (e.g., roads) • Climate change	• Water quality • Climate change resilience • Habitat connectivity	SCCCS 1.3.1: Physically modify or remove fish passage barriers on NMFS-designated Core Population 1, 2, and 3 watersheds, including Salinas Dam, San Antonio Dam, Nacimiento Dam, Los Padres Dam, Old Carmel River Dam (NMFS 2013) and throughout the RCIS area (NMFS 2013, 2016), using NMFS and CDFW priority rankings.

Goal	Objective	Threats	Co-Benefits	Action
		• Fish passage barriers • Climate change	• Habitat connectivity • Climate change resilience	SCCCS 1.3.2: Re-establish access to upper watersheds in both small coastal streams (San Jose, Pismo, and Arroyo Grande creeks), Big Sur River, and larger interior river systems (Salinas, Pajaro, and Carmel rivers) (NMFS 2016).
		• Fish passage barriers; Increased number of impermeable surfaces (e.g., roads)	• Habitat connectivity	SCCCS 1.3.3: Collaborate with the California Department of Transportation (Caltrans) and county transportation departments with oversight on road practices, to reduce or remove transportation related barriers to upstream and downstream passage (including railroad bridges, abutments, and similar structures) (NMFS 2013).

Goal	Objective	Threats	Co-Benefits	Action
		• Modifications to riparian substrates, vegetation, and channel morphology	• Water quality • Other focal/ non-focal species	SCCCS 1.3.4: On the Carmel River, restore spawning gravel and large woody debris recruitment to the lower mainstem (NMFS 2013).
		• Modifications to natural flow regimes (e.g., water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic use, and hydropower) • Climate change	• Climate change resilience • Flood control • Water quality • Protection of working lands	SCCCS 1.3.5: Implement local flood control and management programs (Pajaro River Bench Excavation Program and USACE Lower Pajaro River Flood Control Program) and incorporate habitat protection and restoration provisions (NMFS 2013).

Goal	Objective	Threats	Co-Benefits	Action
		• Fish passage barriers • Climate change	• Water quality • Climate change resilience • Public access • Habitat connectivity	SCCCS 1.3.6: Implement restoration projects to provide fish access to historical spawning and rearing habitats throughout the DPS boundary (NMFS 2013, 2016), such as to historical watersheds that are blocked anthropogenically (e.g., riparian habitats above Hernandez Dam, San Antonio Dam, Nacimiento Dam, Salinas Dam, Lopez Dam, and North Fork Pacheco Creek Dam; NMFS 2016).

Goal	Objective	Threats	Co-Benefits	Action
		• Modifications to natural flow regimes (e.g., water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic use, and hydropower) • Climate change	• Water quality • Climate change resilience • Focal/non-focal species	SCCCS 1.3.7: Assess the condition of and restore estuarine habitat through the control of fill, waste discharges, and instream flows, and through the establishment of functioning riparian buffers on intermittent and perennial streams (NMFS 2013).

Goal	Objective	Threats	Co-Benefits	Action
SCCCS Goal 2: Promote persistence of eelgrass populations in the RCIS area through protection, enhancement, and restoration of habitat.	SCCCS Objective 2.1: Create, restore, and enhance eelgrass habitat as an associated non-focal species occurring in estuarine steelhead rearing habitat. The NMFS California Eelgrass Mitigation Policy (CEMP) guidelines and standards include creating or restoring 20% more eelgrass habitat than was previous eliminated as part of mitigation efforts (NMFS 2014).	• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity	SCCCS 2.1.1: Map eelgrass in the following estuaries where its occurrence has not been evaluated, identify anthropogenic factors inhibiting eelgrass, and develop measures to promote eelgrass where appropriate: Pajaro River, Salinas River, Carmel River, Garrapata Creek, Little Sur Lagoon, and the Big Sur River (Sherman and DeBruyckere 2018).
		• Erosion and runoff (e.g., sedimentation, contaminants)	• Water quality • Public access • Other focal/ non-focal species • Biodiversity	SCCCS 2.1.2: Decrease sources of sedimentation running into estuaries and the nearshore environment (Sherman and DeBruyckere 2018).
Sources: CDFW 2015; CNPS 2019b; NMFS 2013, 2016; Sherman and DeBruyckere 2018				

5.3.22 Tidewater Goby (Eucyclogobius newberryi)

Tidwater goby
Photo Credit: U.S. Fish and Wildlife Service

Status

- Federally Endangered
- State Species of Special Concern

Ecological Requirements

- Monterey County Regions: Monterey Bay Coastline, Salinas River and Associated Corridor, Pajaro River
- RCIS Natural Communities: Saline Emergent Wetland, Estuarine (CDFW 2020)
- Found in brackish, shallow lagoons and the uppermost brackish zones of larger estuaries and river mouths (CDFW 2020, USFWS 2005a)
- Prefer sandy substrate for breeding, but can also be found on rocky, mud, and silt substrates (USFWS 2005a)
- Depend on sandbars to produce calm lagoon conditions that support summer breeding and refuge from winter conditions (USFWS 2007a)
- Full species account available: California Natural Diversity Database, RareFind 5 (CDFW 2020) and the USFWS Recovery Plan for the Tidewater Goby (Eucyclogobius newberryi) (USFWS 2005a)

- RCIS Conservation Target: Highest (Federally listed, few populations in the RCIS area, unique coastal estuarine habitat

Associated Non-Focal Species

- Eelgrass (Zostera marina)

Climate Change Vulnerability Assessment

Tidewater goby (TG) is sensitive to climate threats including increases in the amount of precipitation during storm event and associated flooding, as well as increased frequency and severity of drought conditions (Hutto et al. 2015; USFWS 2007b). Sea-level rise could benefit tidewater goby by increasing the amount of available shallow water pool habitat, although it may also transform pre-existing shallow water pools into deep water pools leading to a decrease in suitable habitat (Hutto et al. 2015). The impacts of sea-level rise will likely vary and depend on specific local habitat conditions (Hutto et al. 2015). Tidewater goby is sensitive to displacement from extreme storm events, which may also be beneficial or detrimental depending on local conditions, as they do not actively disperse (Hutto et al. 2015).

Multiple climate change vulnerability assessments have been conducted for tidewater goby, and results vary from “Highly Vulnerable” to “On Path to Extinction” (Moyle et al. 2012), as shown in Table 5-33., to “Moderate” (Hutto et al. 2015). Hutto et al. (2015) also conducted climate vulnerability assessments of exposure and sensitivity factors:

Sensitivity to Climate and Climate Driven Change (Exposure)

- Precipitation–Mid High
- pH-Low
- Sea-Level Rise–Low
- Coastal Erosion–Low

Sensitivity of Change in Disturbance Regimes (Exposure)

- Flooding– Mid High

Sensitivity and Current Exposure to Non-Climate Stressors

- Land Use Change–Moderate
- Invasive Species– Low

Overall Vulnerability

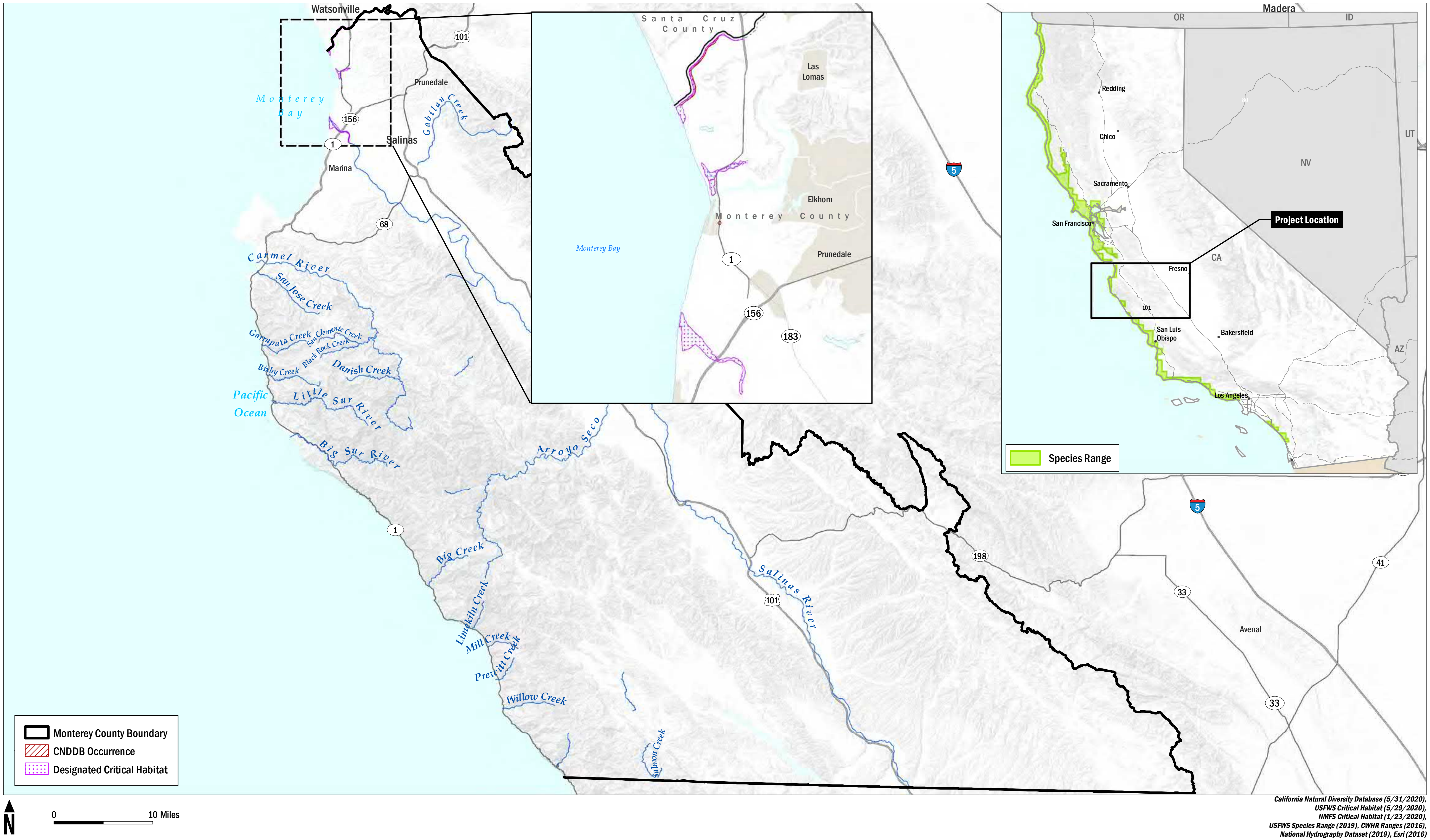
- Overall Vulnerability– Moderate
- Sensitivity– Moderate
- Exposure– Moderate
- Adaptive Capacity– Low

Table 5-33. Tidewater Goby Climate Change Vulnerability Ranking

Present day Vulnerability	Climate Change Vulnerability	Combined Vulnerability Score
Approaching Extinction	Highly Vulnerable	On Path to Extinction
Source: Moyle et al. 2012		

The goals, objectives, and actions shown in Table 5-34. aim to protect, enhance, and restore present day suitable habitats for tidewater goby, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as population monitoring, which may allow individuals to move to newly suitable habitats in the future.

A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-17 shows the range and modeled suitable habitat for the tidewater goby.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-17
Tidewater Goby

Tidewater Goby Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1, Water action 1.1.1, 1.1.7, 1.1.8, and Water Objectives 1.2 and 1.3 apply to tidewater goby.

Table 5-27 summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect habitat in areas in the U.S. Fish and Wildlife Service -designated Greater Bay Recovery Unit: Sub-Unit GB10 (Pajaro River) and Sub-Unit GB11 (Bennett's Slough) (TG 1.1.1).
- Enhance and restore degraded estuarine habitat in the U.S. Fish and Wildlife Service -designated Recovery Sub-Units in Pajaro River and Bennett's Slough (USFWS 2005a) (TG Objective 1.2, 1.3).

Table 5-34. Tidewater Goby Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
TG Goal 1: Promote persistence of tidewater goby populations throughout the RCIS area through protection, restoration, and enhancement of habitat.	TG Objective 1.1: Protect known occurrences and adjacent upstream freshwater habitat and allow expansion by protecting 340 acres of suitable habitat. Measure progress toward achieving this objective by the number of acres of estuary habitat, adjacent upstream aquatic and terrestrial habitat, and associated/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity Climate change resilience	TG 1.1.1: Acquire parcels with suitable estuarine and upstream aquatic and terrestrial habitat through fee title purchase or conservation easement (USFWS 2005a). Focus on areas with the U.S. Fish and Wildlife Service-designated Greater Bay Recovery Unit: Sub-Unit GB10 (Pajaro River) and Sub-Unit GB11 (Bennett's Slough).

Goal	Objective	Threats	Co-Benefits	Action
	TG Objective 1.2: Enhance occupied and suitable tidewater goby habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced and occupied by tidewater goby.	• Anthropogenic breaching of lagoons (especially in dry season)	• Other focal/ non-focal species • Biodiversity	TG 1.2.1: Conduct outreach programs to educate the public about the negative impacts of anthropogenic breaching of lagoons, especially during the dry season (USFWS 2005a).
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Water quality • Biodiversity	TG 1.2.2: Develop an umbrella Safe Harbor Agreement or obtain financial incentives for landowners to maintain or enhance tidewater goby habitat (USFWS 2005a).

Goal	Objective	Threats	Co-Benefits	Action
		• Increased sedimentation (reduced water availability in lagoons, changes in predators, temperature changes • Channelization of rivers, streams, lagoons (dredging), and wetland draining and filling • Modifications to natural flow regimes (Water diversions, channelization, altered flows, groundwater overdraft) • Coastal development	• Other focal/ non-focal species • Water quality • Biodiversity	TG 1.2.3: Include measures to prevent increased sedimentation, channelization, and water diversions during coastal transportation and development projects in estuarine and upstream freshwater habitats. Design plans to minimize wetland draining and/or filling (USFWS 2005a)

Goal	Objective	Threats	Co-Benefits	Action
	TG Objective 1.3: Restore degraded estuarine habitat in the RCIS area. Measure progress toward achieving this goal by acres of estuarine habitat and adjacent/equivalent acres restored and occupied by tidewater goby.	• Habital loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Water quality • Biodiversity • Climate change resilience	TG 1.3.1: Restore suitable estuary habitat, focusing on habitats in the U.S. Fish and Wildlife Service-designated Recovery Sub-Units (USFWS 2005a). Plant favorable vegetation upstream and around estuary and lagoon habitats.
		• Habitat loss, degradation, fragmentation • Climate change	• Climate change resilience • Biodiversity	TG 1.3.2: Survey known occupied and previously occupied localities to determine population status and collaborate to create a well-developed, long-term monitoring plan throughout the RCIS area, to help locate potential locations for restoration (USFWS 2007a).

Goal	Objective	Threats	Co-Benefits	Action
		• Channelization of rivers, streams, lagoons (dredging), and wetland draining and filling • Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Water quality • Biodiversity	TG 1.3.3: Identify locations where artificial fill can be removed from estuarine habitats and restored, or where estuarine habitat can be reconnected, through replacement of culverts with bridges.
Sources: CDFW 2015, 2020, USFWS 2005a, 2007b				

5.3.23 Tricolored Blackbird (Agelaius tricolor)

Tricolored blackbird
Photo Credit: California Department of Fish and Wildlife

Status

- State Threatened
- State Species of Special Concern

Ecological Requirements

- RCIS Regions: All terrestrial regions
- RCIS Natural Communities: Freshwater Emergent Wetland, Agriculture, Annual Grassland (CDFW 2020)
- Breeding habitat: Large, dense breeding colonies (March to August) in emergent wetlands with tall, dense cattails or tules (CDFW 2008, 2019; Hamilton 2004). Often associated with dairies and ripening grain heads (Hamilton 2004). Requires open water within 500 meters of colonies (Hamilton 2004).
- Foraging habitat: Croplands, grassy fields, flooded lands, irrigated pasture, dry rangelands, dairy operations and along edges of ponds, may be up to 4 miles from breeding areas (CDFW 2008, 2019; Hamilton 2004); particularly attracted to ephmeral pools (Hamilton 2004)
- Wintering habitat: Open rangeland, grasslands, and agricultural fields with low-growing vegetation, and dairies and feedlots (Hamilton 2004; Shuford and Gardali 2008).

- Colonies make extensive migrations and movements during the breeding season and in winter within their range (Shuford and Gardali 2008)
- Full species account available: Tricolored Blackbird (Agelaius tricolor). The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California (Hamilton 2004)
- RCIS Conservation Priorty: High (steeply declining, breeding areas require management)

Associated Non-Focal Species

- Two-striped garter snake (Thamnophis hammondii)

Climate Change Vulnerability Assessment

The Audubon 2019 Climate Report (Wilsey et al. 2019) assessed the tricolored blackbird (TCBB) as moderately vulnerable to climate change. A large portion of the species' summer range around the Monterey Peninsula and Salinas River corridor and almost all its winter range throughout the RCIS area will become unsuitable under high emission scenarios (Wilsey et al. 2019). Climate threats include increased frequency and intensity of wildfires, increased spring heat waves, and heavy rain events (Wilsey et al. 2019).

Gardali et al. (2012) conducted a species-specific climate change vulnerability assessment for the tricolored blackbird (TRBB) on exposure and sensitivity factors:

Exposure Factors

- Habitat suitability-Moderate
- Extreme weather- Moderate
- Food availability- Low

Sensitivity Factors

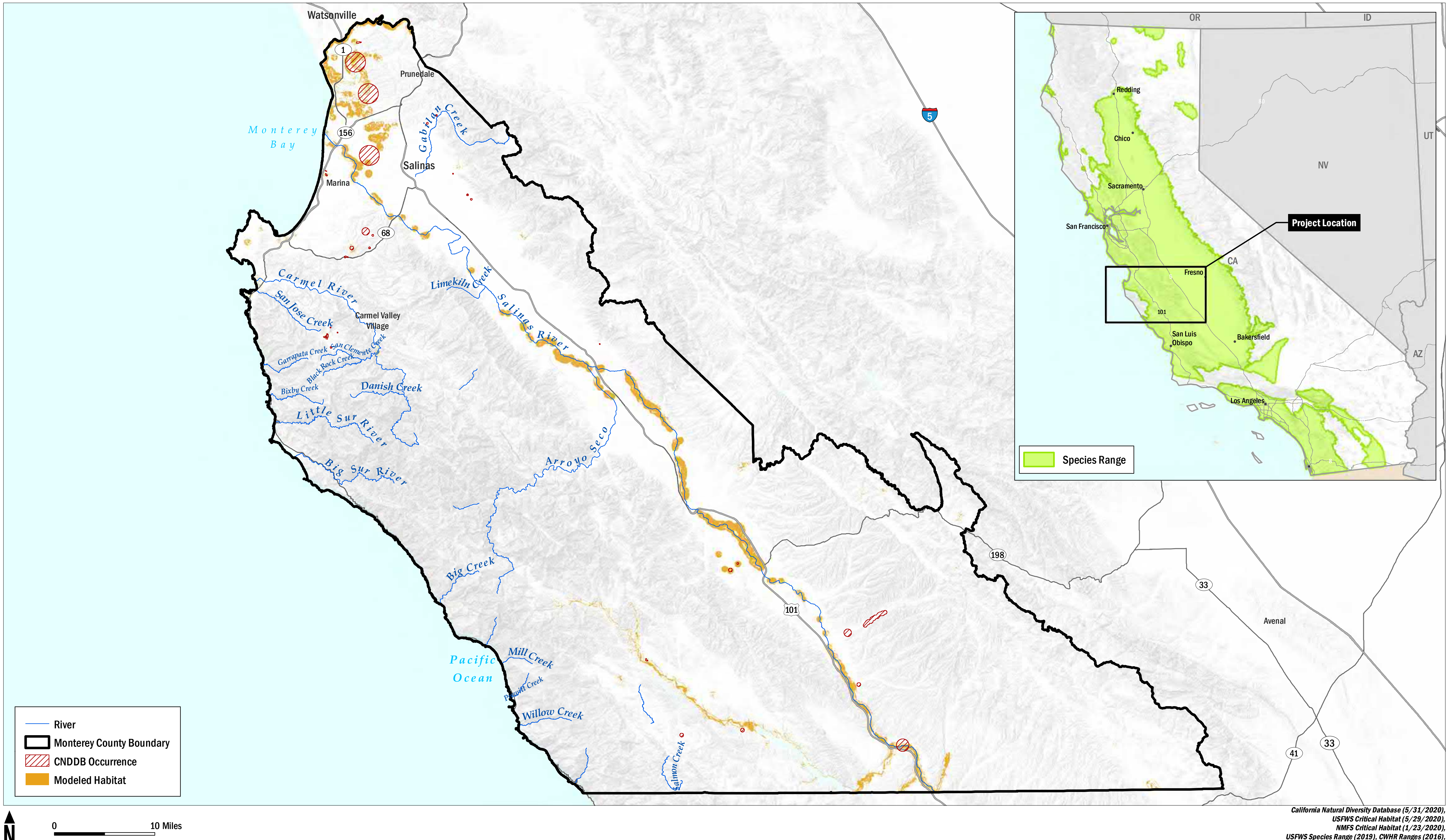
- Habitat specialization-Moderate
- Dispersal ability-Low
- Physiological tolerances- Low
- Migratory status- Low

Though tricolored blackbirds are projected to experience a 10 to 50 percent decrease in habitat suitability and some increase in exposure to extreme weather events, they can tolerate some variability in habitat types (Gardali et al. 2012). With a high ability to migrate and disperse to new habitats as well as an ability to successfully use appropriately managed agricultural lands, tricolored blackbirds are not included on the Climate Change Vulnerability Priority list (top 25 percent of highest assessed scores) (Gardali et al. 2012; Hamilton 2004).

Table 5-35. Tricolored Blackbird Climate Vulnerability Ranking

The goals, objectives, and actions shown in Table 5-36. aim to protect, enhance, and restore present day suitable habitats for tricolored blackbird, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as studies on basic life history, which may allow individuals to move to newly suitable habitats in the future.

A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-18 shows the range and modeled suitable habitat for the tricolored blackbird.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-18
Tricolored Blackbird

Tricolored Blackbird Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1, Water 1.1.1, 1.1.3, 1.1.5, 1.1.6, 1.1.7, 1.1.8, and Water Objective 1.2 apply to tricolored blackbird. Table 5-36. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Aqcuire and protect known breeding colonies, and habitats that may support potential breeding colonies, including grassland habitats within 500 meters of open water. particularly habitats that are within 12.5 miles of known breeding locations in the Santa Lucia Preserve and the Laguna Seca Recreation Area (Wilson et al. 2016) (RC Objective 1.1).
- Enhance habitat to maintain or establish suitable vegetation structure in locations suitable for breeding and foraging, especially during the peak breeding season (March–June) (CDFW 2018g) (TCBB 1.2.1).

Table 5-36. Tricolored Blackbird Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
TCBB Goal 1. Promote persistence of tricolored blackbird populations in the RCIS area through	TCBB Objective 1.1: Protect known occurrences and allow expansion by protecting suitable habitat. Measure progress toward achieving this objective by the number of breeding locations, acres of	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
protection and enhancement of habitat.	adjacent foraging habitat, and associated/equivalent acres protected.	• Habitat loss, degradation, fragmentation		TCBB 1.1.1: Promote persistence of active breeding colonies by conducting community outreach programs to encourage private protection and appropriate management of occupied habitat (Tricolored Blackbird Working Group 2007).
	TCBB Objective 1.2: Enhance occupied and suitable tricolored blackbird breeding, wintering, and foraging habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced and occupied by tricolored blackbirds.	• Surface water diversion and vegetation maintenance • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	TCBB 1.2.1: Maintain suitable vegetation structure in tricolored breeding and foraging habitat, including biennial burning of breeding habitat with heavily flattened cattails and modified grazing practices in irrigated pastures (Hamilton 2004; Shuford and Gardali 2008).

Goal	Objective	Threats	Co-Benefits	Action
		• Agricultural practices (e.g., insecticide and herbicides, grazing, silage harvest) • Climate change	• Climate change resilience	TCBB 1.2.2: Manage water levels in breeding habitat to prevent flooding of nests and increased predator accessibility (Tricolored Blackbird Working Group 2007).
		• Agricultural practices (e.g., insecticide and herbicides, grazing, silage harvest)		TCBB 1.2.3: Conduct studies on gaps in basic life history information, such as distribution, resource utilization, and survival of wintering birds (Shuford and Gardali 2008).

Goal	Objective	Threats	Co-Benefits	Action
	TCBB Objective 1.3: Restore occupied and suitable tricolored blackbird breeding, wintering, and foraging habitat and create new habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres restored and occupied by tricolored blackbirds.	• Surface water diversion and vegetation maintenance • Climate change	• Climate change resilience	TCBB 1.3.1: Restore/create appropriate densities of nest substrate species in suitable breeding habitat near productive foraging habitat (Shuford and Gardali 2008), using appropriate vegetation management practices and active revegetation, where needed.
		• Surface water diversion and vegetation maintenance • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	TCBB 1.3.2: Create ephemeral pools with appropriate native vegetation densities to encourage presence of breeding and foraging tricolored blackbird where its absence limits species' settlement (Hamilton 2004).

Goal	Objective	Threats	Co-Benefits	Action
	TCBB Objective 1.4: Protect grain and silage-nesting tricolored blackbirds until sufficient permanent breeding habitat is available (Tricolored Blackbird Working Group 2007). Measure progress toward achieving this objective by acres of silage and grain habitat and adjacent/equivalent acres restored and occupied by tricolored blackbirds	• Habitat loss, degradation, fragmentation	• Working lands	TCBB 1.4.1: Fund and carryout silage buyout with willing private landowners (Tricolored Blackbird Working Group 2007).
		• Habitat loss, degradation, fragmentation	• Working lands	TCBB 1.4.2: Promote awareness of tricolored blackbird nesting behavior and conservation options on ranch and farmlands, such as deferring harvest of grain and silage crops when possible, until after the breeding season (Tricolored Blackbird Working Group 2007).
Sources: CDFW 2015, 2020; Hamilton 2004; Shuford and Gardali 2008; Tricolored Blackbird Working Group 2007				

5.3.24 Vernal Pool Fairy Shrimp (Branchinecta lynchi)

Vernal pool fairy shrimp
Photo Credit: Ivan Parr

Status

- Federally Threatened

Ecological Requirements

- RCIS Regions: Inner Coast Range, San Antonio Valley (CDFW 2020)
- RCIS Natural Communities: Vernal Pool (CDFW 2020; USFWS 2005b).
- Occurs in cool-water vernal pools or vernal pool-like habitats (CDFW 2020; USFWS 2005b, 2007b)
- Threatened by incompatible grazing regimes and mosquito abatement programs (USFWS 2007b)
- Full species account available: California Natural Diversity Database, RareFind 5 (CDFW 2020) and the U.S. Fish and Wildlife Service 2007 5-Year Review for vernal pool fairy shrimp (USFWS 2007b)
- RCIS Conservation Target: Moderate (large range; modeled suitable habitat is designated critical habitat)

Associated Non-Focal Species

- Western spadefoot (Spea hammondii)

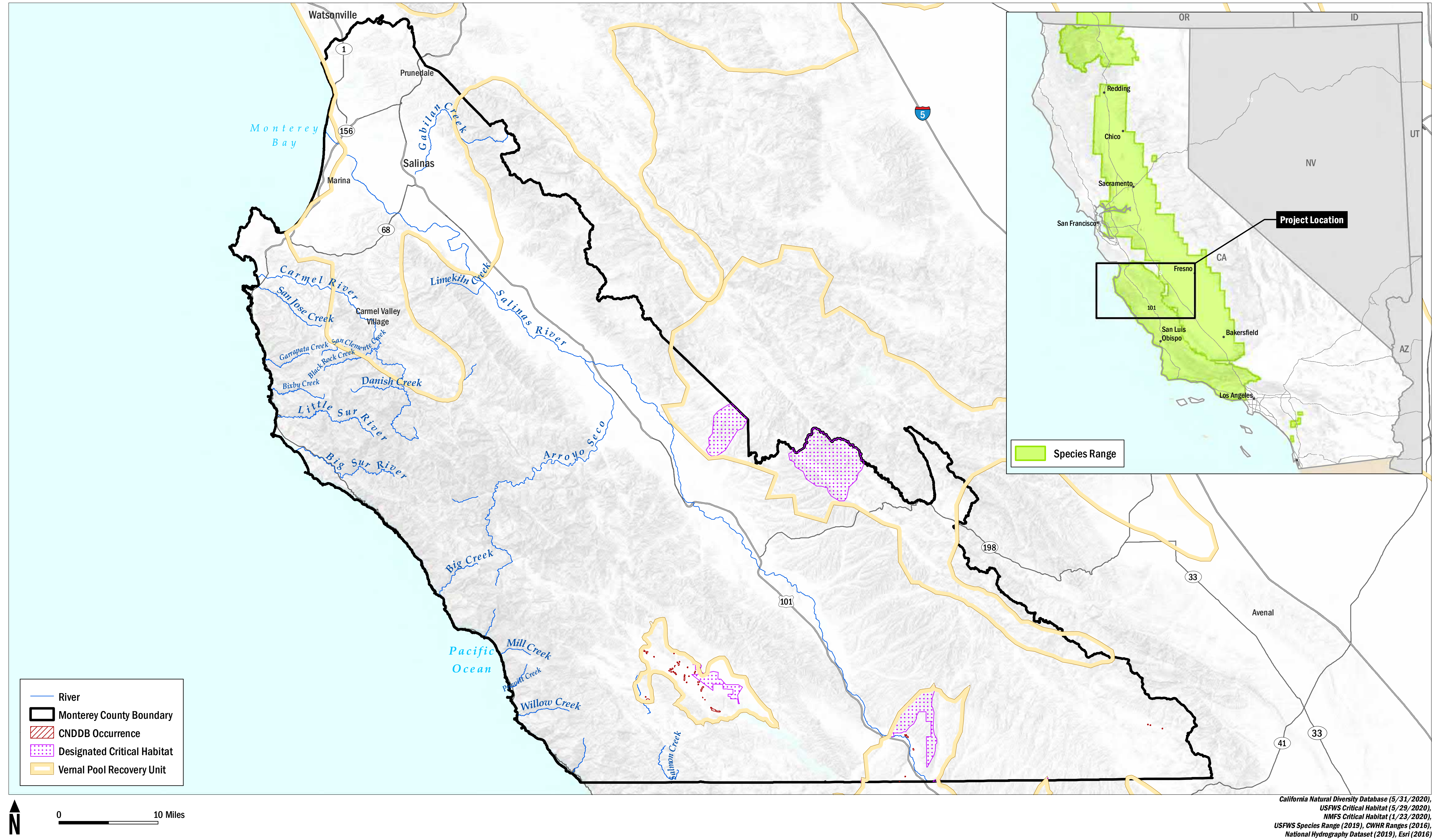
- Contra Costa goldfields (Lasthenia conjugens)

Climate Change Vulnerability Assessment

The U.S. Fish and Wildlife Service 2007 5-Year Review for vernal pool fairy shrimp (USFWS 2007c) projects potential climate change impacts to vernal pool fairy shrimp and vernal pool communities in California and many of these impacts are closely connected to the availability of water. More rainfall through intense precipitation events could result in an increase in suitable vernal pool habitat that would benefit vernal pool fairy shrimp. Or if a more hot and dry global circulation model occurs, the resulting droughts could negatively affect the amount of vernal pool habitat and increase the frequency of vernal pools drying before vernal pool fairy shrimp have completed their life cycle, or cause pool temperatures to exceed suitable temperatures for breeding.

The goals, objectives, and actions shown in Table 5-37. aim to protect, enhance, and restore present day suitable habitats for vernal pool fairy shrimp, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as reintroductions, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-19 shows the range and modeled habitat for the vernal pool fairy shrimp.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-19

Vernal Pool Fairy Shrimp

Vernal Pool Fairy Shrimp Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1, Water actions 1.1.1, 1.1.5, 1.1.7, and 1.1.8 apply to vernal pool fairy shrimp. Table 5-37 summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect habitat in and around the U.S. Fish and Wildlife Service -designated Fort Hunter-Liggett core area, which contains 80% of occurrences in the RCIS area (USFWS 2005) (RC Objective 1.1).
- Enhance habitatin U.S. Fish and Wildlife Service -designated Fort Hunter-Liggett core area (VPFS Objective 1.2).

Table 5-37. Vernal Pool Fairy Shrimp Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
VPFS Goal 1. Promote persistence of vernal pool fairy shrimp's populations in the RCIS area through protection, restoration, and enhancement of habitat.	VPFS Goal 1.1: Protect known occurrences and allow expansion by protecting 16,000 acres of suitable habitat. Protect 85% of suitable habitat in the U.S. Fish and Wildlife Service-designated Fort Hunter-Liggett core area and 80% of occurrences in the RCIS area (USFWS 2005). Measure progress toward achieving this objective in acres of vernal pool habitat, number of occurrences, and associated/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	VPFS Objective 1.2: Enhance occupied and suitable vernal pool fairy shrimp habitat in the RCIS area. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced.	• Altered natural flow regime	• Other focal/ non-focal species • Biodiversity • Water quality	VPFS 1.2.1: Maintain hydrology of vernal pools or vernal pool complexes (USFWS 2005).
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity	VPFS 1.2.2: Provide suitable upland habitat buffers to protect pollinators of vernal pool plants, dispersal of vernal pool plants and wildlife, and local watersheds, and sustain important predators of herbivores (USFWS 2005).
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity • Working lands	VPFS 1.2.3: Create and implement managed grazing plans in/adjacent to vernal pools and vernal pool complexes (USFWS 2005).

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity • Working lands	VPFS 1.2.4: Assist local governments in developing habitat conservation plans and assist private landowners in developing landowner agreements (USFWS 2005).
		• Habitat loss, degradation, fragmentation		VPFS 1.2.5: Develop and implement adaptive management plans, based on monitoring data and best available science (USFWS 2005).
		• Habitat loss, degradation, fragmentation		VPFS 1.2.6 Implement education and outreach programs to inform partners and the public about recovery needs and opportunities for vernal pool ecosystems (USFWS 2005).

Goal	Objective	Threats	Co-Benefits	Action
		• Mosquito abatement programs		VPFS 1.2.7: Limit use of mosquitofish as mosquito abatement in vernal pools with known occurrences and adjacent habitat (USFWS 2007b).
	VPFS Goal 1.3: Restore occupied and suitable vernal pool fairy shrimp habitat in the RCIS area. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres restored and occupied by vernal pool fairy shrimp.	• Habitat loss, degradation, fragmentation		VPFS 1.3.1: Reintroduce vernal pool fairy shrimp to suitable or newly created habitat (USFWS 2005, 2007b).
Sources: CDFW 2015, 2020; USFWS 2005, 2007b				

5.3.25 Western Snowy Plover (Charadrius nivosus nivosus)

Western Snowy Plover
Photo Credit: Ivan Parr

Status

- Federally Threatened
- State Species of Special Concern

Ecological Requirements

- RCIS Regions: Monterey Bay Coastline (CDFW 2020, USFWS 2007b)
- RCIS Natural Communities: Coastal Dune, Coastal Scrub (CDFW 2020; USFWS 2007c)
- Breeding habitat: Nests consist of scrapes above the high tide line on coastal beaches, sand spits, dune-backed beaches, sparsely-vegetated dunes, beaches at creek and river mouths, and salt pans at lagoons and esturaries (CDFW 2020; USFWS 2007c). Driftwood, shells, and other debris are used by chicks for shelter (USFWS 2019c).
- Wintering habitat: Uses same beaches used for nesting, as well as non-breeding beaches, man-made salt ponds, and esturarine sand and mud flats (CDFW 2020; USFWS 2007c)
- Nests and individuals often camoflaged and difficult to detect (USFWS 2007c, 2019b)

- Sensitive to impacts from recreational use of coastal habitats used for breeding and wintering, such as increased predator populations from presence of trash (USFWS 2007c)
- Full species account available: Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (Charadrius alexandrinus nivosus) (USFWS 2007c).
- RCIS Conservation Target: High (limitied coastal habitat, threatened by sea-level rise)

Associated Non-Focal Species

- None

Climate Change Vulnerability Assessment

Western snowy plover (WSP) is ranked among the top 25 percent most vulnerable California avifauna, and Gardali et al. (2012) listed it as "Moderate" on the Climate Change Vulnerability Priority list. Climate threats that would likely still impact western snowy plover include an increase in spring heat waves, sea-level rise, coastal erosion, increased wave action, and increased frequency and intensity of wildfires (Wilsey et al. 2019; Hutto et al. 2015). Gardali et al. (2012) conducted a species-specific climate change vulnerability assessment for the western snowy plover on exposure and sensitivity factors:

Exposure Factors

- Habitat suitability-Moderate
- Food availability- Low
- Extreme weather-High

Sensitivity Factors

- Habitat specialization- High
- Dispersal ability- Low
- Physiological tolerances- Low
- Migratory status- Low

Hutto et al. (2015) also conducted climate vulnerability assessments of exposure and sensitivity factors for the western snowy plover:

Sensitivity to Climate and Climate Driven Change (Exposure)

- Sea-Level Rise– High
- Coastal Erosion– High
- Wave Action– High
- pH- Low
- Precipitation– Low

Sensitivity of Change in Disturbance Regimes (Exposure)

- Wind–High
- Storms-High
- Flooding-High

Sensitivity and Current Exposure to Non-Climate Stressors

- Land Use Change-High
- Pollution and Poison– High
- Recreation– High
- Invasive Species– Moderate-high

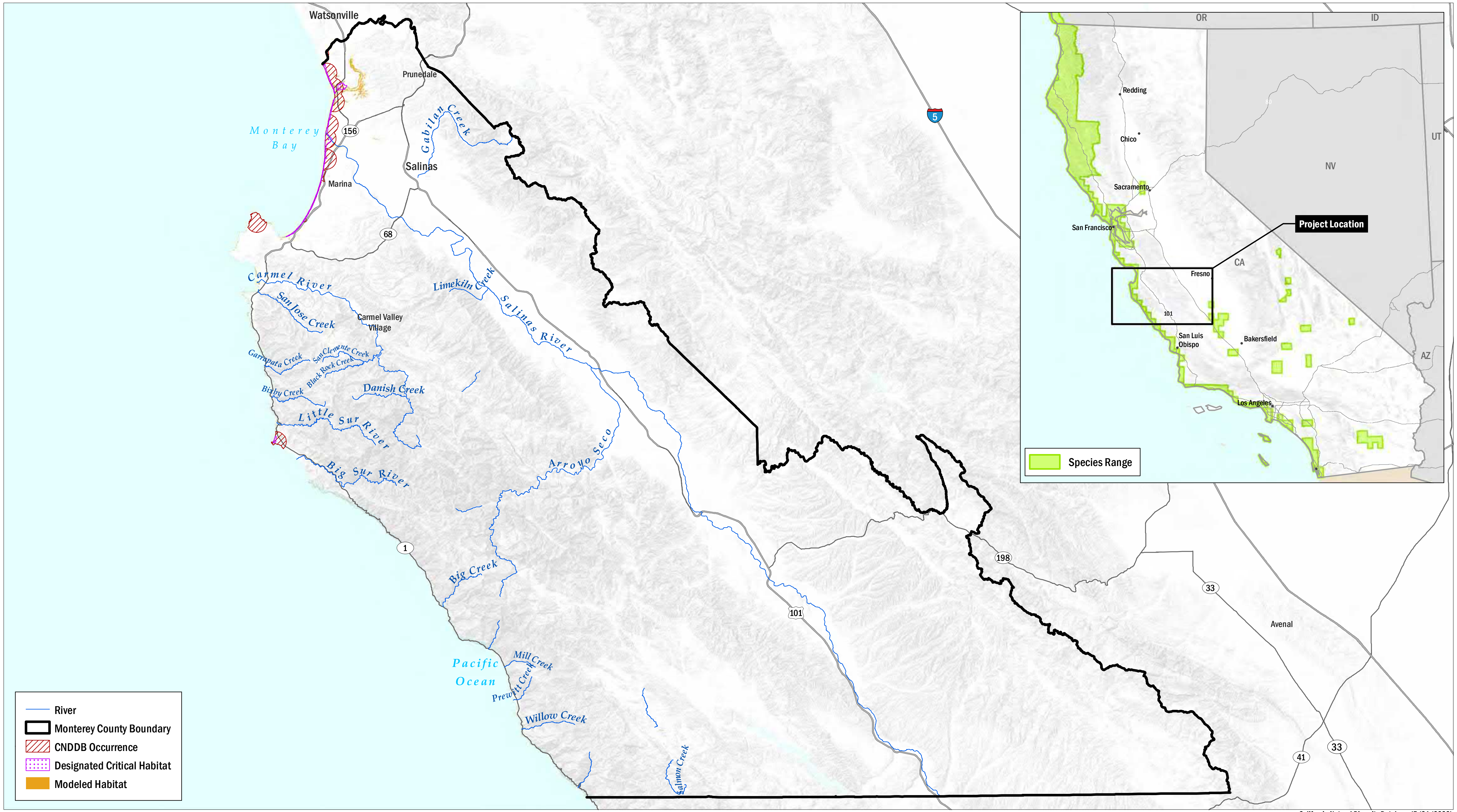
Overall Vulnerability

- Overall Vulnerability– Moderate-high
- Sensitivity– Moderate-high
- Exposure– Moderate-high
- Adaptive Capacity– Moderate

Western snowy plover is highly sensitive to stressors from extreme weather, such as wind, storms, and flooding (Hutto et al. 2015; Gardali et al. 2012) and are projected to experience a 10 to 50 percent decrease in habitat suitability (Gardali et al. 2012). Coastal habitats have high public value and could recover quickly if they have space to migrate or have enough sediment supply to keep up with sea-level rise and related erosion impacts (Hutto et al. 2015). While they only use specific habitat types, western snowy plovers have a high dispersal ability and may be able to move to newly created coastal habitats that are protected from sea-level rise and storm impacts in the RCIS area.

The goals, objectives, and actions shown in Table 5-38. aim to protect, enhance, and restore present day suitable habitats for western snowy plover, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as management of anthropogenically increased predator populations, which may allow individuals to move to newly suitable habitats in the future.

A summary of natural communities where this species occurs is presented in Chapter 4. Figure 5-20 shows the range and modeled suitable habitat for the western snowy plover.



N

0 10 Miles

California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

FIGURE 5-20
Western Snowy Plover

Western Snowy Plover Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1 and Water objective 1.3 apply to western snowy plover. Table 5-38. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect coastal habitats along the Monterey Bay coastline, Point Pinos, and Point Sur (WSP Objective 1.1).
- Enhance and restore coastal dune beach habitats for breeding and wintering western snowy plovers along the coastline in the RCIS area (WSP Objective 1.2, 1.3).

Table 5-38. Western Snowy Plover Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
WSP Goal 1. Promote persistence of western snowy plover populations in the RCIS area	WSP Objective 1.1: Protect known occurrences and allow expansion by protecting suitable habitat. Measure progress toward achieving this objective by the number of breeding locations, acres	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
through protection and enhancement of habitat.	of adjacent foraging habitat and coastal zone, and associated/equivalent acres protected WSP Objective 1.2: Enhance occupied, suitable, and USFWS-designated critical western snowy plover breeding, wintering, and foraging habitat. Measure progress toward achieving this objective by the area of habitat enhanced and occupied by western snowy plovers.	• Increased predator populations	• Other focal/ non-focal species • Biodiversity • Non-native invasive species	WSP 1.2.1: Where native and non-native predator populations have increased because of anthropogenic factors, initiate predator removal programs, such as the removal of predatory bird perches (USFWS 2007c).
		• Recreational activities (e.g., equestrians, pets, off-road vehicles, foot traffic)	• Other focal/ non-focal species • Biodiversity	WSP 1.2.2: Conduct public outreach and install signage concerning the effects of recreational activities and garbage near nesting and wintering sites, including increasing retention of driftwood and shells on beaches by discouraging beach visitors from removing driftwood and shells (USFWS 2019b).

Goal	Objective	Threats	Co-Benefits	Action
		• Recreational activities (e.g., equestrians, pets, off-road vehicles, foot traffic)	• Other focal/ non-focal species • Biodiversity • Recreation	WSP 1.2.3: Protect nesting colonies from anthropogenic factors that disrupt breeding, by conducting patrols and using enforcement where needed (USFWS 2007c).
		• Pollution and trash	• Other focal/ non-focal species • Biodiversity • Recreation	WSP 1.2.4: Remove trash from suitable habitat manually, to avoid mechanical raking (USFWS 2007c).
		• Habitat loss, degradation, fragmentation		WSP 1.2.5: Create and sustain long-term monitoring of breeding and wintering sites (USFWS 2007b).
		• Habitat loss, degradation, fragmentation		WSP 1.2.6: Conduct private landowner outreach to facilitate cooperation with U.S. Fish and Wildlife Service Recovery Plan objectives (USFWS 2007c).

Goal	Objective	Threats	Co-Benefits	Action
		• Decrease in beach sediment sources • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience • Flood control • Water quality enhancement	WSP 1.2.7: Manage dams and debris basins to allow sediment release, to replenish coastal beaches (Hutto et al. 2015).
		• Habitat loss, degradation, fragmentation		WSP 1.2.8: Implement U.S. Fish and Wildlife Service Recovery Plan recommendations at designated breeding sites (USFWS 2007c).

Goal	Objective	Threats	Co-Benefits	Action
	WSP Objective 1.3: Restore occupied, suitable, and U.S. Fish and Wildlife Service-designated breeding, wintering, and foraging habitat for western snowy plover and create new habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres restored and occupied by plovers.	• Decrease in beach sediment sources • Climate change	• Climate change resilience • Flood control • Other focal/ non-focal species • Biodiversity	WSP 1.3.1: Restore coastal dune and beach habitats for breeding and wintering western snowy plovers.
WSP Goal 2: Promote resiliency to climate change-induced coastal retreat to maintain western snowy plover breeding and	WSP Objective 2.1: Create and protect new coastal dune and beach systems as breeding and wintering western snowy plover habitat. Measure progress toward achieving this objective by acres of coastal habitat and	• Decrease in beach sediment sources • Climate change	• Climate change resilience • Flood control • Other focal/ non-focal species • Biodiversity	WSP 2.1.1: Conduct beach nourishment instead of coastal armoring and create additional coastal dune systems where feasible and informed by modeled sea-level rise projections (Hutto et al. 2015).

Goal	Objective	Threats	Co-Benefits	Action
wintering habitat.	adjacent/equivalent acres created and protected.	• Coastal armoring • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity	WSP 2.1.2: Install living shorelines using shoreline stabilization techniques informed by modeled sea-level rise projections.
Sources: CDFW 2015, 2020; CDPR 2002; Hutto et al. 2015; USFWS 2007c, 2019b				

5.3.26 Carmel Valley Bush Mallow (Malocothamnus palmeri var. involucratus)

Carmel Valley bush mallow

Status

- California Rare Plant Rank 1B.2

Ecological Requirements

- RCIS Regions: Carmel Valley, Inner Coast Range, Mid Inner Coast Range, Outer Coast Range
- RCIS Natural Communities: Coastal Scrub, Mixed Chaparral (CDFW 2020)
- Found on talus hilltops and slopes, sometimes in serpentine soils (CDFW 2020)
- Fire dependent (CDFW 2020)
- Full species account available: California Natural Diversity Database, RareFind 5 (CDFW 2020)
- RCIS Conservation Target: Moderate (non-listed, limited range, represents Carmel Valley)

Associated Non-Focal Species

- Carmel Valley cliff aster (Malacothrix saxatilis var. arachnoidea)
- Woolly-leaf manzanita shrubland (Arctostaphylos tomentosa Alliance)

Climate Change Vulnerability Assessment

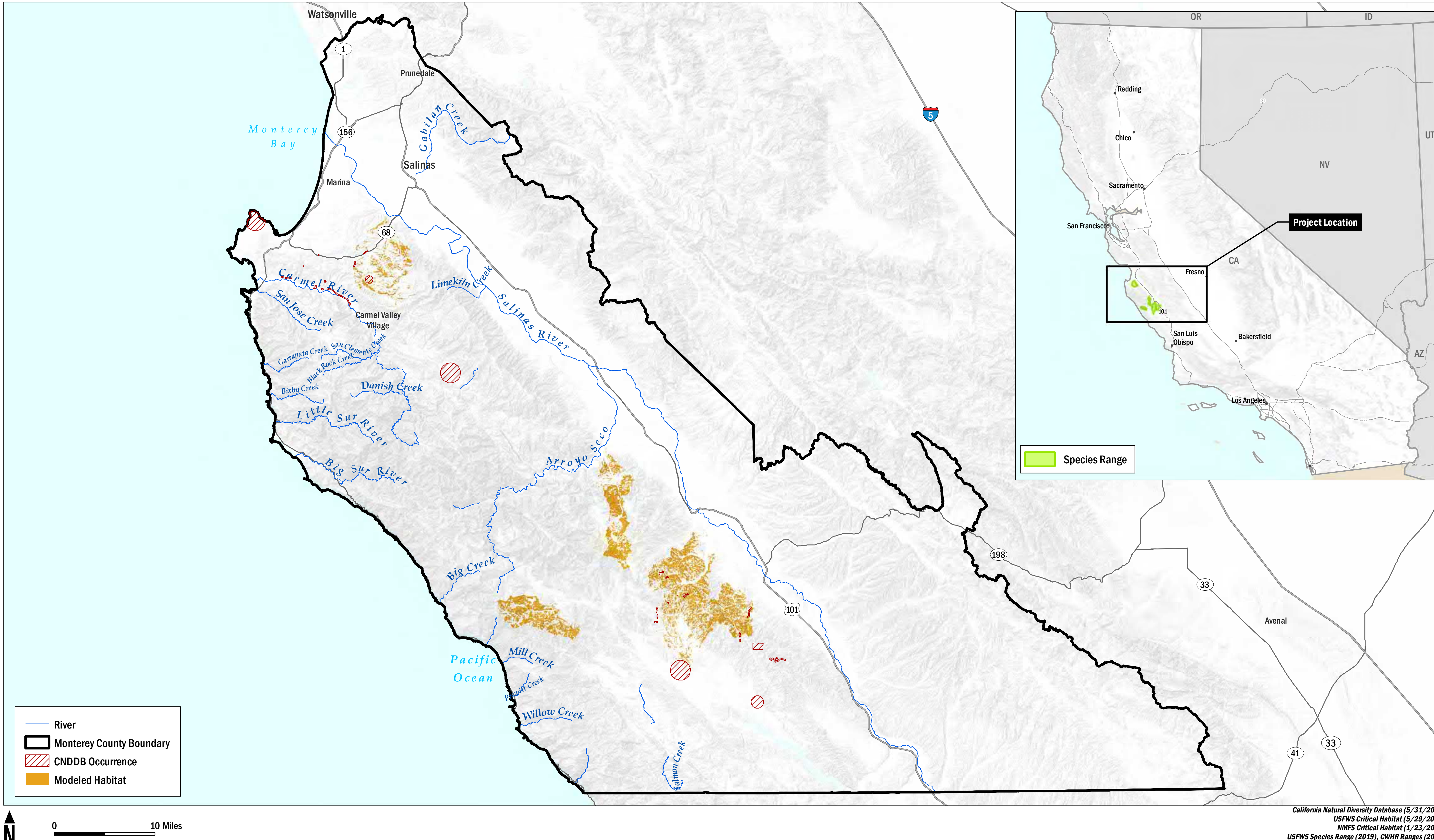
Table 5-39 summarizes the climate change exposure, spatial distribution, and vulnerability of natural communities associated with the Carmel Valley bush mallow (CVBM). Statewide, coastal scrub communities could experience a 25 to 75 percent reduction in habitat suitability, and mixed chaparral communities could experience a 0 to 25 percent reduction in habitat suitability.

Table 5-39. Carmel Valley Bush Mallow Natural Communities Climate Vulnerability Ranking

Natural Communities	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Coastal Scrub	Moderate	Moderate to Mid-High	Moderate to Mid-High
Mixed Chaparral	Low to Moderate	Moderate to Mid-High	Moderate to Mid-High
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-40 aim to protect, enhance, and restore present day suitable habitats for Carmel Valley bush mallow, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as prescribed burns, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-21 shows the range and modeled habitat for Carmel Valley bush mallow.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-21
Carmel Valley Bush-mallow

Carmel Valley Bush Mallow Conservation Priorities Goals, Objectives, and Actions

RC Goal 1 and all Plant goals, objectives, and actions apply to Carmel Valley bush mallow. Table 5-46 summarizes specific goals, objectives, and actions for the species

Conservation Priorities

- Protect suitable habitat surrounding known occurrences in the Santa Lucia Range, Carmel Valley, Fort Hunter Ligget, and surrounding areas (RC Objective 1.1).
- Enhance suitable habitat through prescribed burns, because of the species fire dependence, near known occurences to promote plant establishment, and expansion (CVBM 1.2.1).

Table 5-40. Carmel Valley Bush Mallow Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
CVBM Goal 1. Promote persistence of Carmel Valley bush mallow populations in the RCIS area through protection, restoration, and enhancement of habitat.	CVBM Objective 1.1: Protect known occurrences and allow expansion by of protecting 8,200 acres of suitable or potentially suitable habitat for Carmel Valley bush mallow. Measure progress toward achieving this objective by the number of known occurrences, acres of suitable or potentially suitable habitat, and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Biodiversity • Other focal species/non-focal species • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	CVBM Objective 1.2: Enhance Carmel Valley bush mallow habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced.	• Fire suppression activities	• Fire management • Biodiversity • Other focal/ non-focal species • Biodiversity	CVBM 1.2.1: Use prescribed burns to promote plant establishment, in coordination with scientific advisors, land managers, universities, and/or regulatory agencies to inform the location and frequency of potential burn areas.
Sources: CDFW 2015, 2020; CNPS 2019b				

5.3.27 Hickman's Onion (Allium hickmanii)

Hickman's onion
Photo Credit: Joe Broberg

Status

- California Rare Plant Rank 1B.2

Ecological Requirements

- RCIS Regions: Monterey Peninsula to Point Lobos, Inner Coast Range, Carmel Valley, Big Sur Coastline
- RCIS Natural Communities: Wet Meadow, Mixed Chaparral, Closed-Cone Pine-Cypress (CDFW 2020)
- Found in sandy loam, damp ground, and vernal swales (CDFW 2020)
- Full species account available: Allium Hickmanii Fact Sheet (Coastal Training Program 2020a)
- RCIS Conservation Target: High (non-listed, limited habitat, near-endemic to Monterey County)

Associated Non-Focal Species

- Santa Lucia slender salamander (Batrachoseps luciae)
- Monterey clover (Trifolium trichocalyx)

Climate Change Vulnerability Assessment

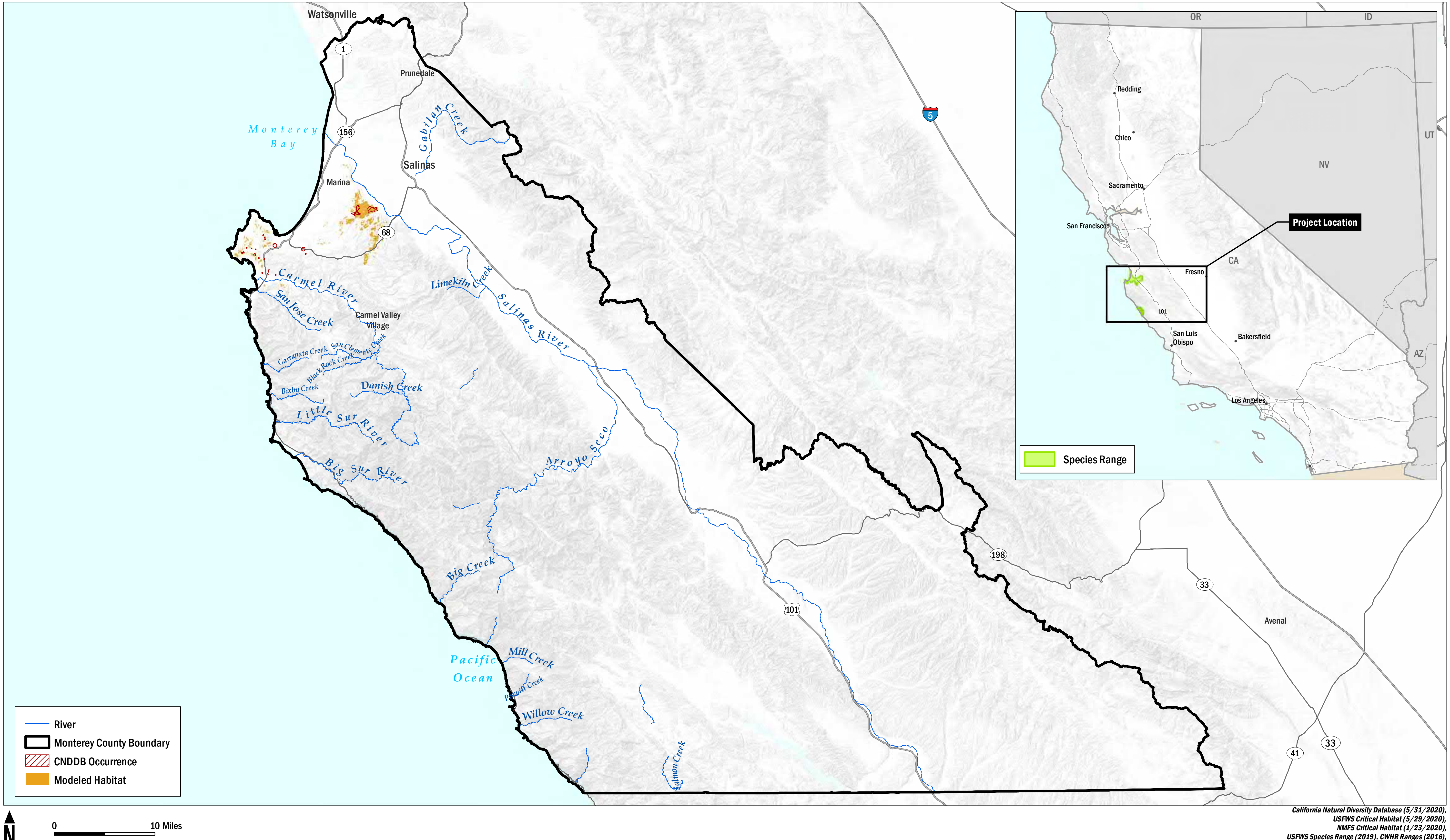
Table 5-47 summarizes the climate change exposure, spatial distribution, and vulnerability of natural communities associated with Hickman's onion (HO). Statewide, some mixed chaparral communities could experience a 0 to 25 percent reduction in habitat suitability, closed-cone pine-cypress could experience a 25 to 75 percent reduction, and wet meadow natural communities could experience a 50 to 75 percent reduction in habitat suitability.

Table 5-41. Hickman's Onion Natural Communities Climate Vulnerability Ranking

Natural Communities	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Mixed Chaparral	Low to Moderate	Moderate to Mid-High	Moderate to Mid-High
Closed-cone Pine-Cypress	Moderate	Mid-High	Moderate
Wet Meadow	Mid-High	Mid-High	Mid-High
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-42 aim to protect, enhance, and restore present day suitable habitats for Hickman's onion, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as seed storage, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-22 shows the range and modeled habitat for Hickman's onion.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-22
Hickman's Onion

Hickman's Onion Conservation Priorities Goals, Objectives, and Actions

RC Goal 1 and all Plant goals, objectives, and actions apply to Hickman's onion. Table 5-48 summarizes specific goals, objectives, and actions for the species

Conservation Priorities

- Protect suitable habitat in sandy loam, damp ground, and vernal swales surrounding known occurrences on the Monterey Peninsula, Big Sur near Plaskett Creek, and near Salmon Creek (Coastal Training P 2020a) (RC Objective 1.1).

Table 5-42. Hickman's Onion Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
HO Goal 1. Promote persistence of Hickman's onion populations in the RCIS area through protection, restoration, and enhancement of habitat.	HO Objective 1.1: Protect known occurrences and allow expansion by protecting 410 acres of suitable or potentially suitable habitat for Hickman's onion. Measure progress toward achieving this objective by the number of known occurrences, acres of suitable or potentially suitable habitat, and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Biodiversity • Other focal species/non-focal species • Climate change resilience	RC Objective 1.1 (Protection) actions
Sources: CDFW 2015, 2020				

5.3.28 Lemmon's Jewelflower (Caulanthus lemmonii)

Lemmon's jewelflower
Photo Credit: Chris Winchell

Status

- California Rare Plant Rank 1B.2

Ecological Requirements

- RCIS Regions: Inner Coast Range, San Antonio Valley, Stockdale Mountain, Gabilan Range and Pinnacles National Monument
- RCIS Natural Communities: Annual Grassland, Perennial Grassland (CDFW 2020)
- Found in valley and foothill grasslands on slopes in rocky-clay, serpentine, and shale soils (CDFW 2020)
- Full species account available: California Natural Diversity Database, RareFind 5 (CDFW 2020)
- RCIS Conservation Target: High (non-listed, limited range, representative of native grasslands)

Associated Non-Focal Species

- American badger (Taxidea taxus)
- Northern California legless lizard (Anniella pulchra)

Climate Change Vulnerability Assessment

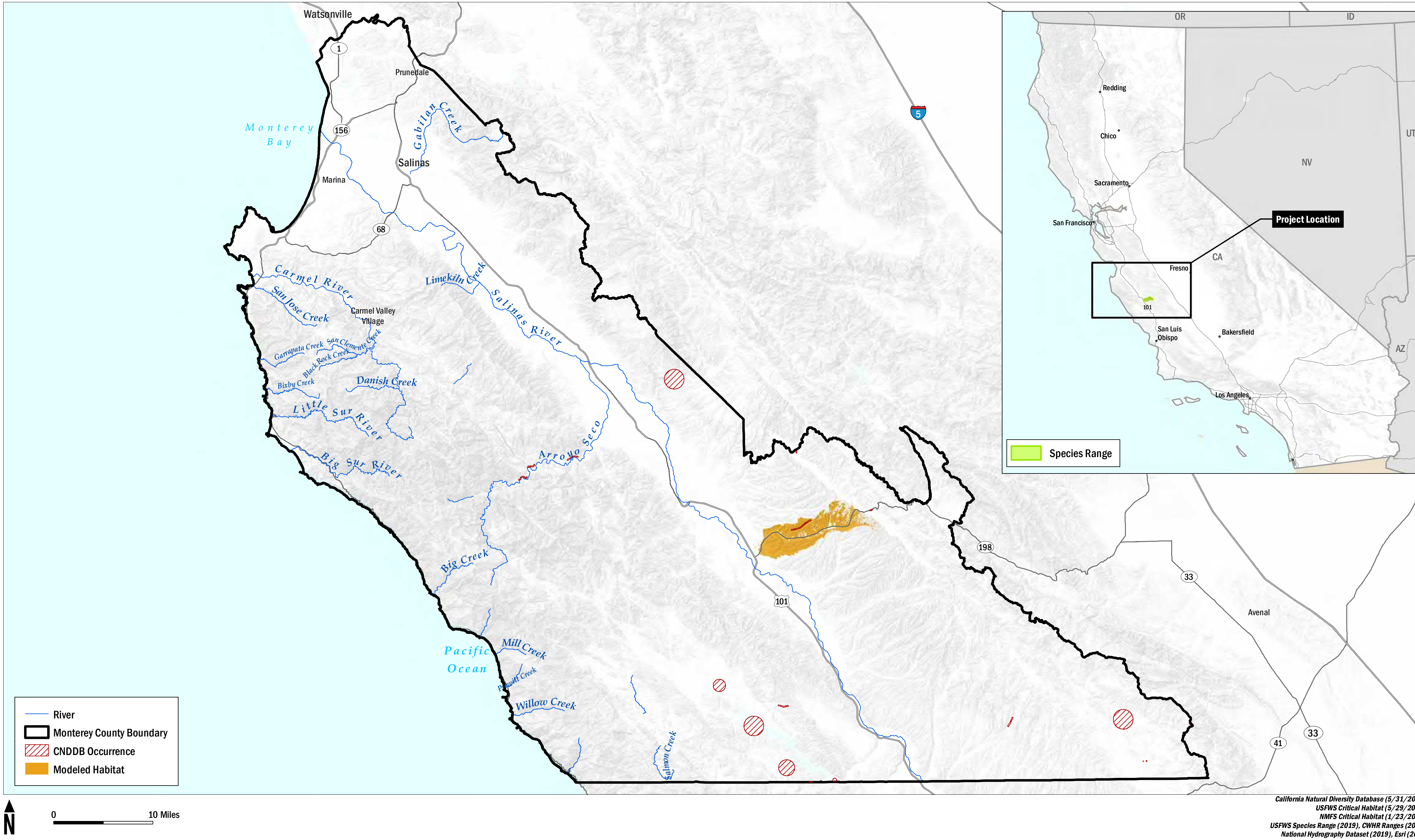
Table 5-43 summarizes the climate change exposure, spatial distribution, and vulnerability of natural communities associated with Lemmon's jewelflower (LJ). Annual grassland and perennial grassland communities statewide could experience a 25 to 75 percent reduction in habitat suitability.

Table 5-43. Lemmon's Jewelflower Natural Communities Climate Vulnerability Ranking

Natural Communities	Climate Exposure and Spatial Disruption Rank High Emission (RCP8.5) Warm and Wet	Climate Exposure and Spatial Disruption Rank High Emission (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Annual Grassland	Moderate to Mid-High	Mid-High	Mid-High
Perennial Grassland	Moderate to Mid-High	Mid-High	Moderate (Warm and Wet) to Mid-High
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-50 aim to protect, enhance, and restore present day suitable habitats for Lemmon's jewelflower, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as seed storage, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-23 shows the range and modeled habitat for Lemmon's jewelflower.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-23
Lemmon's Jewelflower

Lemmon's Jewelflower Conservation Priorities Goals, Objectives, and Actions

RC Goal 1 and all Plant goals, objectives, and actions apply to Lemmon's jewelflower. Table 5-50 summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Protect and preserve native grasslands habitats surrounding known occurrences in Cholame Valley (RC Objective 1.1).

Table 5-44. Lemmon's Jewelflower Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
LJ Goal 1. Promote persistence of Lemmon's jewelflower populations in the RCIS area through protection, restoration, and enhancement of habitat.	LJ Objective 1.1: Protect known occurrences and allow expansion by protecting 10,000 acres of suitable or potentially suitable habitat for Lemmon's jewelflower. Measure progress toward achieving this objective by the number of known occurrences, acres of suitable or potentially suitable habitat, and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation	• Biodiversity • Other focal species/non-focal species	RC Objective 1.1 (Protection) actions
Sources: CDFW 2015; CNPS 2019b				

5.3.29 Monterey Gilia (Gilia tenuiflora ssp. arenaria)

Monterey gilia

Status

- Federally Endangered
- State Threatened
- California Rare Plant Rank 1B.2

Ecological Requirements

- RCIS Regions: Monterey Bay Coastline (USFWS 1998b)
- RCIS Natural Communities: Mixed Chaparral, Coastal Dune, Coastal Scrub (CDFW 2020)
- Sandy openings in bare, wind-sheltered areas often near dune summits or in the hind dunes (CDFW 2020, CNPS 2019b, USFWS 1998b)
- Fire adapted (USFWS 2008)
- Endemic to Monterey County (USFWS 1998b, 2008)
- Full species account available: Monterey Gilia 5-Year Review (USFWS 2008)
- RCIS Conservation Target: High (Federally and state listed, endemic to the RCIS area)

Associated Non-Focal Species

- Woolly-leaf manzanita shrubland (Arctostaphylos tomentosa Alliance)

Climate Change Vulnerability Assessment

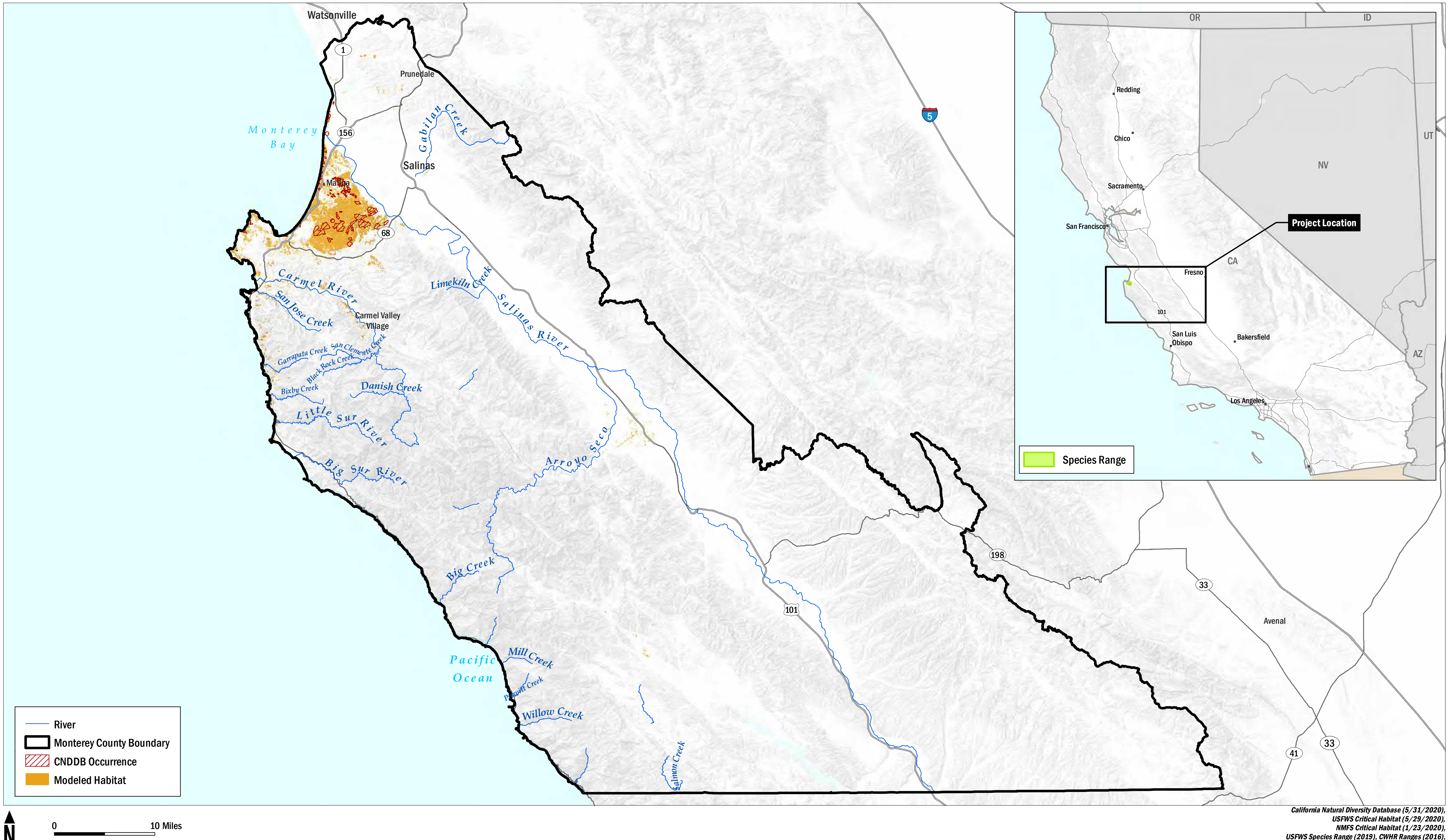
Table 5-51 summarizes the climate change exposure, spatial distribution, and vulnerability natural communities associated with Monterey gilia (MG). Coastal scrub and coastal dune communities statewide could experience a 25 to 75 percent reduction in habitat suitability, and some mixed chaparral communities could experience a 0 to 25 percent reduction in habitat suitability.

Table 5-45. Monterey Gilia Natural Communities Climate Vulnerability Ranking

Natural Communities	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Coastal Dune	Moderate to Mid-High	Moderate	Mid-High
Coastal Scrub	Moderate to Mid-High	Moderate	Moderate to Mid-High
Mixed Chaparral	Low to Moderate	Moderate to Mid-High	Moderate to Mid-High
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-51 aim to protect, enhance, and restore present day suitable habitats for Monterey gilia, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as installation of boardwalks to limit trampling, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-24 shows the range and modeled habitat for Monterey gilia.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-24

Monterey Gilia

Monterey Gilia Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1 and all Plant goals, objectives, and actions apply to Monterey gilia. Table 5-52 summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect suitable habitat surrounding known occurrences in the Monterey Bay – Fort Ord region (USFWS 1998b) (RC Objective 1.1).
- Enhance suitable or potentially suitable habitat in the Monterey County region through non-native species control or seed germination pilot studies (Plant Goal 1).

Table 5-46. Monterey Gilia Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
MG Goal 1. Promote persistence of Monterey gilia populations in the RCIS area through protection, restoration, and enhancement of habitat.	MG Objective 1.1: Protect known occurrences and allow expansion by protecting 5,100 acres of suitable habitat. Measure progress toward achieving this objective by the number of known occurrences, acres of suitable or potentially suitable habitat, and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Biodiversity • Other focal species/non-focal species • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	MG Objective 1.2: Enhance occupied and suitable Monterey gilia habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced and occupied by Monterey gilia.	• Recreational activities (e.g., off-road vehicles, foot traffic, equestrians)		MG 1.2.1: Install fencing and boardwalks to limit trampling in areas of known occurrences (USFWS 1998b).
		• Habitat loss, degradation, fragmentation • Climate change	• Fire management • Biodiversity • Other focal/ non-focal species • Climate change resilience	MG 1.2.2: Initiate controlled burn studies at former Fort Ord, to reduce vegetation density and allow population expansion (USFWS 2008).
Sources: CDFW 2015, 2020; CNPS 2019b; USFWS 1998b, 2008				

5.3.30 Monterey Spineflower (Chorizanthe pungens var. pungens)

Monterey spineflower

Status

- Federally Threatened
- California Rare Plant Rank 1B2.

Ecological Requirements

- RCIS Regions: Monterey Bay Coastline, Inner Coast Range (CDFW 2020; USFWS 1998b)
- RCIS Natural Communities: Coastal Dune, Coastal Scrub, Mixed Chaparral (CDFW 2020; USFWS 1998b)
- Openings in sandy soils in coastal dunes or more inland within chaparral or other habitats (CDFW 2020; USFWS 1998b, 2009a)
- Fire adapted (USFWS 2009a)
- Full species account available: U.S. Fish and Wildlife Service 5-Year Review: Monterey Spineflower (Chorizanthe pungens var. pungens), Summary and Evaluation (USFWS 2009a)
- RCIS Conservation Target: Highest (Federally listed, near-endemic to the RCIS area)

Associated Non-Focal Species

- Northern California legless lizard (Anniella pulchra)
- Menzies' wallflower (Erysimum menziesii)
- Monterey larkspur (Delphinium hutchinsoniae)
- Sandmat manzanita (Arctostaphylos pumila)
- Woolly-leaf manzanita shrubland (Arctostaphylos tomentosa Alliance)

Climate Change Vulnerability Assessment

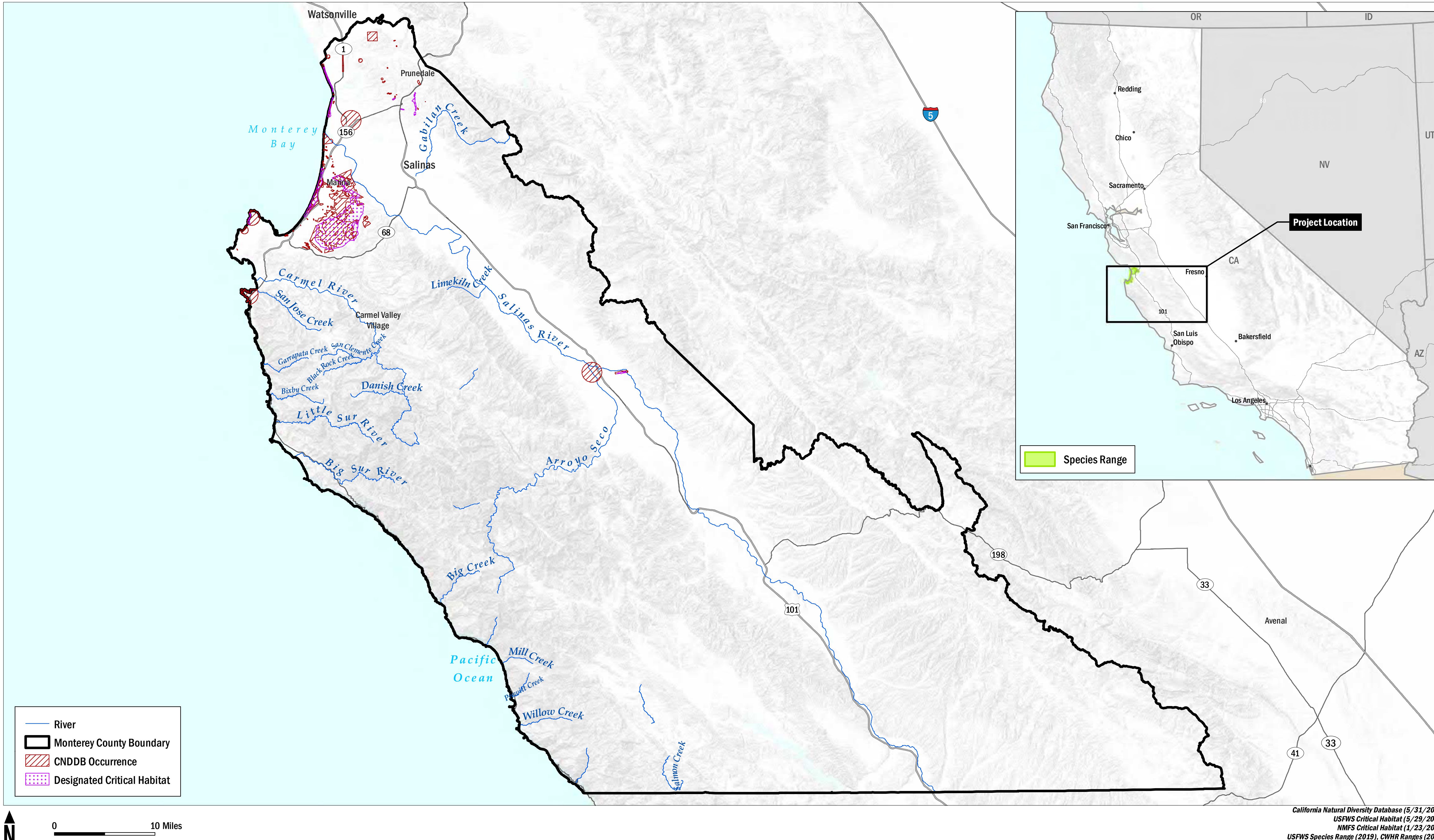
Table 5-53 summarizes the climate change exposure, spatial distribution, and vulnerability of natural communities associated with the Monterey spineflower (MS). Coastal scrub and coastal dune communities statewide could experience a 25 to 75 percent reduction in habitat suitability, and some mixed chaparral communities could experience a 0 to 25 percent reduction in habitat suitability. Projected shoreline retreat and beach erosion because of increased frequency and intensity of wave action will also contribute to degradation or loss of habitat (USFWS 2009a).

Table 5-47. Monterey Spineflower Vulnerability Ranking

Natural Communities	Climate Exposure and Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Coastal Scrub	Moderate	Moderate to Mid-High	Mid-High
Coastal Dune	Moderate	Mid-High	Moderate to Mid-High
Mixed Chaparral	Low to Moderate	Moderate to Mid-High	Moderate to Mid-High
Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-53 aim to protect, enhance, and restore present day suitable habitats for Monterey spineflower, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as prescribed burns, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-25 shows the range and modeled habitat for the Monterey spineflower.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-25
Monterey Spineflower

Monterey Spineflower Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1 and all Plant goals, objectives, and actions apply to Monterey spineflower. Table 5-54 summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect suitable habitat surrounding known occurrences in the Monterey Bay–Fort Ord region, Prunedale Hills, and known occurences along the Salinas River near Soledad (USFWS 2009a) (RC Objective 1.1).
- Enhance suitable or potentially suitable habitat in Monterey County through non-native species control or seed germination pilot studies (Plant Goal 1).

Table 5-48. Monterey Spineflower Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
MS Goal 1. Promote persistence of Monterey spineflower populations in the RCIS area through protection, restoration, and enhancement of habitat.	MS Objective 1.1: Protect known occurrences and allow expansion by protecting 2,000 acres of suitable habitat. Measure progress toward achieving this objective by the number of known occurrences, acres of suitable or potentially suitable habitat, and adjacent/equivalent acres protected, focusing on Caltrans-managed lands in the Prunedale Hills area (USFWS 2009a).	• Habitat loss, degradation, fragmentation • Climate change	• Biodiversity • Other focal species/non-focal species • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	MS Objective 1.2: Enhance occupied and suitable Monterey spineflower habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced and occupied by Monterey spineflower.	• Fire suppression activities • Climate change	• Fire management • Biodiversity • Other focal/ non-focal species • Climate change resilience	MS 1.2.1: Use prescribed burns to create suitable vegetation densities to promote plant establishment, in coordination with scientific advisors, land managers, universities, and/or regulatory agencies to inform the location and frequency of potential burn areas.
		• Habitat loss, degradation, fragmentation • Climate change	• Climate change resilience	MS 1.2.2: Conduct surveys and research on inland populations to determine ecological information, such as distribution, range, and climate change vulnerability.

Goal	Objective	Threats	Co-Benefits	Action
MS Goal 2: Promote resiliency to the impacts of climate-change-induced coastal retreat, to maintain habitat.	MS Objective 2.1: Create and protect new coastal dune and beach systems as Monterey spineflower habitat. Measure progress toward achieving this objective by acres of coastal habitat and adjacent/equivalent acres created and protected.	• Sand mining • Climate change	• Other focal species/non-focal species • Climate change resilience	MS 2.1.1: Conduct beach nourishment to create additional coastal dune systems where feasible and informed by modeled sea-level rise projections.
		• Climate change	• Other focal species/non-focal species • Climate change resilience	MS 2.1.2: Install living shorelines using shoreline stabilization techniques informed by modeled sea-level rise projections.
Sources: CDFW 2015, 2020; CNPS 2019b; USFWS 1998a, 1998b, 2009a				

5.3.31 Pajaro Manzanita (Arctostaphylos pajaroensis)

Pajaro Manzanita
Photo Credit: Joe Broberg

Status

- California Rare Plant Rank 1B.1

Ecological Requirements

- RCIS Regions: Pajaro River, Gabilan Range and Pinnacles National Monument, Monterey Bay Coastline, Outer Coast Range, Inner Coast Range, Salinas Valley (CDFW 2020)
- RCIS Natural Communities: Mixed Chaparral (CDFW 2020; CNPS 2019b)
- Fire-adapted found in sandy soils at edges and openings of chaparral (CDFW 2020; CNPS 2019b)
- Full species account available: Arctostaphylos Pajaroensis Fact Sheet (Coastal Training Program 2020b)
- RCIS Conservation Target: High (non-listed, limited range, represents near-endemic to RCIS area, unique habitat [sandy chaparral])

Associated Non-Focal Species

- Northern California legless lizard (Anniella pulchra)

Climate Change Vulnerability Assessment

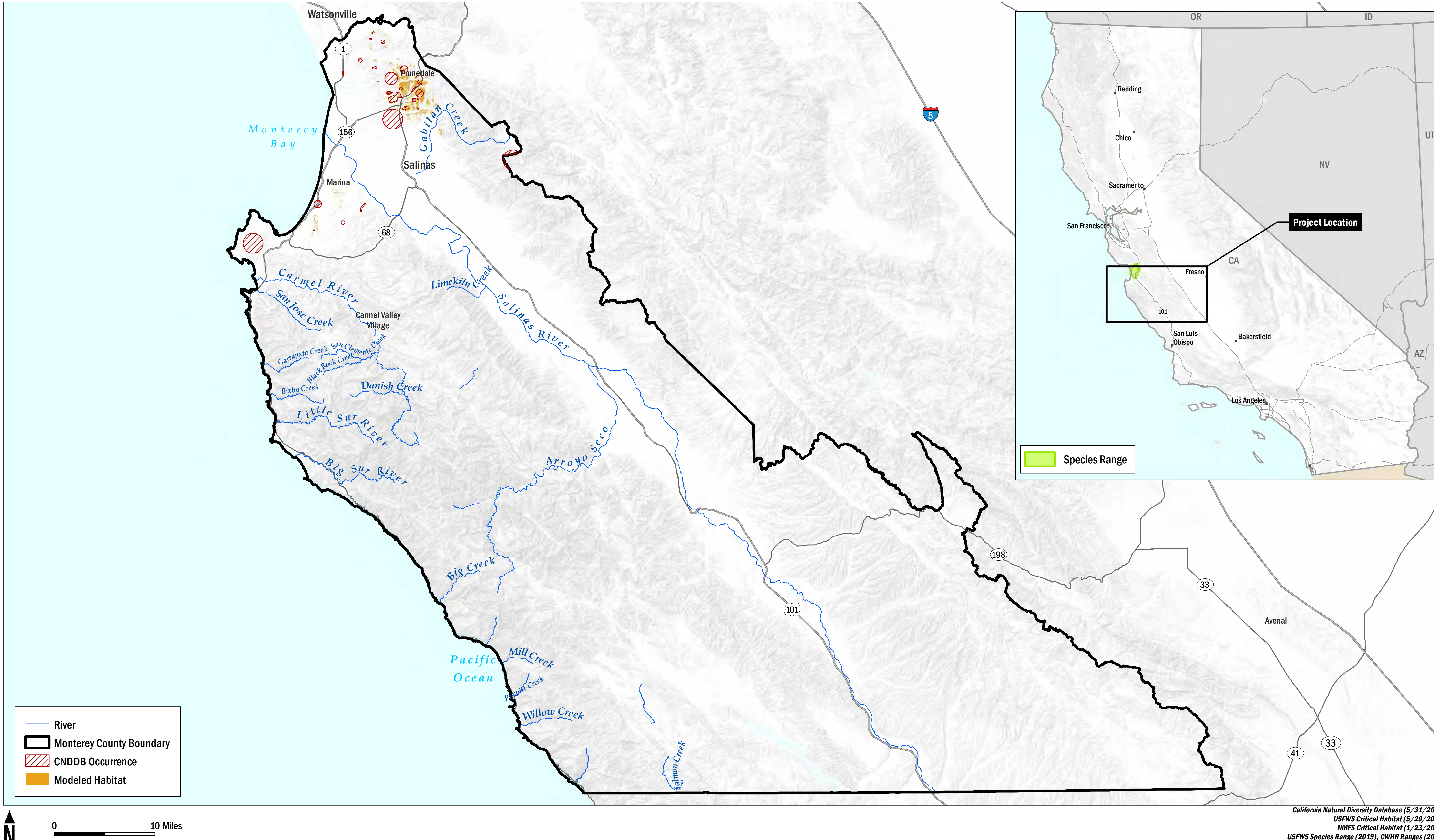
Table 5-55 summarizes the climate change exposure, spatial distribution, and vulnerability of natural communities associated with Pajaro manzanita (PM). Mixed chaparral communities statewide could experience a 0 to 75 percent reduction in habitat suitability.

Table 5-49. Pajaro Manzanita Natural Communities Climate Vulnerability Ranking

Natural Communities	Climate Exposure and Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Mixed Chaparral	Low to Moderate	Moderate to Mid-High	Moderate to Mid-High
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-55 aim to protect, enhance, and restore present day suitable habitats for Pajaro manzanita, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as prescribed burns, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-26 shows the range and modeled habitat for Pajaro manzanita.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-26
Pajaro Manzanita

Pajaro Manzanita Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1 and all Plant goals, objectives, and actions apply to Pajaro manzanita. Table 5-56 summarizes the goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect suitable habitat surrounding known occurrences in the Prunedale Hills area, Gabilan Range, and known occurences along the Monterey Peninsula (RC Objective 1.1).
- Enhance suitable or potentially suitable habitat in Monterey County through planting, non-native species control, or seed germination through prescribed burns (Plant Goal 1).

Table 5-50. Pajaro Manzanita Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
PM Goal 1. Promote persistence of Pajaro manzanita populations in the RCIS area through protection, restoration, and enhancement of habitat.	PM Objective 1.1: Protect known occurrences and allow expansion by protecting 1,500 acres of suitable habitat. Measure progress toward achieving this objective by the number of known occurrences, acres of suitable or potentially suitable habitat, and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Biodiversity • Other focal species/non-focal species • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	PM Objective 1.2: Enhance occupied and suitable Pajaro manzanita habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced and occupied by Pajaro manzanita.	• Fire suppression • Climate change	• Fire management • Biodiversity • Other focal/ non-focal species • Climate change resilience	PM 1.2.1: Use prescribed burns to promote plant establishment, in coordination with scientific advisors, land managers, universities, and/or regulatory agencies to inform the location and frequency of potential burn areas.
Sources: CDFW 2015, 2020; CNPS 2019b				

5.3.32 Seaside Bird's-Beak (Cordylanthus rigidus ssp. littoralis)

Seaside bird's beak

Status

- State Endangered
- California Rare Plant Rank 1B.1

Ecological Requirements

- RCIS Regions: Monterey Bay Coastline, Outer Coast Range (CDFW 2020)
- RCIS Natural Communities: Mixed Chaparral, Coastal Dune (CDFW 2020; CNPS 2019b)
- Hemiparasitic, often found in sandy soils at disturbed sites (CDFW 2020; CNPS 2019b)
- Full species account available: Cordylanthus Riginus subsp. Littoralis Fact Sheet (Coastal Training Program 2020c).
- RCIS Conservation Target: High (State listed, near-endemic to RCIS area)

Associated Non-Focal Species

- Northern California legless lizard (Anniella pulchra)
- Sandmat manzanita (Arctostaphylos pumila)
- Woolly-leaf manzanita shrubland (Arctostaphylos tomentosa Alliance)

Climate Change Vulnerability Assessment

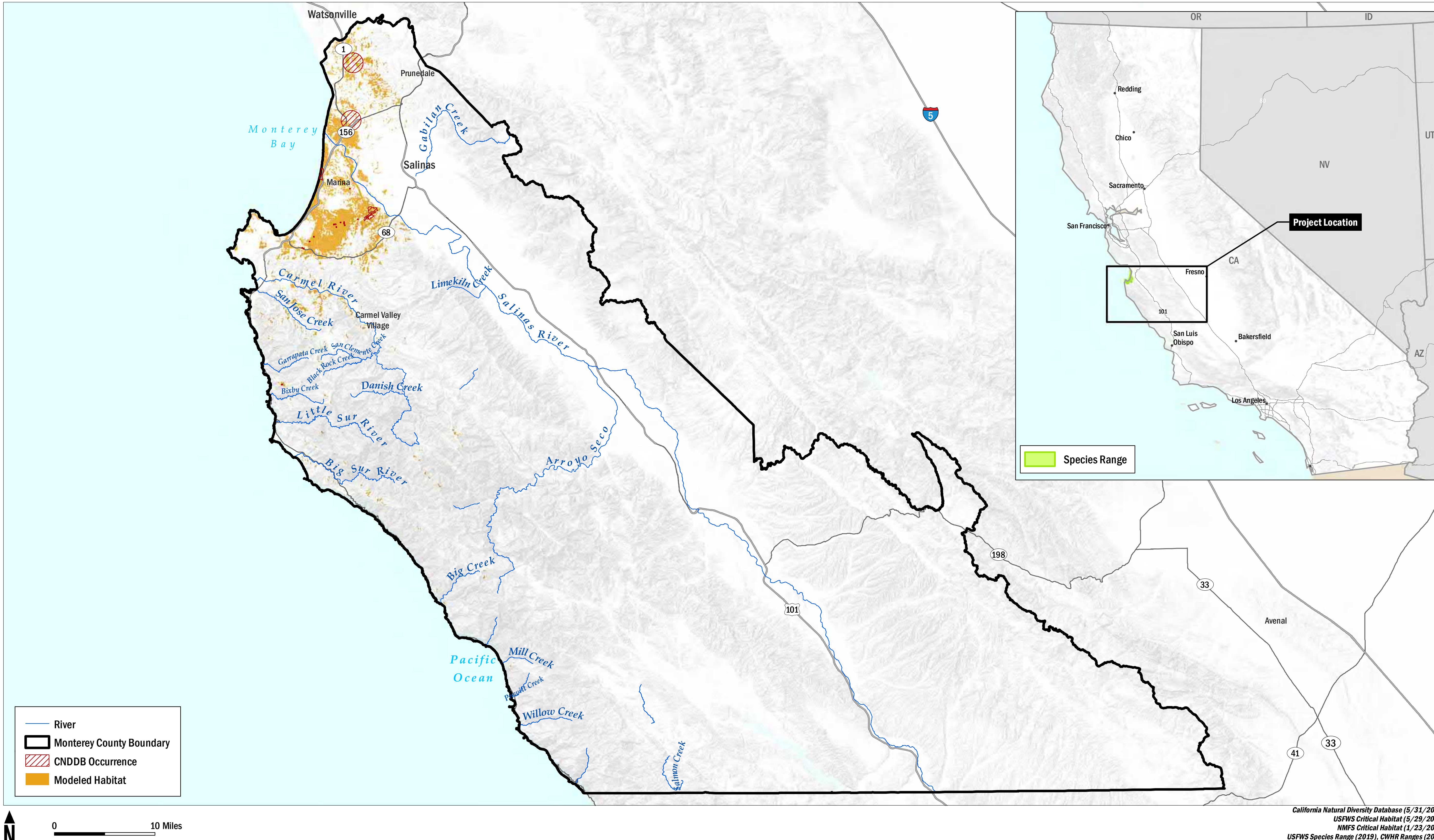
Table 5-57 summarizes the climate change exposure, spatial distribution, and vulnerability of natural communities associated with seaside bird's-beak (SBB) coastal dune communities statewide, which could experience a 25 to 75 percent reduction in habitat suitability, and some mixed chaparral communities statewide could experience a 0 to 25 percent reduction in habitat suitability.

Table 5-51. Seaside Bird's-Beak Climate Vulnerability Ranking

Natural Communities	Climate Exposure and Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Coastal Dune	Moderate	Mid-High	Mid-High
Mixed Chaparral	Low to Moderate	Moderate to Mid-High	Moderate to Mid-High
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-57 aim to protect, enhance, and restore present day suitable habitats for seaside bird's-beak, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as seed storage, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-27 shows the range and modeled habitat for the seaside bird's-beak.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-27
Seaside Bird's-beak

Seaside Bird’s-beak Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1 and all Plant goals, objectives, and actions apply to seaside bird’s-beak. Table 5-58 summarizes the goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect suitable habitat surrounding known occurrences in the Monterey Bay–Fort Ord region and known occurences in the Big Sur region (RC Objective 1.1)

Table 5-52. Seaside Bird’s-beak Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
SBB Goal 1. Promote persistence of seaside bird's-beak populations in the RCIS area through protection, restoration, and enhancement of habitat.	SBB Objective 1.1: Protect known occurrences and allow expansion by protecting 8,300 acres of suitable habitat. Measure progress toward achieving this objective by the number of known occurrences, acres of suitable or potentially suitable habitat, and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Biodiversity • Other focal species/non-focal species • Climate change resilience	RC Objective 1.1 (Protection) actions
Sources: CDFW 2015, 2020; CNPS 2019b				

5.3.33 Yadon's Rein Orchid (Piperia yadonii)

Yodon's rein orchid
Photo Credit: Joe Broberg

Status

- Federally Endangered
- California Native Plant Rank 1B.1

Ecological Requirements

- RCIS Regions: Monterey Peninsula to Point Lobos, Gabilan Range and Pinnacles National Monument (CDFW 2020)
- RCIS Natural Communities: Mixed Chaparral, Closed-Cone Pine-Cypress, Coastal Oak Woodland (CDFW 2020; CNPS 2019b)
- Found in two primary habitat types: 1) Monterey pine forest with an herbaceous, sparse understory; and 2) sandstone ridges in maritime chaparral with shallow soils (USFWS 2004b, 2009c)
- Prefers sandy soil substrate that is poorly drained and often dry (CDFW 2020; USFWS 2004b)
- Threatened by excessive herbivory (USFWS 2004b)

- Full species account available: Recovery Plan for Five Plants from Monterey County, California (USFWS 2004b) and . 5-Year Review: Piperia yadonii (Yadon's piperia), Summary and Evaluation (USFWS 2009c)
- RCIS Conservation Target: High (Federally listed, small population, endemic to the RCIS area[CDFW 2020, USFWS 2004b])

Associated Non-Focal Species

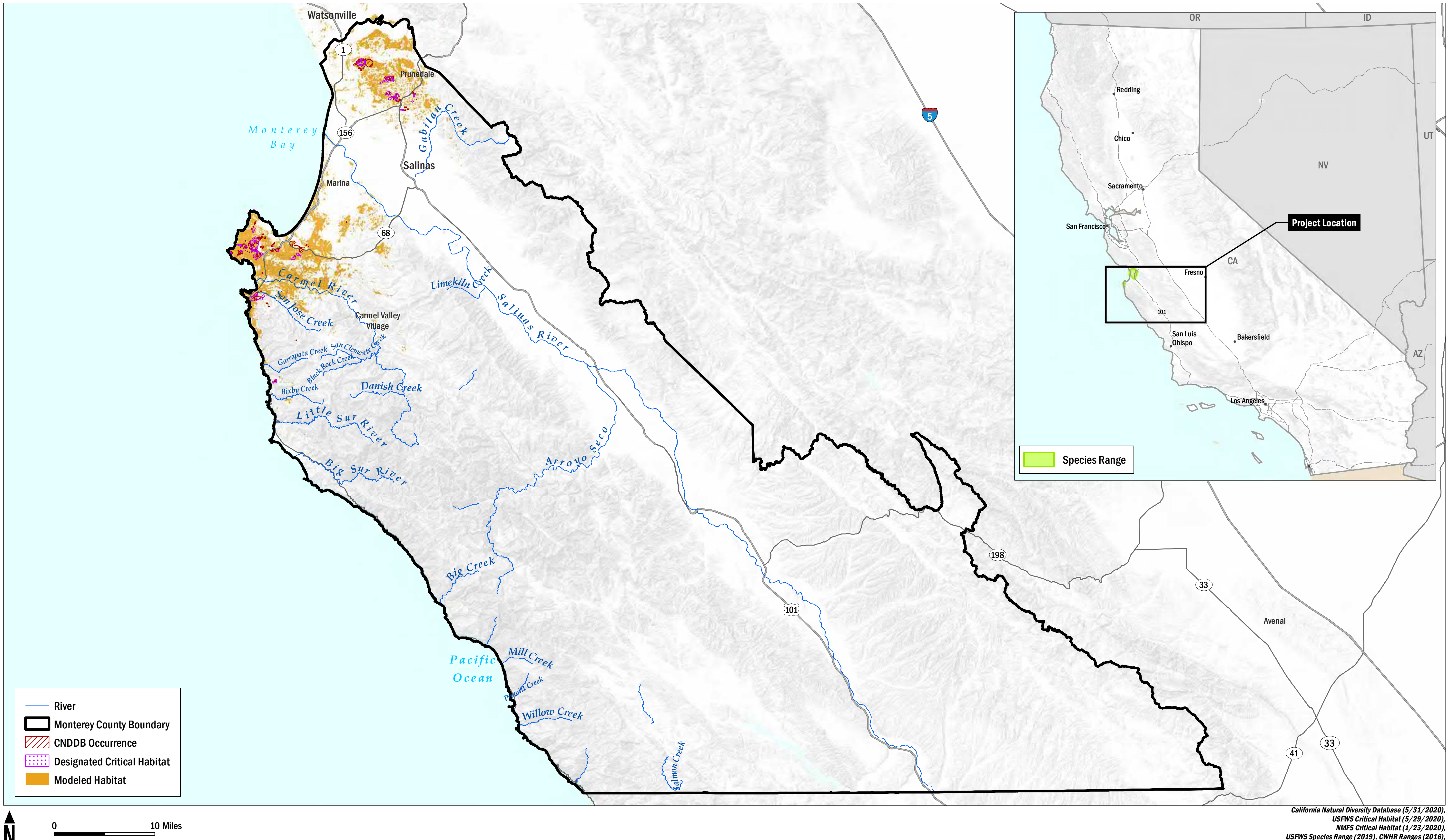
- Santa Lucia slender salamander (Batrachoseps luciae)
- Coast live oak woodland (Quercus agrifolia Alliance)
- Woolly-leaf manzanita shrubland (Arctostaphylos tomentosa Alliance)

Climate Change Vulnerability Assessment

Analysis by Anacker and Leidholm (2012) ranked Yadon's rein orchid as "Extremely Vulnerable," meaning abundance and/or range extent within the assessed geographical area would be extremely likely to substantially decrease or disappear by 2050. Models project a near total range loss for Yadon's rein orchid (Anacker and Leidholm 2012).

The goals, objectives, and actions shown in Table 5-53 aim to protect, enhance, and restore present day suitable habitats for Yadon's rein orchid, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as controlling excess herbivory, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-28 shows the range and modeled habitat for Yadon's rein orchid.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 3-28
Yadon's Rein Orchid

Yadon's Rein Conservation Priorities Orchid Goals, Objectives, and Actions

RC Goal 1 and all Plant goals, objectives, and actions apply to Yadon's rein orchid. Table 5-59 summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Acquire and protect suitable habitat surrounding U.S. Fish and Wildlife Service -designated geographic areas: Monterey Peninsula (Area 1), the interior area of the Monterey Peninsula (Area 2), northern Monterey County–Prunedale–Elkhorn (Area 3), the area east of Point Lobos State Reserve–Point Lobos Ranch (Area 4), and Palo Colorado Canyon (Area 5) (USFWS 2019c). Note that protected areas need to be as large as possible (i.e., hundreds of acres) (USFWS 2019c) (YRO Objective 1.1)

Table 5-53. Yadon's Rein Orchid Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
YRO Goal 1. Promote persistence of Yadon's rein orchid populations in the RCIS area through protection, restoration, and enhancement of habitat.	YRO Objective 1.1: Protect known occurrences and allow expansion by protecting 15,000 acres of suitable habitat. Measure progress toward achieving this objective by the number of known occurrences, acres of suitable or potentially suitable habitat, and adjacent/equivalent acres protected. Protect a minimum of 12 populations in the U.S. Fish and Wildlife Service-designated geographic areas: Monterey Peninsula (Area 1), the interior area of the Monterey Peninsula (Area 2), northern Monterey County–Prunedale–Elkhorn (Area 3), the area east of Point Lobos State Reserve–Point Lobos Ranch (Area 4), and Palo Colorado Canyon (Area 5) (USFWS 2019c). Note that protected areas need to be as large as possible (i.e., hundreds of acres) (USFWS 2019c).	• Habitat loss, degradation, fragmentation • Climate change	• Biodiversity • Other focal species/non-focal species • Climate change resilience	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	YRO Objective 1.2: Enhance occupied and suitable Yadon's rein orchid habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced and occupied by Yadon's rein orchid.	• Habitat loss, degradation, fragmentation • Climate change	• Water quality • Groundwater recharge • Biodiversity • Other focal species/non-focal species • Climate change resilience	YRO 1.2.1: Maintain hydrologic regime, drainage patterns, proximity to pollinator habitat, and vegetation community associates in protected areas (USFWS 2019c).
		• Herbivory (e.g., deer, rabbits)		YRO 1.2.2: Control excessive herbivory (deer and rabbits) (USFWS 2019c).
Sources: Anacker and Leidholm 2012; CDFW 2015; CNPS 2019b; USFWS 2004b, 2009c, 2019c				

5.3.34 California Sycamore Woodlands (Plantanus racemosa Alliance)

California Sycamore Woodland
Photo Credit: Danny Slakey

Status

- State Rarity S3 (Vulnerable)

Ecological Requirements

- RCIS Regions: Naciemento River Valley, Salinas River and Associated Corridor
- RCIS Natural Communities: Freshwater Emergent Wetland, Riparian (CNPS 2019b)
- California sycamore woodlands (CSW) are dominated by California sycamore (Plantanus racemosa) in the tree canopy.
- Rarer habitat alliance that occurs in gullies, intermittent streams, springs, and seeps; on stream banks and terraces adjacent to floodplains; and on north-facing lower slopes, which are subject to high-intensity flooding in rocky or cobbly alluvium soils with permanent moisture (CNPS 2019b).
- Well adapted to intermittent flooding conditions; limited ability to colonize areas without frequent natural flooding events (CNPS 2019b)
- Full account available: A Manual of California Vegetation, Online Edition Online (CNPS 2019b)
- RCIS Conservation Priorty Highest (rare community, high disease prevalence)

Associated Non-Focal Species

- Least Bell's vireo (Vireo bellii pusillus)
- Little willow flycatcher (Empidonax traillii brewsteri)

Climate Change Vulnerability Assessment

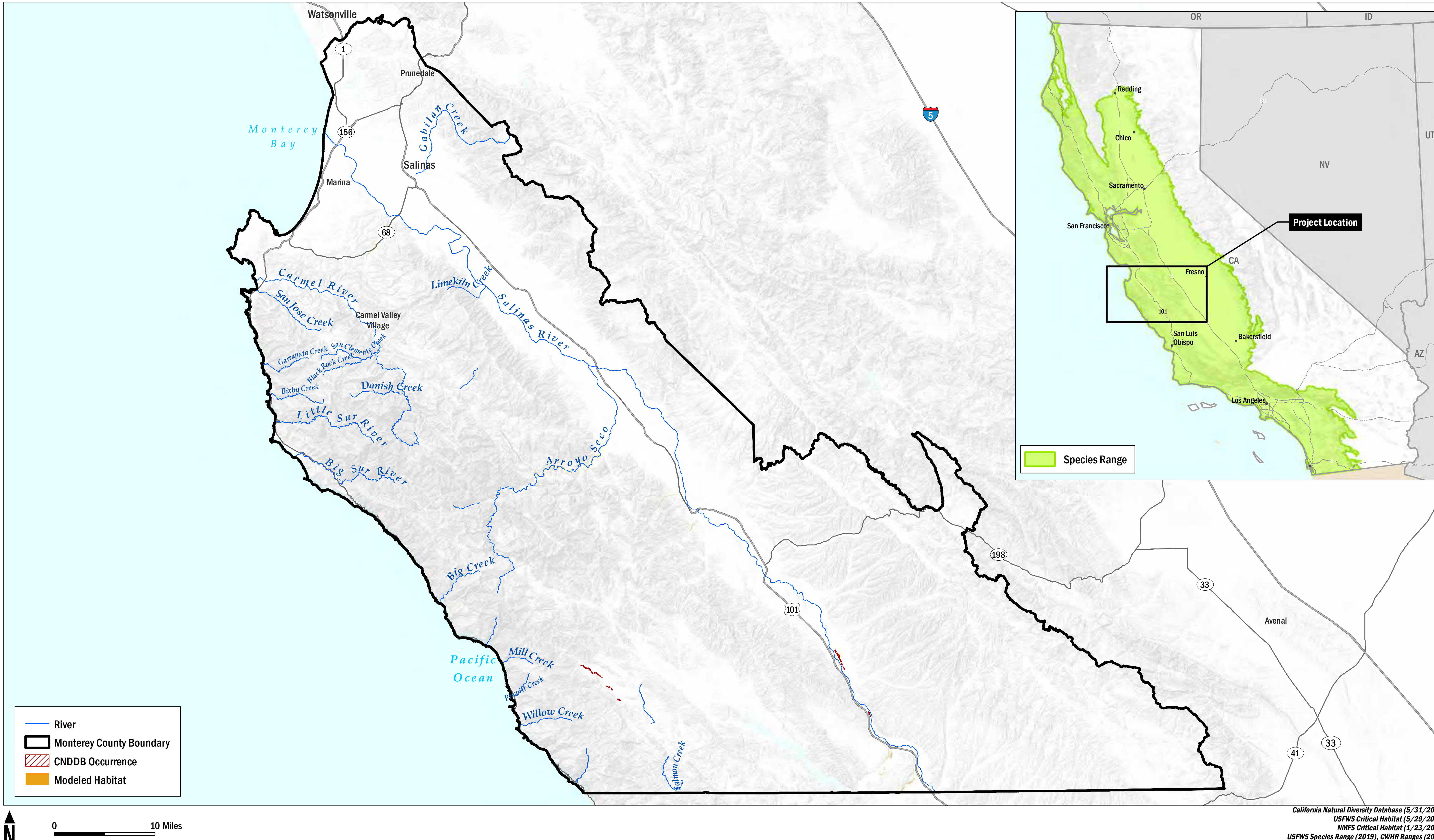
Table 5-54. summarizes the climate change exposure, spatial distribution, and vulnerability for riparian communities statewide, which could experience a 50 to 75 percent reduction in habitat suitability, and for freshwater emergent wetland communities statewide, which could experience a 75 to 100 percent reduction in habitat suitability.

Table 5-54. California Sycamore Woodland Natural Communities Climate Vulnerability Ranking

Natural Communities	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5)	Combined Vulnerability Rank High Emissions (RCP8.5)
Freshwater Emergent Wetland	High	High
Riparian	Mid-High	Mid-High
Thorne et al. 2016		

The goals, objectives, and actions shown in Table 5-55.0 aim to protect, enhance, and restore present day suitable habitats for California sycamore woodlands, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as controlling excess herbivory and intermittent flooding, which may allow expansion to newly suitable habitats in the future.

Figure 5-29 shows the range and modeled habitat for California sycamore woodlands.



California Natural Diversity Database (5/31/2020), USFWS Critical Habitat (5/29/2020), NMFS Critical Habitat (1/23/2020), USFWS Species Range (2019), CWHR Ranges (2016), National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-29
California Sycamore Woodland

California Sycamore Woodland Conservation Priorities Goals, Objectives, and Actions

RC Goal 1, Water action 1.1.1, 1.1.4, 1.1.6, 1.1.7, 1.1.8, Water Objective 1.2, and all Plant goals, objectives, and actions apply to California sycamore woodlands. Table 5-54. summarizes specific goals, objectives, and actions for California sycamore woodland.

Conservation Priorities

- Protect and preserve riparian and aquatic habitat surrounding known occurrences in the lower Salinas River valley and Naciemiento River valley (CSW Objective 1).
- Manage and/or restore appropriate hydrology (such as intermittent flooding) in areas of potentially suitable habitat CSW 1.2.1), because of the limited ability to colonize areas without frequent natural flooding events.

Table 5-55. California Sycamore Woodland Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
CSW Goal 1. Promote persistence of California sycamore woodland habitat in the RCIS area through protection, restoration, and enhancement of habitat.	CSW Objective 1.1: Protect known occurrences and allow expansion by protecting 430 acres of suitable habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change	• Riparian habitat connectivity	RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	CSW Objective 1.2: Enhance California sycamore woodland habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced.	• Habitat loss, degradation, fragmentation	• Water Quality • Biodiversity • Connectivity • Water recharge • Climate change resilience	CSW 1.2.1: Manage and/or restore appropriate hydrology (e.g., intermittent flooding) in areas of potentially suitable habitat.
		• Non-native species	• Water quality • Climate change resilience • Other focal/ non-focal species • Biodiversity	CSW 1.2.2: Maintain plant and wildlife species diversity and richness.
Sources: CDFW 2015, 2020; CNPS 2019b				

5.3.35 Monterey Pine Forest (Pinus muricata – Pinus radiata Alliance)

Monterey pine forest
Photo Credit: Danny Slakey

Status

- State Rarity S3 (Vulnerable)

Ecological Requirements

- RCIS Regions: Monterey Peninsula to Point Lobos, Carmel Valley
- RCIS Natural Communities: Closed-Cone Pine-Cypress (CNPS 2019b)
- One of the three natural stands in the state is located in the RCIS area.
- Monterey pine (Pinus radiata) or Bishop pine (Pinus muricata) is dominant or co-dominant in Monterey pine forest (MPF) (CNPS 2019b)
- Occurs on very windy, foggy slopes in the coastal marine layer in well-drained soils (CNPS 2019b)
- Monterey Peninsula population of Pinus radiata appears to be fire-dependent (CNPS 2019b)
- Susceptible to pitch pine canker (CNPS 2019b)
- Full account available: A Manual of California Vegetation, Online Edition Online (CNPS 2019b)

- RCIS Conservation Target: High (high disease prevalence)

Associated Non-Focal Species

- Santa Lucia slender salamander (Batrachoseps luciae)
- Monterey clover (Trifolium trichocalyx)

Climate Change Vulnerability Assessment

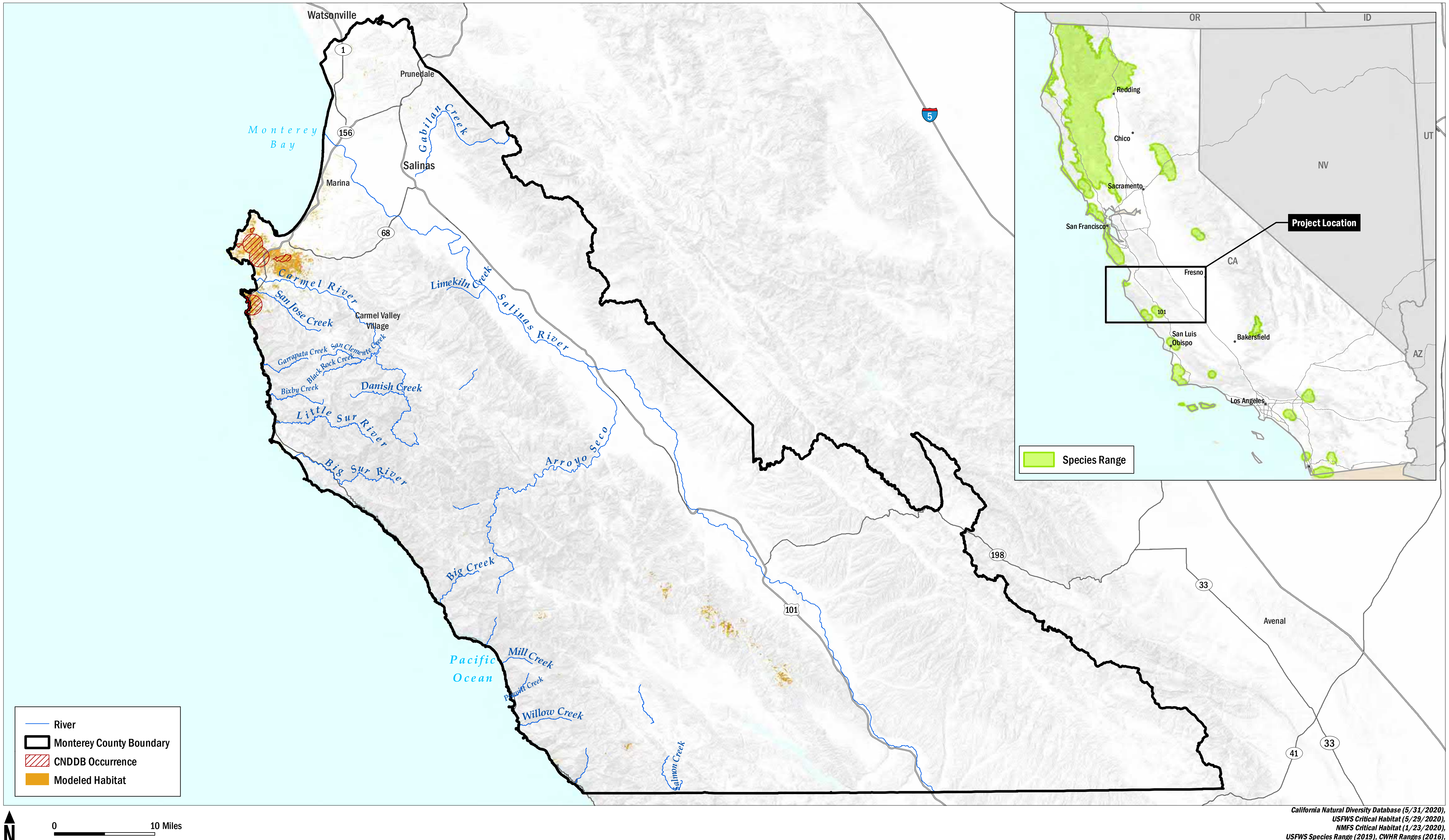
Table 5-56. summarizes the climate change exposure, spatial distribution, and vulnerability for closed-cone pine-cypress communities statewide, which could experience a 25 to 75 percent reduction in habitat suitability.

Table 5-56. Monterey Pine Forest Natural Community Vulnerability Ranking

Natural Communities	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Closed-cone Pine-Cypress	Moderate	Mid-High	Moderate
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-57. aim to protect, enhance, and restore present day suitable habitats for Monterey pine forest, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as managing diseases, which may allow individuals to move to newly suitable habitats in the future.

Figure 5-30 shows the range and modeled habitat for Monterey pine forest.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-30
Monterey Pine Forest

Monterey Pine Forest Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1 and all PLANT goals, objectives, and actions apply to Monterey pine forest. Table 5-57. summarizes specific goals, objectives, and actions for Monterey pine forest.

Conservation Priorities

- Protect and preserve habitat surrounding known occurences on the Monterey Peninsula, one of the three natural stands of Monterey pine in the state.
- Protect the genetic integrity of native stands through removal of nursery-stock Monterey pines where they outcompete native species (MPF 1.2.1).

Table 5-57. Monterey Pine Forest Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
MPF Goal 1. Promote persistence of Monterey pine forest habitat in the RCIS area through protection, restoration, and	MPF Objective 1.1: Protect known occurrences and allow expansion by protecting 4,200 acres of suitable habitat. Measure progress toward achieving this objective by acres of habitat and associated/equivalent acres protected.	• Habitat loss, degradation, fragmentation		RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
enhancement of habitat.	MPF Objective 1.2: Enhance Monterey pine forest habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced.	• Genetic contamination (e.g., nursery stock from non-native sources)	• Biodiversity • Other focal species/non-focal species	MPF 1.2.1: Remove invasive pine species and nursery-stock Monterey pines, as well as non-native plants where they outcompete native species.
		• Genetic contamination (e.g., nursery stock from non-native sources) • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity	MPF 1.2.2: Maintain plant and wildlife species diversity and richness.
		• Fire suppression	• Climate change resilience • Other focal/ non-focal species • Biodiversity	MPF 1.2.3: Manage suitable fire regimes in suitable habitat to promote Monterey pine recruitment.

Goal	Objective	Threats	Co-Benefits	Action
		• Disease (e.g., pine pitch canker)	• Biodiversity • Other focal species/non-focal species	MPF 1.2.4: Control spread of pine pitch canker.
Sources: CDFW 2015, 2020; CNPS 2019b				

5.3.36 Valley Oak Woodland (Quercus lobata Woodland Alliance)

Valley oak woodland
Photo Credit: Danny Slakey

Status

- State Rarity S3 (Vulnerable)

Ecological Requirements

- RCIS Regions: All terrestrial regions
- RCIS Natural Communities: Valley Oak Woodland
- Valley Oak (Quercus lobata) is dominant or co-dominant in the tree canopy (CNPS 2019b).
- Valley oak woodland (VOW) occurs in valley bottoms, lower slopes, and summit valleys in alluvial or residual soils (CNPS 2019b).
- Has low sapling recruitment (CNPS 2019b)
- Tolerate
- Full account available: A Manual of California Vegetation, Online Edition Online (CNPS 2019b)
- RCIS Conservation Priorty: Moderate

Associated Non-Focal Species

- Western spadefoot (Spea hammondii)
- Yellow-billed magpie (Pica nuttallii)

Climate Change Vulnerability Assessment

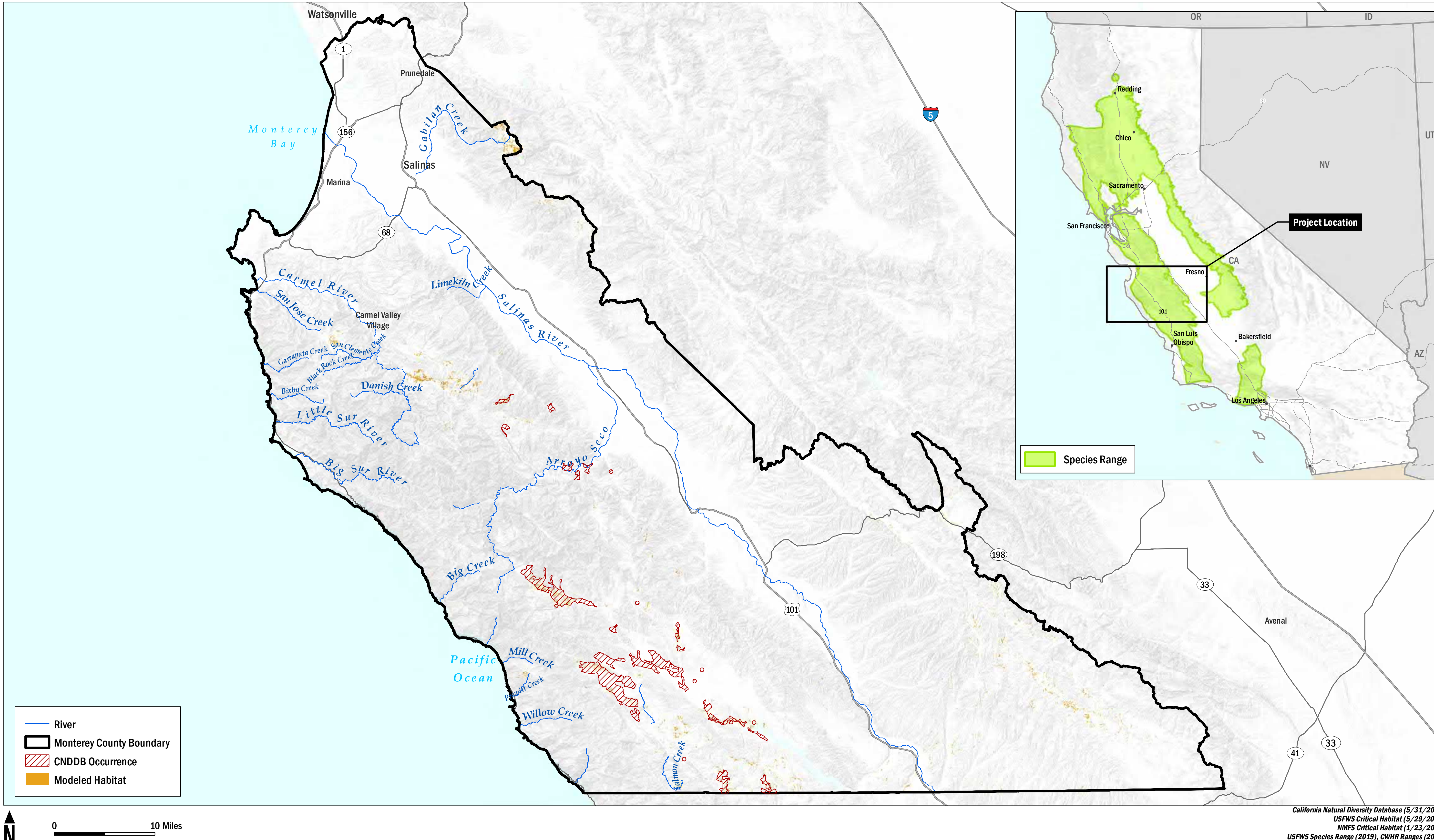
Table 5-58. summarizes the climate change exposure, spatial distribution, and vulnerability for valley oak woodland natural communities statewide, which could experience a 25 to 75 percent reduction in habitat suitability.

Table 5-58. Valley Oak Woodland Natural Community Vulnerability Ranking

Natural Communities	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Warm and Wet	Climate Exposure and Spatial Disruption Rank High Emissions (RCP8.5) Hot and Dry	Combined Vulnerability Rank High Emissions (RCP8.5)
Valley Oak Woodland	Moderate	Mid-High	Moderate
Source: Thorne et al. 2016			

The goals, objectives, and actions shown in Table 5-59. aim to protect, enhance, and restore present day suitable habitats for valley oak woodland, as well habitats that may become suitable in the future because of projected climate changes. Actions also address population stability, such as managing grazing to allow sapling establishment, which may expansion to newly suitable habitats in the future.

Figure 5-31 shows the range and modeled habitat for valley oak woodland.



California Natural Diversity Database (5/31/2020),
USFWS Critical Habitat (5/29/2020),
NMFS Critical Habitat (1/23/2020),
USFWS Species Range (2019), CWHR Ranges (2016),
National Hydrography Dataset (2019), Esri (2016)

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FIGURE 5-31
Valley Oak Woodland

Valley Oak Woodland Conservation Priorities, Goals, Objectives, and Actions

RC Goal 1 and all Plant goals, objectives, and actions apply to valley oak woodland. Table 5-59. summarizes specific goals, objectives, and actions for valley oak woodland.

Conservation Priorities

- Protect and preserve habitat surrounding known occurences in the San Antonio river valley, Arroyo Seco valley, and Naciemento river valley (RC Objective 1.1).
- Promote sapling recruitment through appropriate managment of grazing and vegetation to protect seedlings (VOW 1.2.2).

Table 5-59. Valley Oak Woodland Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
VOW Goal 1. Promote persistence of valley oak woodland habitat in the RCIS area through protection, restoration, and enhancement of habitat.	VOW Objective 1.1: Protect known occurrences and allow expansion by protecting 2,400 acres of suitable habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres protected.	• Habitat loss, degradation, fragmentation • Climate change		RC Objective 1.1 (Protection) actions

Goal	Objective	Threats	Co-Benefits	Action
	VOW Objective 1.2: Enhance valley oak woodland habitat. Measure progress toward achieving this objective by acres of habitat and adjacent/equivalent acres enhanced.	• Habitat loss, degradation, fragmentation • Climate change	• Climate change resilience • Biodiversity • Other focal/ non-focal species	VOW 1.2.1: Maintain plant and wildlife species diversity and richness.
		• Lack of sapling recruitment	• Other focal/ non-focal species • Working lands	VOW 1.2.2: Manage grazing to ensure that it is compatible with valley oak woodlands (e.g., protecting seedlings).
Sources: Sources: CDFW 2015, 2020; CNPS 2019b				

5.3.37 Working Lands

Working lands
Photo Credit: Diana Edwards

Status

- No Status

Ecological Requirements

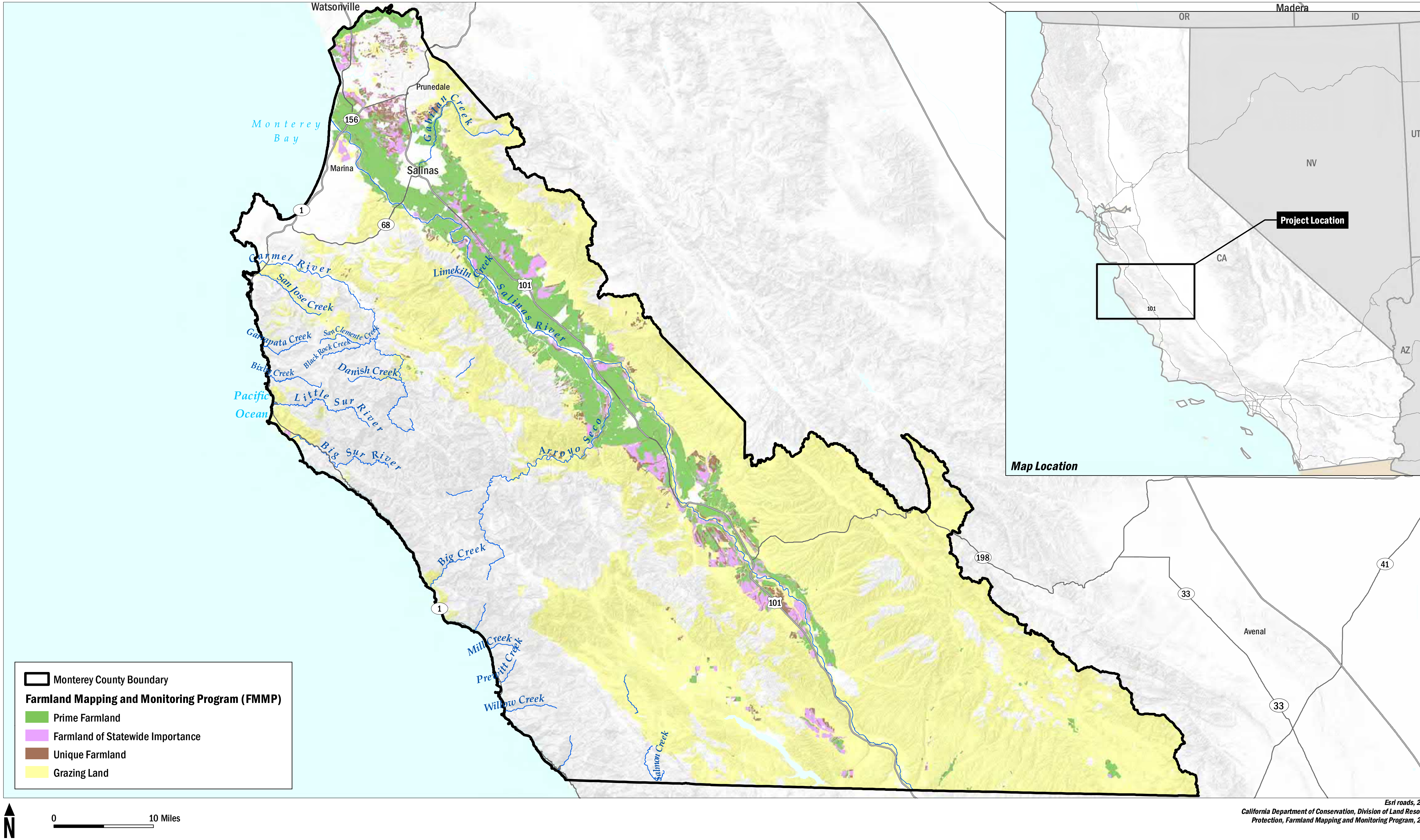
- RCIS Regions: Salinas River and Associated Corridor, Salinas Valley, San Antonio Valley, Mid-Inner Coast Range
- RCIS Natural Communities: Coastal Oak Woodland, Valley Oak Woodland, Agriculture
- Prime Farmland: Best combination of physical and chemical features to sustain long term agricultural production (CDOC 2020)
- Farmland of Statewide Importance: Similar to prime farmland but with minor shortcomings (CDOC 2020)
- Unique Farmland: Lesser quality soils used for production of state's leading agricultural crops (CDOC 2020)
- Grazing Land: Existing vegetation suited for livestock grazing (CDOC 2020)
- Full account available: Farmland Mapping and Monitoring Program (CDOC 2020)
- RCIS Conservation Target: Moderate

Associated Non-Focal Species

- American badger (Taxidea taxus)
- Contra costa goldfields (Lasthenia conjugens)Jolon clarkia (Clarkia jolonensis)
- Townsend's big-eared bat (Corynorhinus townsendii)
- Two-striped garter snake (Thamnophis hammondii)
- Western mastiff bat (Eumops perotis californicus)
- Western spadefoot (Spea hammondii)
- Yellow-billed magpie (Pica nuttallii)
- Coast live oak woodland (Quercus agrifolia Alliance)

Climate Change Vulnerability Assessment

Working lands are projected to experience climate impacts such as water availability, soil degradation, and extreme weather conditions, including drought and severe precipitation events (CDFW 2016b, Hartfield et al. 2014). By mid-century, projected temperature increases and precipitation extremes are expected to cause declines and variation in the yields of major crops throughout the country (Hartfield et al. 2014). Stresses from invasive non-native plants, diseases, and insect pests are projected to increase and may contribute to crop and livestock production declines (Hartfield et al. 2014). Sea level impacts to coastal and estuarine farms are projected to include loss of land and damages to crop soil from saltwater intrusion (CDFW 2016b). The goals, objectives, and actions shown in Table 5-60 aim to protect, enhance, and restore present day working lands to create resiliency to projected climate changes.
Figure 5-32 shows working lands in the RCIS area.



Esri roads, 2016
California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program, 2016

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FIGURE 5-32
Working Lands

Working Lands Conservation Priorities, Goals, Objectives, and Actions

All Regional Conservation, Water, and Amphibian goals, objectives and actions apply to working lands.

Species-specific actions that apply to Working Lands include:

- BUOW 1.2.1, 1.2.3, 1.3.1
- CACO 1.2.1, and 2.1.1
- CRLF 1.2.3, 1.2.10, 1.3.1, Goal 2
- CTS 1.1.4, 1.2.1, Goal 2
- ML 1.3.1
- PB 1.2.1, 2.1.1
- SCLTS 1.1.2, Objective 2.2
- SJKF 1.2.1, 2.1.1
- SSO 1.2.3
- SCCCS 1.2.1, 1.2.5, 1.2.8, 1.3.1
- TG 1.2.3
- TCBB 1.1.1, 1.2.1, 1.2.2, 1.3.1, 1.3.2, 1.4.2
- VPFS 1.2.3, 1.2.7
- CSW 1.2.1
- VOW: All goals

Table 5-60. summarizes specific goals, objectives, and actions for the species.

Conservation Priorities

- Manage grazing regimes to promote native wildlife and plant species, through the targeted removal of non-native plant species, reducing vegetation cover to promote ground squirrel colonization (WL 1.1.7).
- Enhance pollinator habitat and temporary or annual habitats on productive agricultural lands, and throughout working land parcels (CDFW 2016b) (WL 1.1.1).

Table 5-60. Working Lands Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
WL Goal 1. Sustain resilient and integrated working lands and natural communities for the full range of native species, habitats, and ecological functions in the RCIS area, where feasible, through enhancement and restoration of important habitat types, supporting sensitive species.	WL Objective 1.1: Participate and implement activities that support stewardship of habitats and ecological processes in croplands and grazing lands to maintain, enhance, and restore species populations and ecological functions.	• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	WL 1.1.1: Enhance pollinator habitat and temporary or annual habitats throughout working land parcels (CDFW 2016b).
		• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience • Water quality	WL 1.1.2: Work with partners to promote water conservation measures, to benefit wildlife and native plant populations, through development and implementation of outreach programs (CDFW 2016b).

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience	WL 1.1.3: Develop system to assess risks and inform decision-making for protection of low-elevation coastal agricultural areas (CDFW 2016b).
		• Habitat loss, degradation, fragmentation • Climate change	• Other focal/ non-focal species • Biodiversity • Climate change resilience • Water quality	WL 1.1.4: Promote and implement more wildlife/native plant-friendly practices, by planting cover crops, conducting controlled burns, creating secondary channels to improve flow, and removing overcrowded vegetation (CDFW 2016b).
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity	WL 1.1.5: Reduce/eliminate small mammal control efforts. Implement programs to increase small mammal populations in areas where they have been eradicated.

Goal	Objective	Threats	Co-Benefits	Action
		Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity • Climate change resilience	WL 1.1.6: Install, repair, and improve infrastructure (e.g., adding large culverts, undercrossings, overcrossings, bridges, directional fencing, scuppers, barrier breaks, roadside wildlife detection systems), and remove existing barriers to promote wildlife movement and reduce road mortality of focal/non focal species.
		• Habitat loss, degradation, fragmentation	• Other focal/ non-focal species • Biodiversity • Non-native invasive species	WL 1.1.7: Manage grazing regimes to promote native wildlife and plant species, through targeted removal of non-native plant species and reducing vegetation cover to promote ground squirrel colonization.
		• Habitat loss, degradation, fragmentation	•	WL 1.1.8: Acquire, lease, or establish easements to protect productive agricultural or grazing lands.

Goal	Objective	Threats	Co-Benefits	Action
	WL Objective 1.2: Implement groundwater recharge throughout working lands to mitigate saltwater intrusion and climate change reliance. Measure progress toward this objective in the number of recharge basins created.	• Habitat loss, degradation, fragmentation • Climate change • Sedimentation	• Other focal/ non-focal species • Biodiversity • Water quality • Climate change resilience	WL 1.2.1: Implement groundwater recharge methods, redirecting water across land surfaces through canals, infiltration basins, or ponds, adding irrigation furrows or sprinkler systems, or adding injection wells (USGS 2020).
Sources: CDFW 2016b				

5.3.38 Habitat Connectivity

Mountain lion recorded traveling through the El Toro Creek Bridge underpass in November 2008.
Photo Credit: Pathways for Wildlife and Big Sur Land Trust

Terrestrial Connectivity

- Areas of Conservation Emphasis (ACE) identitified priority areas of terrestrial connectivitity. Irreplaceable and Essential Corridors (ACE Rank 5) in and around the RCIS area:
  + Gabilan Range (including Pinnacles National Park)- Santa Cruz mountains corridor (CDFW 2019a)
  + The Santa Lucia Range–Inner Coast Range corridor. (Figure 5-33a) (CDFW 2019a)
- Conservation Planning Linkages (ACE Rank 4) in and around the RCIS area:
  + Along the Santa Lucia Range From the Fort Ord south to the Carmel River, and further south to the Nacimiento River
  + Carmel River Valley south east to the Inner Coast Range
  + Monterey Bay dunes and Fort Ord south west to Sierra de Salinas & Toro County Park, and south east to to the Carmel River area to Fort Ord and the coastal dunes of Monterey Bay (across Hwy 68) (TAMC 2017)
- Along the Inner Cost range from Stockdale Mountain to the Gabilan Range.

- Bay Area Linkage Network identified large parcels of high ecological integrity, or Landscape Blocks: Gabilan Range and Pinnacles National Park, Inner Coast Range, Santa Lucia Range, Inner Coast Range and Stockdale Mountain (Figure 5-33b) (Penrod et al. 2013).

Aquatic Connectivity

Riparian Corridors

- Riparian corridors facilitate wildlife movement throughout the RCIS area, through unsuitable habitat, such as urban and agricultural areas (Hilty et al. 2006).
- California Essential Habitat Connectivity dataset identified potential riparian corridors that provide access to Landscape Blocks: Salinas River, Gabilan Creek and associated riparian corridor; San Antonio River; Nacimiento River (Spencer et al. 2010).

Fish Passage Barriers

The Fish Passage Assessment Database (CDFW 2019b) identifies barriers in California that hinder migration of salmonids. A total barrier (either natural or artificial) is a complete barrier to fish passage for all anadromous species at all life stages, at all times of year. All total (natural and artificial), and partial (natural and artificial) barriers and the aquatic resources affected by these barriers are shown in Figure 5-33a. Major waterways and their direct tributaries that have these barriers include: Pacific Ocean, Garrapata Creek, Big Sur River, San Jose Creek, Carmel River, Arroyo Seco, Limekiln Creek, Mill Creek, San Clemente Creek, Salinas River, Big Creek, Big Sur Creek, Black Rock Creek, Danish Creek, Little Sur River, Prewitt Creek, Willow Creek The Fish Passage Assessment Database also identified the Arizona Crossing, located on private land, as a high-priority barrier affecting anadromous fish, whose migration impacts should be addressed promptly (CDFW 2019b). According to The California Department of Transportation, no other barriers to fish passage occur in the RCIS area (Moonjian, pers. comm, 2019). See steelhead actions for additional priority fish passage barriers.

Table 5-61. shows stressors and pressures as well as actions that address these threats.

Associated Non-Focal Species

- American badger (Taxidea taxus)
- Least Bell's vireo (Vireo bellii pusillus)

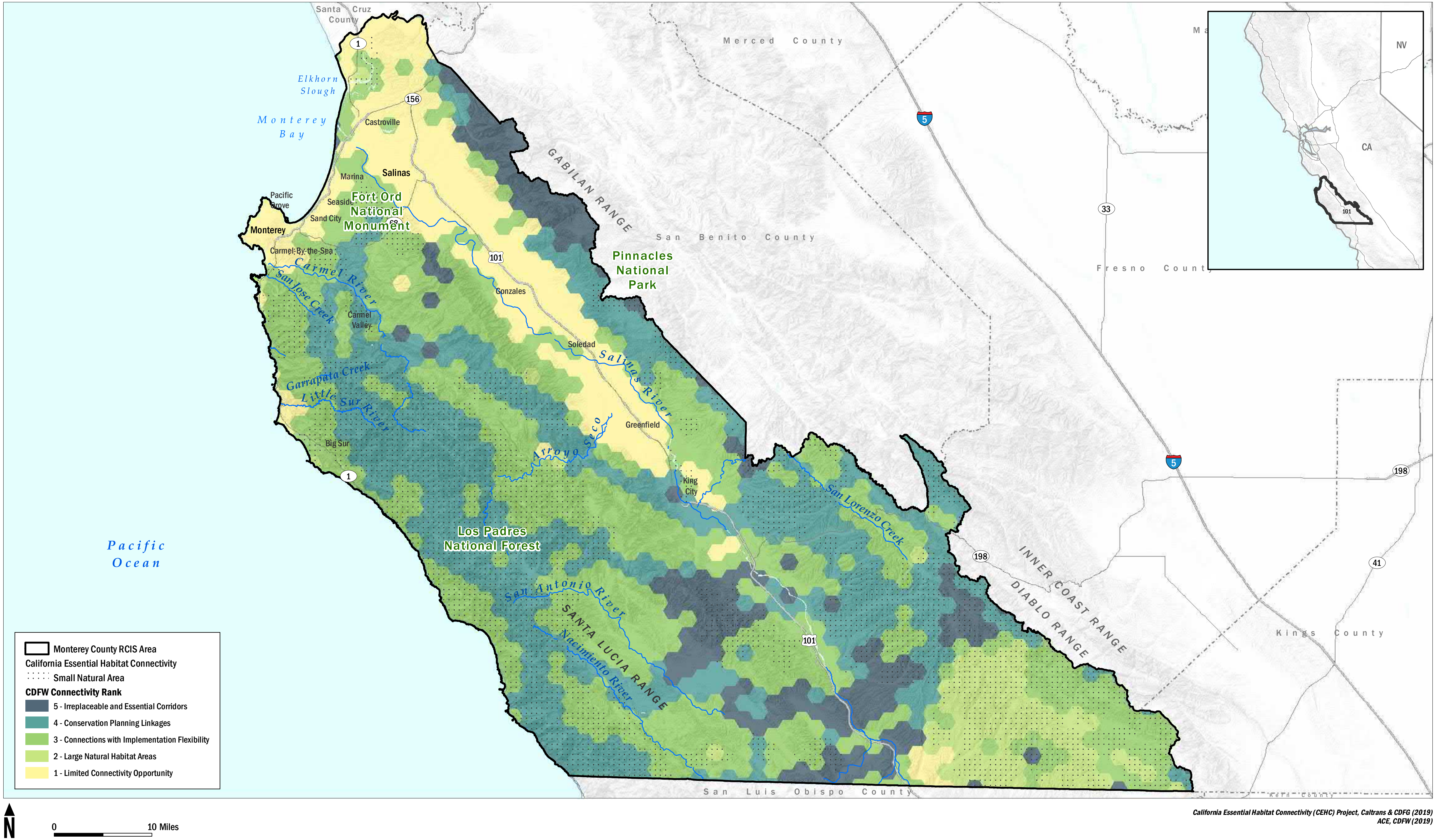
- Little willow flycatcher (Empidonax traillii brewsteri)
- Two-striped garter snake (Thamnophis hammondii)
- Western spadefoot (Spea hammondii)
- Yellow-billed magpie (Pica nuttallii)

Climate Change Vulnerability Assessment

The loss of habitat connectivity and increased habitat fragmentation will have a major impact on wildlife and natural communities in the RCIS area. Development of agricultural and urban areas, especially installation of new linear features (e.g., roads and utility lines) or development in critical choke points (areas of constrained movement) can affect plant and wildlife dispersal and predator–prey relationships, leading to increased mortality and genetic isolation. Movement by focal species such as mountain lion can be used as an indicator of healthy connectivity between different terrestrial habitat types, because of its occurrence in all the natural communities in the RCIS area and its large home range. However, habitat fragmentation and degradation can more acutely impact smaller species.

Aquatic species are limited in their abilities to bypass connectivity barriers in streams. Improving fish passage throughout riparian corridors can increase habitat connectivity for steelhead and other water-bound species. Furthermore, maintaining healthy connectivity between freshwater and saltwater habitats is important for maintaining hydrological regimes, water quality, and sediment balances.

In addition to providing habitat for aquatic species, riparian areas provide shade, water, and upland habitat for many terrestrial species. Riparian habitats disproportionately contribute to regional species richness (Krosby et al. 2018). These areas have the potential to act as dispersal corridors for both terrestrial and aquatic species because they often span multiple climatic gradients (Krosby et al. 2018). Riparian corridors in forested areas can reduce the effects of climate exposure by providing refugia from increasing air and water temperatures (Klausmeyer et al. 2011). Conservation strategies focusing on maintaining connectivity between various riparian habitats in the RCIS area have the potential to create future climate refugia for vulnerable species and maintain current species richness. The goals, objectives, and actions shown in Table 5-61 aim to protect, enhance, and restore present day habitat connectivity to create resiliency to projected climate changes.



California Essential Habitat Connectivity (CEHC) Project, Caltrans & CDFG (2019)
ACE, CDFW (2019)

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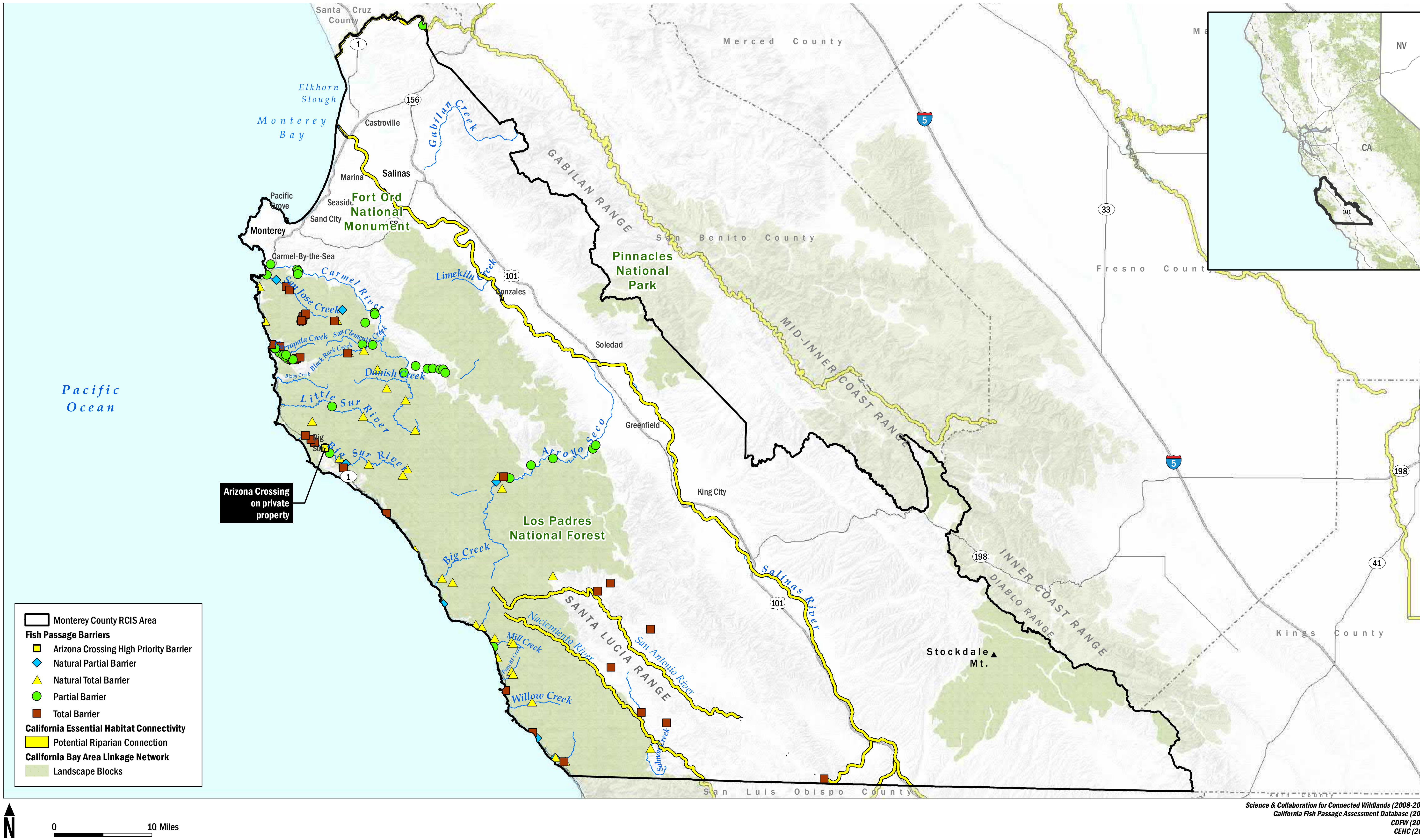
FIGURE 5-33A
Areas of Conservation Emphasis Terrestrial Connectivity



Science & Collaboration for Connected Wildlands (2008-2014),
California Fish Passage Assessment Database (2019),
CDFW (2019),
CEHC (2019)

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FIGURE 5-33B
Additional Aquatic and Terrestrial Connectivity

Habitat Connectivity Conservation Priorities, Goals, Objectives, and Actions

All RC and Water goals, objectives and actions apply to habitat connectivity (HC). Amphibian actions 1.2.2, 1.2.3, and 1.2.4 apply to habitat connectivity.

Species-specific actions that apply to habitat connectivity include:

- BUOW 1.2.1, 1.2.3, 1.3.1
- CACO 1.2.1, and 2.1.1
- CRLF 2.1.1
- CTS 1.1.4, 2.1.1
- MB 1.3.1
- ML 1.2.1, 1.2.2, 1.2.3, 1.3.3, 1.5.1,
- SCLTS Goal 2
- SJKF 1.1.1, 1.1.2, 1.2.3,
- SSO 1.2.3
- SCCCS 1.2.1, 1.2.3, 1.3.1, 1.3.2, 1.3.3, 1.3.6,
- CSW 1.2.1
- Working Lands: 1.1.6

Table 5-61. summarizes specific goals, objectives, and actions for the habitat connectivity

Conservation Priorities

- Protect, enhance, and restore habitat along irreplacable and important terrestrial corridors including:
  - Gabilan Range (including Pinnacles National Park)–Santa Cruz mountains corridor (CDFW 2019a) (
  - Santa Lucia Range–Inner Coast Range corridor (Figure 5-33a) (CDFW 2019a)
  - Santa Lucia Range from Fort Ord south to the Carmel River, and further south to the Nacimiento River
  - Carmel River valley southeast to the Inner Coast Range

  + Monterey Bay dunes and Fort Ord southwest to Sierra de Salinas and Toro County Park, and southeast to the Carmel River area, and to Fort Ord and the coastal dunes of Monterey Bay (across Highway 68) (TAMC 2017)
- Install, repair, and improve infrastructure, such as culverts, undercrossings, overcrossings, bridges, directional fencing, scuppers, barrier breaks, roadside wildlife detection systems, drift fences, and wildlife tunnels, and remove existing barriers along linear infrastructure corridors, fire-break treatment, and agricultural and urban development, to promote wildlife movement (HC Action 1.2.1).
- Protect existing and intact aquatic and riparian habitat connectivity and linkages, and enhance and restore aquatic and riparian habitats, including removing and improving barriers to fish passage.

Table 5-61. Habitat Connectivity Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
HC Goal 1: Protect, establish, and improving habitat connectivity and linkages.	HC Objective 1.1: Protect known habitat corridors and linkages by protecting suitable habitat. Measure progress toward achieving this objective in the acres of habitat and adjacent/equivalent acres protected. HC Objective 1.2: Establish and improve habitat connectivity. Measure progress toward achieving this objective in acres of corridor habitat protected and the number of barriers to movement modified, removed, or otherwise upgraded.	• Habitat loss, degradation, fragmentation	• Connectivity Other focal/ non-focal species	RC Objective 1.1 (Protection) actions
		• Vehicle-impact mortality • Decreased habitat connectivity	• Connectivity • Other focal/ non-focal species • Intraspecific competition because of limited habitat	HC 1.2.1 Install, repair, and improve infrastructure (e.g., culverts, undercrossings, overcrossings, bridges, directional fencing, scuppers, barrier breaks, roadside wildlife detection systems, drift fences, wildlife tunnels) and remove existing barriers along linear infrastructure corridors, fire-break treatment, and agricultural and urban development, to promote wildlife movement.

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation	• Connectivity • Other focal/ non-focal species	HC 1.2.2 Conduct studies of species movement to identify areas to improve population connectivity.
		• Vehicle-impact mortality	• Connectivity • Other focal/ non-focal species	HC 1.2.3: Work with transportation districts or others to collect and analyze roadkill data, to identify hotspots where wildlife interactions occur, to inform the location and design of wildlife crossing infrastructure improvements
		• Habitat loss, degradation, fragmentation	• Connectivity	HC 1.2.4. Restore and enhance linkages between habitats required for all life stages (i.e., improve linkages between upland and breeding or foraging habitats).
		• Habitat loss, degradation, fragmentation	• Connectivity	HC 1.2.5 Restore and enhance terrestrial habitat corridors and linkages between small and large landscape blocks.

Goal	Objective	Threats	Co-Benefits	Action
HC Goal 2: Improve aquatic and riparian connectivity throughout the RCIS area through protection, enhancement, and restoration	HC Objective 2.1: Improve freshwater aquatic and riparian connectivity in areas that link sensitive species and habitats. Measure progress toward achieving this objective by the improvement of aquatic conditions, water quality, and connectivity of aquatic and riparian resources.	• Habitat loss, degradation, fragmentation	• Connectivity	HC 2.1.1. Protect existing and intact aquatic and riparian habitat connectivity and linkages.
		• Habitat loss, degradation, fragmentation	• Fish passage barriers	HC 2.1.2 Improve connectivity/ remove barriers to fish passage throughout the RCIS area, by ground-truthing and monitoring assumed fish passage barriers.
		• Habitat loss, degradation, fragmentation	• Connectivity	HC 2.1.3: Improve quality and connectivity of riparian habitats, focusing on temperature profiles and appropriate substrate, especially considering areas of expected climate change impacts and future range.

5.3.39 Dune Formation

Sand Dune near Monterey Bay
Photo Credit: Rose Laird

- RCIS Regions: Monterey Bay Coastline, Salinas River and Associated Corridor
- RCIS Natural Communities: Coastal Dune
- Ecosystem function: Reduce wave damage and landward movement of shoreline, winter storm and flood protection (SRSBDR 2016, USACE 2020)
- Variation influenced by littoral sand supply, rainfall variation, shoreline changes, wind direction, and vegetation (Neuman et al. 2019, NOAA 2019, USFWS 1998b)
- Dominated by primary successional plant species which contribute to dune building and stabilization, as well as different dune zones: beach and fore dunes, mid dunes, and rear dunes (Neuman et al. 2019)
- Full species account available: Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly (USFWS 1998b)
- RCIS Conservation Target: High (Important ecosystem function creating a unique habitat)

Associated Non-Focal Species

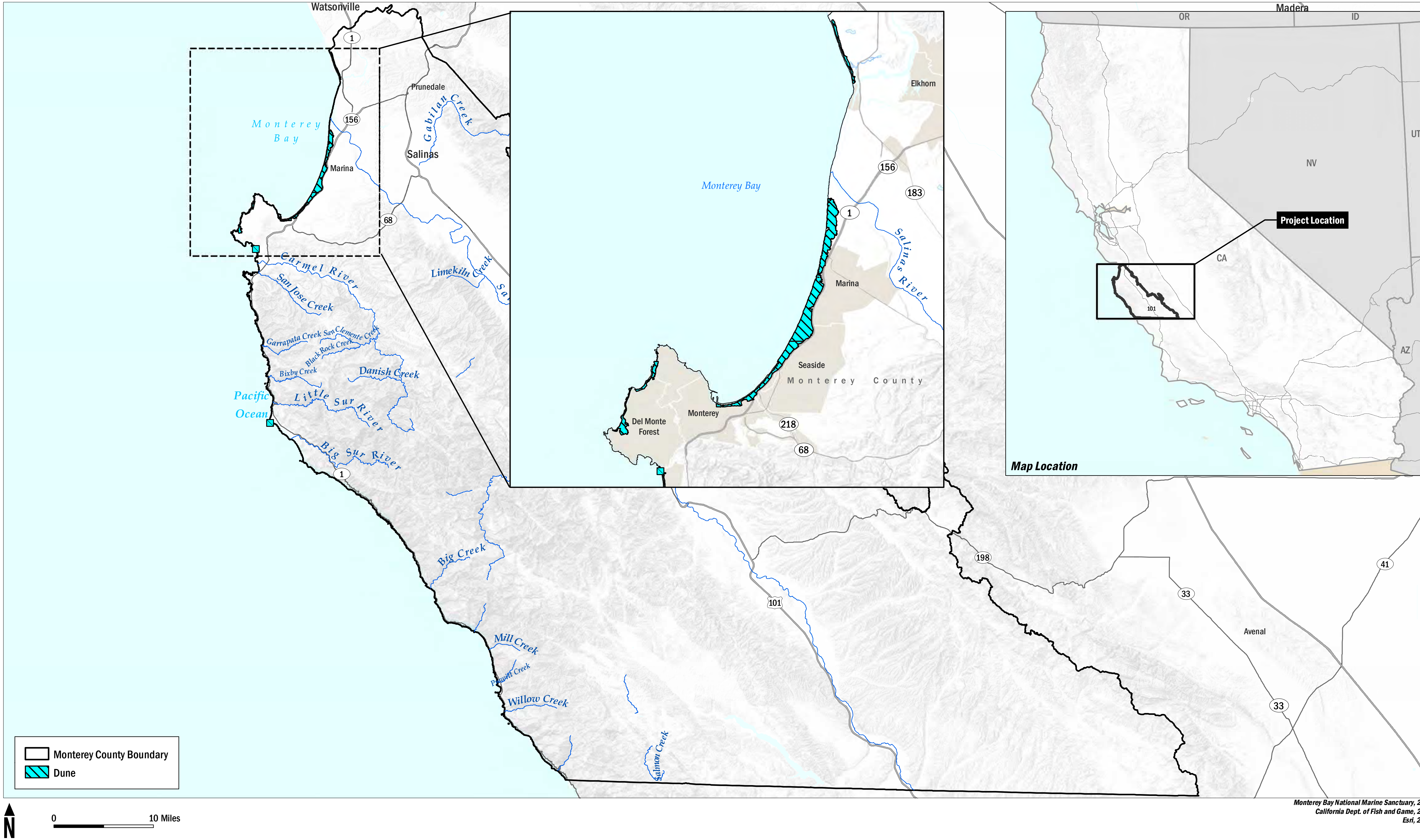
- Northern California legless lizard (Anniella pulchra)
- Menzies' wallflower (Erysimum menziesii)
- Monterey larkspur (Delphinium hutchinsoniae)

Climate Change Vulnerability Assessment

Dunes in the RCIS area are found along the shoreline of Monterey Bay and are some of the most at-risk to the effects of climate change and are projected to have some of the greatest losses in current spatial distribution, because of greater and more frequent wave action, resulting in erosion and shoreline retreat (USFWS 2009). In addition, the representative plant species used in the climate change vulnerability assessments for coastal dunes had low adaptive capacity scores (Thorne et al. 2016), meaning they do not physiologically respond well to changing conditions. When combined with projected impacts of sea-level rise and changes in temperature and precipitation, coastal dunes are very vulnerable to climate change. Conservation strategies targeting non-climate stressors, such as recreation, land use changes, pollution, and invasive species, as well as allowing space for inland migration of dune formation and coastal ecosystems, can help create new areas of suitable habitat that will help reduce the pressures of climate change coastal dunes, as well as with other focal and non-focal species. The goals, objectives, and actions shown in Table 5-62 aim to protect, enhance, and restore present day dune formation to create resiliency to projected climate changes.

Figure 5-35 shows dunes in the RCIS area.

AECOM Oakland CA 6/30/2020 USER caitlin.jensen PATH \\na.aecomnet.com\lfs\AMER\Oakland-USOAK01\DCS\Projects\GIS\Projects\Monterey_County_RCS\02_Maps\02_Map_Production_and_Reports\Baseball_Cards\Fig3-33_CoastalDunes.mxd



Monterey Bay National Marine Sanctuary, 2019
California Dept. of Fish and Game, 2016
Esri, 2016

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FIGURE 5-34
Dunes in the RCIS Area

Dune Formation Priorities, Goals, Objectives, and Actions

All Regional Conservation goals, objectives, and actions apply to dune formation. Water actions 1.1.1, 1.1.7, 1.2.3, 1.2.4, 1.2.5.

Other species-specific actions that apply to Dune Formation include:

- BLUE 1.2.1, 1.2.2, 1.3.1
- MG 1.2.1
- MS 1.2.1, 2.1.1, 2.1.2
- WSP 1.2.7, 1.3.1, 2.1.1, 2.1.2

Table 5-60. summarizes specific goals, objectives, and actions for dune formation.

Conservation Priorities

- Protect and preserve existing intact coastal dune habit along the Monterey Bay shoreline, particularly near the mouth of the Salinas River.
- Protect and preserve lands adjacent to coastal dunes, to allow inland dune migration and shoreline retreat.

Table 5-62. Dune Formation Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
Dune Goal 1 Promote resiliency from climate change-induced coastal retreat by encourage dune formation to maintain coastal dune communities for focal and non-focal species	Dune Objective 1.1: Enhance, restore, and create new coastal and beach systems by promoting physical processes that contribute to dune formation with a focus on locations with high resilience to projected climate changes. Measures progress toward achieving this objective by acres of dunes and adjacent/associated enhanced, restored, and/or created.	• Decrease in beach sediment sources • Climate change • Erosion	• Climate change resilience • Flood control • Other focal/ non-focal species • Biodiversity	Dune 1.1.1: Conduct beach nourishment instead of coastal armoring and create additional coastal dune systems where feasible and informed by modeled sea-level rise projections (Hutto et al. 2015).
		• Coastal armoring • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.2: Install living shorelines using shoreline stabilization techniques informed by modeled sea-level rise projections.
		• Coastal armoring • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.3: Relocate infrastructure that are barriers to shoreline retreat (Neuman et al. 2019).

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation • Climate change • Recreation • Erosion	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.4: Eliminate unnecessary beach access points and plan new access points in areas that minimize erosion hazards, to protect landform integrity (Neuman et al. 2019).
		• Habitat loss, degradation, fragmentation • Climate change • Sand mining	• Climate change resilience • Other focal/ non-focal species • Biodiversity • Water quality	Dune 1.1.5: Promote positive sediment dynamics by preserving normal river flows, such as the Salinas and Pajaro rivers (Neuman et al. 2019).
		• Habitat loss, degradation, fragmentation • Climate change • Sand mining	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.6: Promote the cessation of sand mining throughout the RCIS area, to promote climate change benefits of dune presence.

Goal	Objective	Threats	Co-Benefits	Action
		• Habitat loss, degradation, fragmentation • Climate change • Erosion	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.7: Install sand fences to promote retention of sand and other materials.
		• Habitat loss, degradation, fragmentation • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.8: Protect, enhance, and restore adjacent habitat to allow future dune migration because of sea-level rise.
	DUNE Objective 1.2: Enhance, restore, and create new coastal and beach systems by promoting natural processes contributing to dune formation, with a focus on locations with high resilience	• Habitat loss, degradation, fragmentation • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity	DUNE 1.2.1: Remove non-native vegetation in transition zone habitat to allow dune ecology to transition to mid-dune habitats (Neuman et al. 2019).

Goal	Objective	Threats	Co-Benefits	Action
	to projected climate changes. Measures progress toward achieving this objective by the acres of dunes and adjacent/associated habitat enhanced, restored, and/or created.	• Habitat loss, degradation, fragmentation • Climate change • Recreation	• Climate change resilience • Other focal/ non-focal species • Biodiversity	DUNE 1.2.2: Install buffers and signs and designate/update trails to delineate public access and reduce negative impacts on biotic factors.
Sources: Neuman et al. 2019; USFWS 1998b				

5.4 Strategy Consistency

The California Fish and Game Code Section 1852(c)(11) requires an RCIS to have "... an explanation of whether and to what extent the strategy is consistent with any previously approved strategy or amended strategy, State or federal recovery plan, or other state or federal approved conservation strategy that overlaps with the strategy area." Table 5-63 and Table 5-64 summarize the consistency of the RCIS conservation strategies with those of existing Habitat Conservation Plans and approved U.S. Fish and Wildlife Service recovery plans in the RCIS area. No Natural Community Conservation Plans exist for the RCIS area.

5.4.1 Consistency with Habitat Conservation Plans

Table 5-63. Habitat Conservation and Management Plans

Species	RCIS and Habitat Conservation Plan Overlapping Strategies
Fort Ord Habitat Conservation Plan (Draft)	
Consistency: The Monterey County RCIS is compatible with the Fort Ord Habitat Conservation Plan (Draft) because it includes conservation strategies to protect species covered by the plan and their habitats. The RCIS identifies specific threats to covered species and provides strategies to avoid impacts from loss of habitat, non-native species, and anthropogenic disturbance that are consistent with the plan. The RCIS also includes goals for enhancement and restoration of habitats to allow population expansion, and these goals are consistent with the goals in the plan (FORA 2018).	
Western snowy plover	• Protect nesting colonies through controlling public access during the nesting season • Improve habitat quality for western snowy plover • Monitor nesting success and implement recovery actions

Species	RCIS and Habitat Conservation Plan Overlapping Strategies
California tiger salamander	• Protect California tiger salamander occupied and unoccupied aquatic habitats • Protect California tiger salamander occupied and unoccupied adjacent upland habitats • Remove non-native California tiger salamander predators from known and potential upland and aquatic habitats • Remove hybrid tiger salamanders from aquatic habitat
California red-legged frog	• Protect California red-legged frog occupied and unoccupied aquatic habitats • Protect California red-legged frog occupied and unoccupied adjacent upland habitats • Remove non-native California red-legged frog predators from known and potential upland and aquatic habitats
Smith's blue butterfly	• Preserve Smith's blue butterfly habitat in coastal dune scrub • Include host plants seacliff buckwheat (Eriogonum parvifolium) and coast buckwheat (E. latifolium) in restoration efforts
seaside bird's beak	• Maintain or increase the distribution and abundance of seaside bird's-beak • Reduce anthropogenic impacts to seaside bird's-beak through protection, restoration, and enhancement of habitat
Monterey gilia	• Maintain or increase the distribution and abundance of Monterey gilia • Reduce anthropogenic impacts to Monterey gilia through protection, restoration, and enhancement of habitat
Monterey spineflower	• Maintain or increase the distribution and abundance of Monterey spineflower • Reduce anthropogenic impacts to Monterey spineflower through protection, restoration, and enhancement of habitat

<table>
<tr><th>Species</th><th>RCIS and Habitat Conservation Plan Overlapping Strategies</th></tr>
<tr><td>Yadon’s rein orchid</td><td>• Maintain or increase the distribution and abundance of Yadon’s rein orchid
• Reduce anthropogenic impacts to Yadon’s rein orchid through protection, restoration, and enhancement of habitat</td></tr>
<tr><td colspan="2">Installation-Wide Multispecies Fort Ord Habitat Management Plan</td></tr>
<tr><td colspan="2">Consistency: While there are no species-specific goals identified in the Fort Ord Habitat Management Plan, the main conservation strategy for the considered species is achieved through the establishment of habitat reserves (including the Fort Ord National Monument), protection of special-status species during base clean-up activities, and restoration of habitats post remediation. The RCIS would not implement any activities prohibited within habitat reserve parcels or parcels with development restrictions, and therefore does not conflict with this habitat management plan. In addition, the RCIS is consistent with the general conservation strategies for species considered in the Plan, and therefore is consistent with the Plan (USACE 1997).</td></tr>
<tr><td>• seaside bird’s-beak
• Yadon’s rein orchid
• western snowy plover
• California tiger salamander
• California red-legged frog
• Northern California legless lizard (Anniella pulchra)
• Smith’s blue butterfly
• sandmat manzanita (Arctostaphylos pumila)
• Monterey gilia
• Monterey spineflower</td><td>• Preserve and protect populations and habitat of federally listed, proposed, or candidate plants and wildlife
• Preserve and protect populations and habitat of state listed, proposed, or candidate plants and wildlife
• Avoid reducing populations of plants with a California rare plant rank of 1B
• Provide guidance to land management agencies and/or educate the public on conservation, impact avoidance, and regulatory requirements for listed species</td></tr>
</table>

Species	RCIS and Habitat Conservation Plan Overlapping Strategies
Low-Effect Habitat Conservation Plan for the Smith's Blue Butterfly and California Red-Legged Frog at the Post Ranch Inn	
Consistency: The Post Ranch Inn low-effect habitat conservation plan was developed for a specific project, and therefore the conservation strategies are largely focused on avoidance of "take" during construction. The RCIS is consistent with the long-term conservation strategies in the Post Ranch Inn low-effect habitat conservation plan because it contains goals for the preservation of Smith's blue butterfly and California red-legged frog, as well as goals for habitat restoration to allow population expansion (Post Ranch 2006).	
Smith's blue butterfly	• Protect Smith's blue butterfly and Smith's blue butterfly habitat • Restore Smith's blue butterfly habitat, including host plants
California red-legged frog	• Preserve occupied aquatic (breeding) habitat through habitat management, removal of exotic species, and management of adjacent upland habitat
Low-Effect Habitat Conservation Plan for Gaver Ranch	
Consistency: The Gaver Ranch low-effect habitat conservation plan was developed for a specific project, and therefore the conservation strategies are largely focused on avoidance of "take" during construction and post-project mitigation requirements. The RCIS is consistent with the long-term conservation strategies in the Gaver Ranch low-effect habitat conservation plan because it contains goals for the preservation of the California red-legged frog and California tiger salamander, as well as goals for habitat restoration to allow population expansion (Midnight Sun 2018).	
California red-legged frog	Protect populations of California red-legged frog Restore habitats for California red-legged frog
California tiger salamander	Protect populations of California tiger salamander Restore habitats for California tiger salamander

5.4.2 Approved Recovery Plans

The U.S. Fish and Wildlife Service-approved species' recovery plans shown in Table 5-70 were used to inform conservation actions in the RCIS.

Table 5-64. Species' Recovery Plans

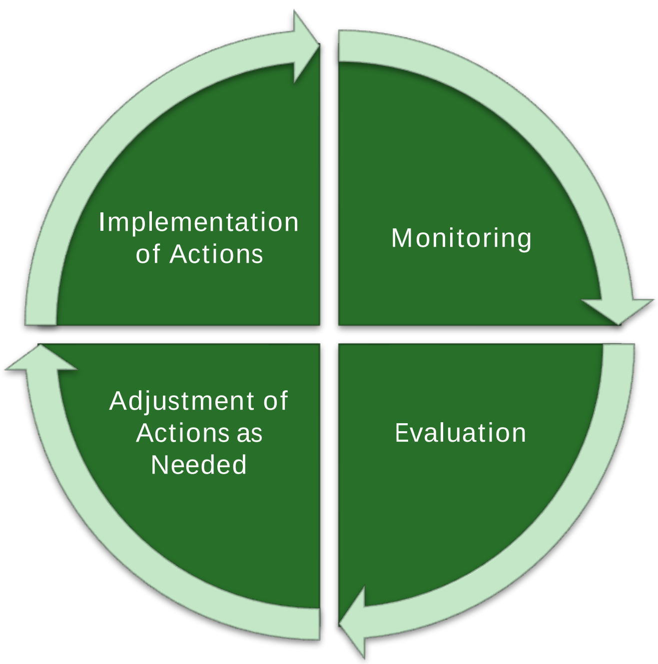
Species	Recovery Plan(s)	RCIS Consistency with Recovery Plans
California condor	Recovery Plan for California Condor (USFWS 1996)	• Included as focal species • Conservation actions included in RCIS
California red-legged frog	Recovery Plan for the California Red-legged Frog (USFWS 2002)	• Included as focal species • Conservation actions included in RCIS
California tiger salamander	Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (USFWS 2017)	• Included as focal species • Conservation actions included in RCIS
least Bell's vireo	Draft Recovery Plan for the Least Bell's Vireo (1998c)	• Included as non-focal species
San Joaquin kit fox	Recovery Plan for Upland Species of the Upland San Joaquin Valley, California (USFWS 1998a)	• Included as focal species • Conservation actions included in RCIS
Santa Cruz long-toed Salamander	Recovery Plan for the Santa Cruz Long-toed Salamander (USFWS 2004a)	• Included as focal species • Conservation actions included in RCIS
Smith's blue butterfly	Smith's Blue Butterfly Recovery Plan (USFWS 1984)	• Included as focal species • Conservation actions included in RCIS

Species	Recovery Plan(s)	RCIS Consistency with Recovery Plans
southern sea otter	Recovery Plan for the Southern Sea Otter	• Included as focal species • Conservation actions included in RCIS
tidewater goby	Recovery Plan for the Tidewater Goby (USFWS 2005a)	• Included as focal species • Conservation actions included in RCIS
western snowy plover	Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (USFWS 2007b)	• Included as focal species • Conservation actions included in RCIS
vernal pool fairy shrimp	Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005b)	• Included as focal species • Conservation actions included in RCIS
Monterey gilia	Recovery Plan for Seven Coastal Plants and Myrtle's Silverspot Butterfly (USFWS 1998b)	• Included as focal species • Conservation actions included in RCIS
Monterey spineflower	Recovery Plan for Seven Coastal Plants and Myrtle's Silverspot Butterfly (USFWS 1998b)	• Included as focal species • Conservation actions included in RCIS
Yadon's rein orchid	Recovery Plan for Five Plants from Monterey County, California (USFWS 2004b)	• Included as focal species • Conservation actions included in RCIS

6. MONITORING AND ADAPTIVE MANAGEMENT STRATEGY

6.1 Monitoring and Adaptive Management Strategy

Monitoring and adaptive management is intended to ensure that conservation and habitat enhancement actions are implemented in ways that benefit focal/non-focal species and other conservation elements and that contribute to the achievement of the conservation goals and objectives stated in the RCIS.



All Mitigation Credit Agreements under an RCIS are required to include a monitoring and adaptive management plan that is consistent with the monitoring and adaptive management strategy provided in this section. California Fish and Game Code 1856(f) outlines the requirements of a Mitigation Credit Agreement, including the inclusion of a monitoring and adaptive management strategy. Further guidance on the requirements of a Mitigation Credit Agreement monitoring and adaptive management strategy will be included in the California Department of Fish and Wildlife Mitigation Credit Agreement Guidelines, which are expected to be released at a future date. A monitoring and adaptive management strategy is not required for actions not related to a Mitigation Credit Agreement; however, it is strongly recommended.

Monitoring and adaptive management includes baseline monitoring, a management and monitoring plan, and long-term adaptive management. The level of detail and application of the monitoring and adaptive management strategy will vary depending on the size and complexity of the Mitigation Credit Agreement site or sites, the resources monitored, and the nature of the implementation of the conservation or enhancement actions.

The following sections describe the components necessary to develop a Mitigation Credit Agreement based on the currently available draft guidelines.

6.1.1 Baseline Inventory

It is recommended that a baseline inventory be conducted within two years following the commitment to implement conservation actions. Baseline inventory should be conducted prior to the implementation of conservation actions. Quantitative and qualitative information collected will be used to document the baseline conditions of habitat and other natural resources, and to assess the effectiveness of conservation actions.

6.1.2 Management and Monitoring Plan

Following the baseline inventory, a management and monitoring plan will be developed and will describe conservation or habitat enhancement actions, desired outcomes, adaptive management, monitoring protocol, criteria for success, reporting and other activities.

The plan will be developed following the Mitigation Credit Agreement Guidelines from the California Department of Fish and Wildlife, and should include the following based on the currently available draft guidance:

- The purpose for establishing the Mitigation Credit Agreement
- Desired outcome of the conservation or habitat enhancement action

- Description of the condition of habitat and other natural resources
- A description of conservation and habitat enhancement actions
- The requirements and schedule for the overall management of the site, including adaptive management strategies, maintenance tasks, monitoring methodologies, implementation schedule, and a discussion of any constraints that may impede implementation
- Performance standards to evaluate the effectiveness of conservation and habitat enhancement actions and guide implementation of effective adaptive management strategies
- Monitoring plan including routine monitoring and monitoring to assess the effectiveness of conservation and habitat enhancement actions

6.1.3 Long-Term Monitoring and Adaptive Management

The quantitative and qualitative information gathered during monitoring will be used to evaluate the progress of the conservation and habitat enhancement actions. This evaluation will determine if unforeseen challenges are threatening the success of conservation and habitat enhancement actions and will identify specific problems. Long-term monitoring and management should occur for the length of time specified in the Management and Monitoring Plan and includes:

- Monitor response to conservation and habitat enhancement actions described in the Management and Monitoring Plan
- Monitor success according to performance standards established in the Management and Monitoring Plan
- Management actions identified in the Management and Monitoring Plan. Examples include management of invasive species, property inspections, infrastructure, or structural management needed to ensure hydrological and/or ecological restoration and functions
- Routine monitoring and effectiveness monitoring to determine the progress of achieving the goals of the RCIS

If the determined ecological performance standards are not met, an adjustment of conservation actions and/or habitat enhancement actions will be required and implemented.

6.2 Implementation Monitoring

The RCIS conservation and habitat enhancement actions will be voluntarily implemented by all users of the RCIS. It is envisioned that partners will play key role in implementation of actions to achieve the vision, goals, and objectives of the RCIS. The RCIS proponent, the Transportation Agency for Monterey County, will be responsible for conducting periodic technical and administrative updates to this RCIS consistent with the approved Program Guidelines.

6.2.1 Assessing Progress

To determine the progress of achieving the vision, goals, and objectives of the RCIS, at least every 10 years, or until all mitigation credits are used, an assessment of the effectiveness of conservation and conservation actions may be reported to California Department of Fish and Wildlife, as described in Section 4.3 of the RCIS Guidelines (CDFW 2018). The assessment includes:

- A summary of known habitat enhancements and conservation actions in the RCIS area, including those specifically implemented under this RCIS.
- A summary of the net change in known quantitive metrics for the focal species and other conservation elements, (i.e. number of breeding ponds, area of habitat protected, linear feet of stream restored.)
- Assessment in progress of offsetting threats identified, and in achieving RCIS goals and objectives.
- Summary of the status of Mitigation Credit Agreements in the RCIS area, using readily available information.

Metrics for Tracking Progress

Measurable objectives in this RCIS include metrics for tracking progress towards achieving the RCIS' goals and objectives. In describing objectives, metrics are provided with the intent of measuring, in a consistent way, the net change, from habitat restoration actions, on the habitat area and habitat quality. When implementing conservation actions and habitat enhancement actions that include habitat restoration, a Mitigation Credit Agreement Sponsor shall select, and submit for CDFW's approval, an appropriate metric(s) from the metrics indicated in this RCIS to measure the net change in habitat area and habitat quality.

If the Mitigation Credit Agreement Sponsor determines that an alternative metric, not listed in this RCIS, is more fitting for an action or objective, the Mitigation Credit Agreement Sponsor may notify the RCIS Proponent, and make a written request to the and the California Department of Fish and Wildlife to consider approving that alternative metric instead of, or in addition to, one or more metrics in this RCIS. The California Department of Fish and Wildlife will consider the proposed alternative metric and the RCIS Proponent's recommendation, if any, when determining whether to approve the alternative metric.

Once a metric(s) is designated and approved, it must be used for both the baseline and subsequent measurements of habitat area and habitat quality. If an approved metric turns out to be faulty or problematic, the Mitigation Credit Agreement Sponsor may make a written request to the California Department of Fish and Wildlife to consider approving a different metric instead of, or in addition to, the approved metric(s), as set forth above. The determination to approve will be based, in part, on whether that new metric can be compared with the original baseline data in a reasonable way to compare the change in habitat area or habitat quality, as applicable.

Mitigation Credit Agreement sponsors will report on relevant RCIS metrics for corresponding conservation actions and habitat enhancement actions implemented through a Mitigation Credit Agreement. Mitigation Credit Agreement sponsors may include additional measures and performance standards for assessing habitat quality in a Mitigation Credit Agreement, consistent with the Mitigation Credit Agreement Guidelines and with approval by the California Department of Fish and Wildlife.

The following metrics are acceptable in this RCIS for measuring the net change in habitat area and habitat quality resulting from habitat restoration actions:

- Acreage
- Linear feet
- Percent cover (native vs. nonnative species)
- Native species diversity
- Number of individuals
- Number of populations
- Gene pool / genetic diversity

- Evidence of presence and abundance (presence/absence, # of nests, calls, scat, etc.)
- Habitat structure (number of canopy layers; percent cover; snags, etc.)
- Distribution of key resources (e.g., nesting trees, ponds, host plants) (number per acre)
- Inundation duration (consecutive days)
- Water depth (feet)
- Stream flow (cubic feet per second)
- Water temperature and chemical composition (dissolved oxygen, etc.)
- Stream substrate composition (percent cover; gravel size; etc.)
- Stream characterization (pool, riffle, run; length and width)

6.2.2 Updating and Extending an RCIS

Updates to the RCIS, may be appropriate during the 10-year approval period. Updated information, in general, should be minor and may include new best available scientific information, geographic information system data, minor changes to numbers or text, and minor changes to goals, objectives, or actions in the RCIS. These minor updates to the RCIS should occur as data are available and no less than every ten years, or until all mitigation credit are used. These updates could be submitted to the California Department of Fish and Wildlife in the progress report (see Section 6.2.1), or in a standalone document, as scientific information updates may occur at any time. The California Department of Fish and Wildlife may extend the duration of an approved RCIS for additional periods of up to 10 years after scientific information has been updated. If it is determined that a more substantial update, such as a change in the fundamental aspects of the RCIS is required, than the RCIS should be amended to address these changes (see Section 6.2.5. Amending an RCIS).

6.2.3 Responsible Parties

The RCIS conservation actions will be voluntarily implemented by all users of the RCIS. It is envisioned that partners will be key in implementing action toward achieving the vision, goals, and objectives of the RCIS.

As the RCIS proponent, the Transportation Agency will be responsible for conducting periodic technical and administrative updates to this RCIS consistent with the approved Program Guidelines including:

- Assessing progress toward achieving the vision, goals, and objectives of the RCIS, at least every 10 years, or until all mitigation credits are used (see Section 6.2.1.)
- Updating the RCIS at least once every 10 years, so that it includes the best available scientific information (see Section 6.2.2)

6.2.4 Using this RCIS to Achieve Conservation Investment and Advance Mitigation

Conservation Partners

Entities involved in conservation activities in the RCIS area, such as local, regional, state and federal agencies, resources conservation districts, parks and open space districts, conservation organizations, and land trusts, amongst others should use this RCIS to ensure that conservation investments are comprehensive, informed, and strategic for the region.

Mitigation

Mitigation Banks and In-Lieu Fee Programs

This RCIS can provide voluntary guidance on where mitigation or conservation banks could be established to support focal species and other conservation elements to provide maximum conservation value for the region. Chapter 2 includes a description of existing mitigation banks in the RCIS area. Though there are not any U.S. Army Corps of Engineers approved in-lieu fee programs in the RCIS area, if one were to be developed program proponents could use this RCIS to help design the restoration, enhancement, or preservation of aquatic resources.

Mitigation Credit Agreements

It is anticipated that this RCIS will be used to develop Mitigation Credit Agreements, which are a tool by which credits may be created to satisfy mitigation, including compensatory mitigation for impacts to resources and species, required under the California Engendered Species Act, Lake and Streambed Alteration Agreement, or the California Environmental Quality Act. Mitigation Credit Agreements are developed in collaboration with the California Department of Fish and Wildlife to create mitigation credits by implementing actions in this RCIS. Any person or entity may enter into a Mitigation Credit Agreement with the California Department of Fish and Wildlife. California Fish and Game Code 1856(f) outlines the requirements of a Mitigation

Credit Agreement and further guidance on the requirements of a Mitigation Credit Agreement monitoring and adaptive management strategy will be included in the California Department of Fish and Wildlife Mitigation Credit Agreement Guidelines, expected to be released at a future date.

This RCIS includes the following additional components to facilitate Mitigation Credit Agreements:

- Adaptive management and monitoring strategy (see Monterey County RCIS Conservation Strategy)
- Process for updating scientific information (see Section 6.2.2)
- Process for tracking and reporting the effectiveness of conservation actions (see Section 6.2.1)
- RCIS progress report or RCIS update at least once every 10 years (see Section 6.2.1)
- Identification of an entity responsible for the updates and effectiveness assessment (see Section 6.2.3)

All Mitigation Credit Agreement sponsors shall contribute to collecting data and providing the data to the RCIS proponent to assist with the implementation and completion of the items above. Additionally, it is expected that Mitigation Credit Agreement sponsors shall fund their own involvement in developing Mitigation Credit Agreements.

6.2.5 Amending the RCIS

The RCIS may be amended through the amendment process described in California Fish and Game Code 1854(a). An amendment includes changes to an RCIS that are more than a data update (see Section 6.2.2) (CDFW 2018). The process of public outreach and review and approval are the same for amending an existing RCIS as for developing a new RCIS. Reasons for amending and RCIS may include:

- Change in the RCIS geographic area
- Adding or removing focal species
- Substantial changes in best available science
- Substantial changes in goals, objectives, and actions

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APPENDICES

Appendix A. Vegetation Communities Description and Crosswalk

Table A-1. Monterey County RCIS Natural Communities

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
		Grassland
Annual grassland[1]	632,115	• Open grasslands composed of annual plant species. • Dominant species include introduced annual grasses, such as wild oats (Avena barbata, A. fatua), soft chess (Bromus hordeaceus), and ripgut brome (Bromus diandrus).
Perennial grassland[1]	1,608	• Occurs in coastal prairie, found in areas of Northern California under maritime influence. • Dominated by perennial grass species, such as California oatgrass (Danthonia californica), Pacific hairgrass (Deschampsia cespitosa ssp. holciformis), and sweet vernalgrass (Anthoxanthum odoratum).
		Shrub – Dominated
Alkali desert scrub[1]	1,122	• Includes xerophytic and halophytic plant assemblages. • Occurs at lower-middle elevations and interdigitates with other arid and semi-arid wildlife habitats.
California buckwheat scrub[2]	69	• California buckwheat (Eriogonum fasciculatum) is dominant or co-dominant in the shrub canopy. • Emergent trees may be present at low cover, • Occurs on slopes that are steep and south-facing, on colluvial-derived soils.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
California sagebrush scrub[2]	23	• California sagebrush is dominant or co-dominant in the shrub canopy. • Emergent trees or tall shrubs may be present at low cover. • Occurs on slopes that are usually steep and rarely flooded, low-gradient deposits along streams, and soils are alluvial or colluvial-derived and shallow.
California sagebrush-California buckwheat scrub[2]	307	• California sagebrush and California buckwheat are co-dominant in the shrub canopy. • Occurs on slopes that are steep and south-facing, and on soils that are colluvial-derived.
Chamise chaparral[2]	40	• Chamise is dominant in the shrub canopy. • Occurs in habitats with varied topography, on commonly shallow over colluvium soils, and many types of bedrock.
Chamise-black sage chaparral[2]	142,009	• Chamise and black sage are co-dominant in the shrub canopy. • Occurs in lower to upper slopes, especially south-facing slopes. Soils are shallow, with loamy sand.
Coastal dune vegetation[2]	96	• Coastal sand verbena (Abronia latifolia) and/or beach bur (Ambrosia chamissonis) mix with other perennial herbs, grasses, and low shrubs to form a low canopy. • Emergent shrubs may be present at low cover, including coyote brush, California goldenbush (Ericameria ericoides), coastal bush lupine (Lupinus arboreus), or dune bush lupine (Lupinus chamissonis). • Occurs on sand dunes of coastal bars, river mouths, and along the immediate coastline.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Coastal scrub[1]	140,719	• Structure is typified by low to moderate-sized shrubs with mesophytic leaves, flexible branches, semi-woody stems growing from a woody base, and a shallow root system.
Coyote brush scrub[2]	1,847	• Coyote brush (Baccharis pilularis) is dominant to co-dominant in the shrub canopy. • Emergent trees may present at low cover, including Bishop pine (Pinus muricate), Douglas-fir (Pseudotsuga menziesii), coast live oak, or bay laurel (Umbellularia californica). • Occurs at river mouths, stream sides, terraces, stabilized dunes of coastal bars, spits along the coastline, coastal bluffs, open slopes, and ridges.
Mixed chaparral[1]	345,288	• Dominated by shrubs with thick, stiff, heavily cutinized evergreen leaves. • Floristically rich type that supports approximately 240 species of woody plants.
Montane chaparral[1]	28	• The growth form of montane chaparral species can vary from treelike (up to 3 meters) to prostrate. When mature, it is often impenetrable to large mammals.
Poison oak[2]	30	• Poison oak (Toxicodendron diversilobum) is dominant in the shrub canopy. • Emergent trees may be present at low cover. • Occurs on the immediate coast in mesic hollows receiving salt-laden fog to interior sheltered mesic and disturbed dry slopes.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Scrub oak chaparral[2]	35	• Inland scrub oak (Quercus berberidifolia) is dominant or co-dominant in the shrub canopy. • Occurs on primarily north-facing, steep slopes. Soils are deep to shallow and are well to extensively drained.
Silver bush lupine[2]	86	• Silver bush lupine (Lupinus albifrons) is dominant or co-dominant in the shrub canopy. • Occurs on steep, dry slopes; rocky alluvial sites.
Tree–Deciduous		
Bigleaf maple forest[2]	53	• Bigleaf maple (Acer macrophyllum) is dominant or co-dominant in the tree canopy, with white fir (Abies concolor), white alder (Alnus rhombifolia), and other species. • Occurs in raised stream benches, terraces, and lower slopes with seeps.
Blue oak woodland[2]	207,000	• Blue oak (Quercus douglasii) is dominant or co-dominant in the tree canopy with California buckeye (Aesculus californica), and other species. • Occurs in valley bottoms, foothills, and rocky outcrops where soils are shallow, low in fertility, and moderately to excessively drained.
California buckeye groves[2]	89	• California buckeye is dominant or co-dominant in the tree canopy. • Occurs on varied sloped and topography, and soils are shallow and moderately to excessively drained.
Canyon live oak forest[2]	2.2	• Canyon live oak (Quercus chrysolepis) is dominant or co-dominant in the tree canopy. • Occurs in stream benches and terraces in canyon bottoms near streams, on upland slopes on steep, shallow, rocky, infertile soils.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Closed-cone pine-cypress[1]	12,994	• Includes many species of evergreen, needle-leaved trees. • Typically dominated by a single species of one of the closed-cone pines or cypress; few stands contain both pines and cypress.
Montane hardwood[1]	45,461	• Typically composed of a pronounced hardwood tree layer, with an infrequent and poorly developed shrub stratum, and a sparse herbaceous layer. • In the Coast Range, canyon live oak often forms pure stands on steep canyon slopes and rocky ridge tops.
Valley oak woodland[1]	9.2	• Varies from savanna-like to forest-like stands with partially closed canopies, composed mostly of winter-deciduous, broad-leaved species. • Canopies of these woodlands are dominated almost exclusively by valley oaks.
Valley oak woodland (Quercus lobata Woodland Alliance)[2]	6,923	• Valley oak is dominant or co-dominant in the tree. • Occurs at valley bottoms, seasonally saturated soils that may intermittently flooded, lower slopes, summit valleys. Soils are alluvial or residual.
Western juniper Woodland Alliance[2]	114	• California juniper is dominant or co-dominant in the tree canopy. • Occurs on gentle slopes, alluvial fans, canyon slopes, and steep, rocky escarpments.
Tree–Evergreen		
California juniper woodland[2]	2.8	• California juniper is dominant or co-dominant in the small tree canopy. • Occurs on ridges, slopes, valleys, alluvial fans, and valley bottoms where soils are porous, rocky, course, sandy, or silty, and are often shallow.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Coast live oak woodland[2]	207,530	• Coast live oak (Quercus agrifolia) is dominant or co-dominant in the tree canopy. • Occurs on alluvial terraces, canyon bottoms, stream banks, slopes, and flats where soils are deep, sandy, or loamy; and have high organic matter.
Coulter pine woodland[2]	27	• Coulter pine (Pinus coulteri) is dominant or co-dominant in the tree canopy. • Occurs on steep upper slopes and ridges; soils vary in fertility, typically are dry and are on granitic and sandstone or serpentine substrates.
Eucalyptus groves[2]	2,752	• Areas dominated by non-native hardwood trees including gums (Eucalyptus spp.), tree of heaven (Ailanthus altissima), and black locust (Robinia pseudoacacia). • Planted as trees, groves, and windbreaks, or is naturalized on uplands or bottomlands and adjacent to stream courses, lakes, or levees.
Foothill pine woodland[2]	62	• California foothill pine (Pinus sabiniana) is dominant or co-dominant in the tree canopy. • Occurs on streamside terraces, valleys, slopes, and ridges. Soils are shallow, often stony, infertile, and moderately to excessively drained.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Holly leaf cherry chaparral[2]	8.1	• Greenbark ceanothus (Ceanothus spinosus), toyon (Heteromeles arbutifolia) and/or holly leaf cherry (Prunus ilicifolia) is dominant or co-dominant in the shrub canopy. • Emergent trees may be present at low cover, including Southern California black walnut (Juglans californica) or coast live oak. • Occurs on slopes that are often steep and north-facing, and on soils that are derived from bedrock or colluvium.
Montane hardwood-conifer[1]	17,752	• Includes both conifers and hardwoods, often as a closed forest. At least one-third of the trees must be conifer, and at least one-third must be broad-leaved. • Common associates include ponderosa pine (Pinus ponderosa), Douglas fir, incense-cedar (Calocedrus decurrens), California black oak (Quercus kelloggii), tanoak (Notholithocarpus densiflorus), Pacific madrone (Arbutus menziesii), Oregon white oak (Quercus garryana), and other localized species.
Ponderosa pine[1]	1,038	• The ponderosa pine habitat includes pure stands of ponderosa pine, as well as stands of mixed species in which at least 50% of the canopy area is ponderosa pine. • Typical tree associates, incense-cedar, Coulter pine, Douglas-fir, canyon live oak, California black oak, Pacific madrone, and tanoak.
Sierran mixed conifer[1]	3,760	• Assemblage of conifer and hardwood species that forms a multilayered forest. • Five conifers and one hardwood typify the mixed conifer forest, Douglas-fir, ponderosa pine, incense-cedar, and California black oak.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Tanoak forest[2]	24	• Tanoak is dominant or co-dominant in the tree canopy. • Occurs on raised stream benches, terraces, slopes, and ridges of all aspects. Soils are deep and well drained.
Western juniper Woodland Alliance[2]	114	• California juniper is dominant or co-dominant in the tree canopy. • Occurs on gentle slopes, alluvial fans, canyon slopes, and steep, rocky escarpments.
Riparian Shrubs		
Desert riparian[1]	14	• Characterized as dense groves of low, shrub like trees, or tall shrubs to woodlands of small- to medium-sized trees. • Occurs adjacent to permanent surface water (e.g., streams, springs) or in naturally sub-irrigated areas.
Desert wash[1]	186	• Characterized by the presence of arborescent, often spiny, shrubs generally associated with intermittent streams (washes) or drier bajadas (alluvial deposits adjacent to washes).
Riparian Trees		
Arroyo willow thickets[2]	7,416	• Arroyo willow (Salix lasiolepis) are dominant or co-dominant in the tall shrub or low tree canopy. • Habitats include stream banks and benches, slope seeps, and along drainages.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
California sycamore woodlands[2]	706	• California sycamore (Platanus racemosa) is dominant or co-dominant in the tree canopy. • Occurs on gullies, intermittent streams, springs, seeps, stream banks, and terraces adjacent to floodplains that incur high-intensity flooding. • Soils are rocky or cobbly, with permanent moisture at depth.
Fremont cottonwood forest[2]	3,563	• Fremont cottonwood (Populus fremontii) is dominant or co-dominant in the tree canopy. • Occurs on floodplains, along low-gradient rivers, perennial or seasonally intermittent streams, springs, in lower canyons, in alluvial fans, and in valleys with a dependable subsurface water supply that varies considerably during the year.
Montane riparian[1]	22	• Narrow, often-dense grove of broad-leaved, winter deciduous trees up to 30 meters (98 feet) tall with a sparse understory. • Black cottonwood is dominant or codominant with bigleaf maple (Acer macrophyllum) and can occur in association with dogwood (Cornus sp.) and boxelder (Acer negundo).
Red willow thickets[2]	434	• Red willow (Salix laevigata) is dominant or co-dominant in the tree or shrub canopy. • Occurs in ditches, floodplains, lake edges, and low-gradient depositions along streams.
Redwood[1]	11,862	• Redwood is a dominant species in a variety or mix of conifer species that grow within the coastal influence zone.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Sandbar willow thickets[2]	1,674	• Sandbar willow (Salix exigua) is dominant or co-dominant in the shrub canopy. • Emergent trees of many different species may be present at low cover. • Occurs at temporarily flooded floodplains, depositions along rivers and streams, and at springs.
White alder groves[2]	26	• White alder is dominant or co-dominant in the tree canopy. • Occurs at riparian corridors, incised canyons, seeps, stream banks, mid-channel bars, floodplains, and terraces.
Wetland[3]		
Baltic and Mexican rush marsh[2]	914	• Baltic rush (Juncus arcticus var. balticus) and/or Mexican rush (Juncus arcticus var. mexicanus) are dominant or co-dominant in the herbaceous layer. • Habitats are wet and mesic meadows; along stream banks, rivers, lakes, ponds, fens, and sloughs; and freshwater, brackish, and alkaline marshes.
California bulrush marsh[2]	236	• Hardstem bulrush (Schoenoplectus acutus) and/or California bulrush (Schoenoplectus californicus) are dominant or co-dominant in the herbaceous layer. • Occurs in brackish to freshwater marshes, along stream shores, bars, and channels of river mouth estuaries, around ponds and lakes, and in sloughs, swamps, and roadside ditches.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Cattail marsh[2]	3.1	• Narrow-leaved cattail (Typha angustifolia), southern cattail (T. domingensis), or broadleaf cattail (T. latifolia) are dominant or co-dominant in the herbaceous layer. • Occurs in semi-permanently flooded freshwater or brackish marshes, on clay or silty soils.
Common and giant reed marsh[2]	919	• Giant reed (Arundo donax) or common reed (Phragmites australis) is dominant in the herbaceous layer. Emergent trees and shrubs may be present at low cover. • Occurs at riparian areas, along low-gradient streams and ditches, and semi-permanently flooded and slightly brackish marshes, impoundments.
Estuarine[1]	891	• Occurs on periodically and permanently flooded substrates and open water portions of semi-enclosed coastal waters where tidal seawater is diluted by flowing fresh water. • Habitats include coastal lagoons containing waters of more uniform salinity than true estuaries, or waters with vertical rather than horizontal salinity gradients.
Freshwater emergent wetland[1]	170	• Characterized by erect, rooted herbaceous hydrophytes. Dominant vegetation is generally perennial monocots to 2 meters (~6.5 feet) tall. • Flooded frequently, enough so that the roots of the vegetation prosper in an anaerobic environment.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Lacustrine[1]	3,592	• Inland depressions or dammed riverine channels containing standing water that may vary from small ponds less than 1 hectare to large areas covering several square kilometers. Depth can vary from a few centimeters to hundreds of meters. • Habitats include permanently flooded lakes and reservoirs, intermittent lakes, and ponds (including vernal pools) so shallow that rooted plants can grow over the bottom.
Mule fat thicket[2]	6,225	• Mule fat (Baccharis salicifolia) is dominant or co-dominant in the shrub canopy. • Emergent trees may be present at low cover, including California foothill pine (Pinus sabiniana), California sycamore, Fremont cottonwood, Quercus spp. or Salix spp. • Occurs at canyon bottoms, floodplains, irrigation ditches, lake margins, and stream channels.
Perennial pepper weed patch[2]	3.5	• Perennial pepperweed (Lepidium latifolium) is dominant in the herbaceous layer. • Emergent trees and shrubs may be present at low cover. • Occurs at intermittently and seasonally flooded fresh- and saltwater marshes and riparian corridors.
Pickleweed mat[2]	178	• Virginia glasswort (Salicornia depressa) or pickleweed (Sarcocornia pacific) is dominant or co-dominant in the subshrub and herbaceous layers. • Occurs at coastal salt marshes, alkaline flats.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Saline emergent wetland[1]	2,472	• Characterized as salt or brackish marshes consisting mostly of perennial graminoids and forbs. • Characteristic or distinctive vascular plant species ranging from lower saline sites to higher or brackish sites are cordgrass (Spartina foliosa), pickleweed, Humboldt cordgrass (Spartina densiflora), Virginia glasswort, saltwort (Batis maritima), jaumea (Jaumea carnosa).
Water[1]	382	• Open water.
Wet meadow[1]	1.7	• Simple structure consisting of a layer of herbaceous plants. Shrub or tree layers are usually absent or very sparse. • Wet meadows occur with a great variety of plant species; species common in California include Agrostis, Carex, Danthonia, Juncus, Salix, and Scirpus.
Riverine[1]	4,179	• Intermittent or continually running water distinguishes rivers and streams.
Agriculture–Herbaceous		
Cropland[1]	27,148	• Cropland habitats do not conform to normal habitat stages. Instead, cropland is regulated by the crop cycle in California. These habitats can either be annual or perennial; vary according to location in the state; and germinate at various times of the year.
Dryland grain crops[1]	12,442	• Vegetation in the dryland (non-irrigated) grain and seed crops habitat includes seed-producing grasses; primarily, barley, cereal rye, oats, and wheat.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Irrigated grain crops[1]	2,134	• Vegetation in this habitat includes a variety of sizes, shapes, and growing patterns. • Irrigated grain and seed crops occur in association with orchards, vineyards, pasture, urban, and other wildlife habitats such as riparian, chaparral, wetlands, desert, and herbaceous types.
Irrigated hayfield[1]	7,877	• Except for 2- to 6-month initial growing period, depending on climate and soil, this habitat is dense, with nearly 100 percent cover. Average height is about 0.46 meter (1.5 feet) tall. • Planted fields generally are monocultures (the same species or mixtures of a few species with similar structural properties). • This habitat includes alfalfa fields and grass hayfields.
Irrigated row and field crops[1]	5,207	• Row and field crops occur in association with orchards, vineyards, pasture, urban, and other wildlife habitats such as riparian, chaparral, wetlands, desert, and herbaceous types.
Pasture[1]	105,261	• Mix of perennial grasses and legumes that normally provide 100 percent canopy closure.
Rice[1]	1,198	• Rice and wild rice are flood-irrigated crops that are seed-producing annual grasses.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics
Agriculture–Trees/Shrubs		
Deciduous orchard[1]	4,372	• Typically, open single-species-tree-dominated habitats. • Deciduous orchards include trees such as almonds, apples, apricots, cherries, figs, nectarines, peaches, pears, pecans, pistachios, plums, pomegranates, prunes, and walnuts.
Evergreen orchard[1]	499	• Typically, open single-species-tree-dominated habitats. Depending on the tree type and pruning methods, they are usually low, bushy trees with an open understory to facilitate harvest. • Orchards are typically associated with other agricultural types.
Orchard–vineyard[1]	2,568	• Orchards in California are typically open single-species-tree-dominated habitats. Depending on the tree type and pruning methods, they are usually low, bushy trees with an open understory to facilitate harvest. • Citrus, nuts, other fruits, vineyards.
Vineyard[1]	60,843	• Vineyards are composed of single species planted in rows. • Most crops are grapes, kiwifruit, and raspberries.
Other		
Barren[1]	16,532	• Absent of vegetation, with less than 2 percent total vegetation cover by herbaceous, desert, or non-wildland species; and less than 10 percent cover by tree or shrub species.
Urban[1]	56,780	• Urban vegetation including planted and landscaped tree grove, street strip, shade tree/lawn, lawn, and shrub cover.

Natural Community	Acres in RCIS Area	Brief Description/Key Characteristics

1. Defined using the California Wildlife Habitat Relationships classification system (CDFW 2014).
2. Defined using the Manual of California Vegetation classification system (CNPS 2019a).

Table A-1. Vegetation Communities Crosswalk

Monterey County RCIS Natural Community	Manual of California Vegetation	California Wildlife Habitat Relationships	Salinas River Vegetation	Gabilan Ranch Vegetation	Pinnacles National Monument Vegetation	California Department of Forestry and Fire Protection Fire and Resource Assessment Program Vegetation	U.S. Geological Survey Gap Analysis Program Vegetation	United States National Vegetation Classification (Common Name)
Grassland								
Annual Grassland	N/A	Annual Grassland (AGS)	California Annual Grasslands Alliance Tall Temperate Annual Graminoids (Ruderal Dominant)	California Annual Grasslands Alliance California Annual Grasslands with Bracken Fern	Mediterranean California Naturalized Annual Perennial Grassland Herbaceous Vegetation	Annual Grassland	Introduced & Semi Natural Vegetation	California Grassland and Flowerfields Western Upland Grasslands
Perennial Grassland	N/A	Perennial Grass (PGS)	Herbaceous	N/A	N/A	Perennial Grassland	Shrub & Herb Vegetation	California Grassland and Flowerfields Western Upland Grasslands North Coast Deciduous Scrub and Terrace Prairie

Monterey County RCIS Natural Community	Manual of California Vegetation	California Wildlife Habitat Relationships	Salinas River Vegetation	Gabilan Ranch Vegetation	Pinnacles National Monument Vegetation	California Department of Forestry and Fire Protection Fire and Resource Assessment Program Vegetation	U.S. Geological Survey Gap Analysis Program Vegetation	United States National Vegetation Classification (Common Name)
Shrub – Dominated								
Alkali Desert Scrub	N/A	Alkali Desert Scrub (ASC)	N/A	N/A	N/A	Alkali Desert Scrub	Desert & Semi-Desert	Salt Marsh Meadows Shadscale – Saltbush Scrub
California Buckwheat Scrub	California Buckwheat Scrub (Eriogonum fasciculatum Shrubland Alliance)	Mixed Chaparral (MCH) Coastal Scrub (CSC)	Mixed California Buckwheat – California Sagebrush	N/A	California Wild Buckwheat Shrubland Alliance	N/A	Shrub & Herb Vegetation	Desert Transition Chaparral Chaparral North Coast Deciduous Scrub and Terrace Prairie Coastal Sage Scrub
California Sagebrush Scrub	California Sagebrush Scrub (Artemisia californica Shrubland Alliance)	Coastal Scrub (CSC)	California Sagebrush Alliance	California Sagebrush Alliance	N/A	N/A	Shrub & Herb Vegetation	North Coast Deciduous Scrub and Terrace Prairie Coastal Sage Scrub

Monterey County RCIS Natural Community	Manual of California Vegetation	California Wildlife Habitat Relationships	Salinas River Vegetation	Gabilan Ranch Vegetation	Pinnacles National Monument Vegetation	California Department of Forestry and Fire Protection Fire and Resource Assessment Program Vegetation	U.S. Geological Survey Gap Analysis Program Vegetation	United States National Vegetation Classification (Common Name)
California Sagebrush-California Buckwheat Scrub	California Sagebrush-California Buckwheat Scrub (Artemisia californica-Eriogonum fasciculatum Shrubland Alliance)	Coastal Scrub (CSC)	N/A	N/A	California Sagebrush-California Wild Buckwheat Shrubland Alliance	N/A	Shrub & Herb Vegetation	North Coast Deciduous Scrub and Terrace Prairie Coastal Sage Scrub
Chamise Chaparral	Chamise Chaparral (Adenostoma fasciculatum Shrubland Alliance)	Mixed Chaparral (MCH) Chamise-Redshank Chaparral (CRC)	Chamise – Mixed Xeric Chaparral Mapping Unit	N/A	Californian Chaparral Shrubland Macrogroup	Chamise-Redshank Chaparral	Shrub & Herb Vegetation	Desert Transition Chaparral Chaparral
Chamise-Black Sage Chaparral	Chamise-Black Sage Chaparral (Adenostoma fasciculatum-Salvia mellifera Shrubland Alliance)	Coastal Scrub (CSC)	N/A	Chamise – Black Sage – Sticky Monkey Flower	N/A	N/A	Shrub & Herb Vegetation	North Coast Deciduous Scrub and Terrace Prairie Coastal Sage Scrub

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Coastal Dune Vegetation	Dune Mat (Abronia latifolia – Ambrosia chamissonis Herbaceous Alliance)	Barren (BAR)	Coastal Dune Sparsely Vegetated Coastal Dune Vegetation	N/A	N/A	N/A	Shrub & Herb Vegetation	California Foothill and Coastal Rock Outcrop Vegetation Northwest Coast Cliff and Outcrop
Coastal Scrub	N/A	Coastal Scrub (CSC)	N/A	N/A	California Coastal Scrub Shrubland Macrogroup	Coastal Scrub	Shrub & Herb Vegetation	North Coast Deciduous Scrub and Terrace Prairie Coastal Sage Scrub
Coyote Brush Scrub	Coyote Brush Scrub (Baccharis pilularis Shrubland Alliance)	Coastal Scrub (CSC)	Coyote Brush Alliance	Coyote Brush – Mixed Mesophytic Shrubs	N/A	N/A	Shrub & Herb Vegetation	North Coast Deciduous Scrub and Terrace Prairie Coastal Sage Scrub

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Mixed Chaparral	N/A	Mixed Chaparral (MCH)	Temperate Broadleaf Sclerophyll Evergreen Shrublands Temperate Microphyllous Evergreen Shrubland Temperate Xeric Mixed Drought-Deciduous Evergreen Shrubland	N/A	Californian Xeric Chaparral Shrubland Group Post Burn	Mixed Chaparral	Shrub & Herb Vegetation	Desert Transition Chaparral Chaparral
Montane Chaparral	N/A	Montane Chaparral (MCP)	N/A	N/A	N/A	Montane Chaparral	Shrub & Herb Vegetation	Montane Upland Deciduous Scrub
Poison Oak	Poison Oak (Toxicodendron diversilobum Shrubland Alliance)	Coastal Scrub (CSC)	N/A	Poison Oak – Mixed Mesophytic Shrubs / Herbaceous Mapping Unit	N/A	N/A	Shrub & Herb Vegetation	North Coast Deciduous Scrub and Terrace Prairie Coastal Sage Scrub

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Scrub Oak Chaparral	Scrub Oak Chaparral (Quercus berberidifolia Shrubland Alliance)	Mixed Chaparral (MCH)	Mixed Mesic Chaparral (Mixed Scrub Oak, Rhamnus spp. & Toyon)	N/A	N/A	N/A	Shrub & Herb Vegetation	Desert Transition Chaparral Chaparral
Shrublands	N/A	N/A	Shrublands	N/A	N/A	N/A	Shrub & Herb Vegetation	N/A
Silver Bush Lupine	Silver Bush Lupine (Lupinus albifrons Shrubland Alliance)	Coastal Scrub (CSC)	N/A	Bush Lupine – (Poison Oak – Elderberry) / Mixed Grasses & Herbs	N/A	N/A	Shrub & Herb Vegetation	North Coast Deciduous Scrub and Terrace Prairie Coastal Sage Scrub
Tree – Deciduous								
Bigleaf Maple Forest	Bigleaf Maple Forest	Montane Riparian (MRI)	N/A	Big Leaf Maple Alliance	N/A	N/A	Forest & Woodland	North Coastal and Montane Riparian Forest and Woodland

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Blue Oak Woodland	Blue Oak Woodland (Quercus douglasii Woodland Alliance)	Blue Oak Woodland 5(BOW) Blue Oak-Foothill Pine (BOP)	Blue Oak Alliance	N/A	Blue Oak Woodland Alliance Blue Oak/Mixed Herbaceous Woodland Association	Blue Oak Woodland Blue Oak-Foothill Pine	Forest & Woodland	California Foothill and Valley Forests and Woodlands
California Buckeye Groves	California Buckeye Groves (Aesculus californica Woodland Alliance)	Montane Hardwood (MHW)	California Buckeye (Interior Live Oak – Blue Oak)	California Buckeye / Poison Oak	California Buckeye Woodland Alliance	N/A	Forest & Woodland	California Foothill and Valley Forests and Woodlands North Coastal Mixed Evergreen and Montane Conifer Forests

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Canyon Live Oak forest	Canyon Live Oak Forest (Quercus chrysolepis Forest Alliance)	Coastal Oak Woodland (COW) Montane Hardwood (MHW)	Canyon Oak – Madrone Canyon Oak Alliance	N/A	N/A	N/A	Forest & Woodland	California Foothill and Valley Forests and Woodlands North Coastal Mixed Evergreen and Montane Conifer Forests
Closed-Cone Pine-Cypress	N/A	Closed-Cone Pine-Cypress (CPC)	N/A	N/A	N/A	Closed-Cone Pine-Cypress	Forest & Woodland	California Foothill and Valley Forests and Woodlands

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Montane Hardwood	N/A	Montane Hardwood (MHW)	N/A	N/A	N/A	Montane Hardwood	Forest & Woodland	California Foothill and Valley Forests and Woodlands North Coastal Mixed Evergreen and Montane Conifer Forests
Valley Oak Woodland	Valley Oak Woodland	Valley Oak Woodland (VOW)	N/A	Valley Oak – Coast Live Oak Valley Oak / Mixed Herbaceous Valley Oak / Mixed Mesophytic Shrubs	N/A	Valley Oak Woodland	Forest & Woodland	California Foothill and Valley Forests and Woodlands

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Valley Oak Woodland (Quercus lobata Woodland Alliance)	Valley Oak Woodland (Quercus lobata Woodland Alliance)	Valley Oak Woodland (VOW)	Valley Oak Alliance Valley Oak Alliance, Gallery	N/A	N/A	N/A	Forest & Woodland	California Foothill and Valley Forests and Woodlands
Valley-Foothill Woodland	N/A	Valley Oak Woodland (VOW)	Woodlands	N/A	N/A	N/A	Forest & Woodland	California Foothill and Valley Forests and Woodlands
Tree – Evergreen								
California Juniper Woodland	California Juniper Woodland (Juniperus californica Woodland Alliance)	Juniper (JUN)	N/A	N/A	California Juniper Woodland Alliance	N/A	Forest & Woodland	California Foothill and Valley Forests and Woodlands

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Coast Live Oak Woodland	Coast Live Oak Woodland (Quercus agrifolia Woodland Alliance)	Coastal Oak Woodland (COW)	Coast Live Oak Alliance	Coast Live Oak / Chamise Chaparral Coast Live Oak / Poison Oak Coast Live Oak Alliance	Coast Live Oak Woodland Alliance		Forest & Woodland	California Foothill and Valley Forests and Woodlands
Coulter Pine Woodland	Coulter Pine Woodland (Pinus coulteri Woodland Alliance)	Montane Hardwood – Conifer (MHC)	N/A	Coulter Pine – Canyon Oak Coulter Pine – Coast Live Oak – Valley Oak Coulter Pine – Coast Live Oak / (Interior Oak)	N/A	N/A	Forest & Woodland	California Foothill and Valley Forests and Woodlands North Coastal Mixed Evergreen and Montane Conifer Forests

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Eucalyptus Groves	Eucalyptus Groves (Eucalyptus [globulus, camaldulensis] Semi-Natural Woodland Stands)	Eucalyptus (EUC)	Eucalyptus Alliance or Other Exotic Trees	N/A	N/A	Eucalyptus	Introduced & Semi Natural Vegetation	N/A
Foothill Pine Woodland	California Foothill Pine Woodland (Pinus sabiniana Woodland Alliance)	Blue Oak – Foothill Pine (BOP)	N/A	N/A	Foothill Pine Woodland Alliance	N/A	Forest & Woodland	California Foothill and Valley Forests and Woodlands
Holly Leaf Cherry Chaparral	Holly Leaf Cherry Chaparral (Prunus ilicifolia Shrubland Alliance)	Mixed Chaparral (MCH)	N/A	N/A	Holly Leaf Cherry Shrubland Alliance	N/A	Shrub & Herb Vegetation	Desert Transition Chaparral Chaparral

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Montane Hardwood-Conifer	N/A	Montane Hardwood-Conifer (MHC)	N/A	N/A	N/A	Montane Hardwood-Conifer	Forest & Woodland	California Foothill and Valley Forests and Woodlands North Coastal Mixed Evergreen and Montane Conifer Forests
Ponderosa Pine	N/A	Ponderosa Pine (PPN)	N/A	N/A	N/A	Ponderosa Pine	Forest & Woodland	North Coastal Mixed Evergreen and Montane Conifer Forests
Sierran Mixed Conifer	N/A	Sierran Mixed Conifer (SMC)	N/A	N/A	N/A	Sierran Mixed Conifer	Forest & Woodland	North Coastal Mixed Evergreen and Montane Conifer Forests

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Tanoak Forest	Tanoak Forest (Lithocarpus densiflorus Forest Alliance)	Montane Hardwood (MHW)	N/A	Tanoak Alliance	N/A	N/A	Forest & Woodland	California Foothill and Valley Forests and Woodlands North Coastal Mixed Evergreen and Montane Conifer Forests
Western Juniper Woodland Alliance	Western Juniper Woodland Alliance (Juniperus occidentalis Woodland Alliance)	Juniper (JUN)	N/A	N/A	N/A	Juniper	Forest & Woodland	California Foothill and Valley Forests and Woodlands
Riparian Shrubs								
Desert Riparian	N/A	Desert Riparian (DRI)	N/A	N/A	N/A	Desert Riparian	Desert & Semi-Desert	American Southwest Riparian Forest and Woodland

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Desert Wash	N/A	Desert Wash (DSW)	N/A	N/A	N/A	Desert Wash	Desert & Semi-Desert	Desert Wash Woodland and Scrub Shadscale – Saltbush Scrub
Riparian Trees								
Arroyo Willow Thickets	Arroyo Willow Thickets (Salix lasiolepis Shrubland Alliance)	Valley Foothill Riparian (VRI)	Arroyo Willow	Willow – Mixed Riparian Shrubs Mapping Unit	N/A	Valley Foothill Riparian	Forest & Woodland	

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California Sycamore Woodlands	California Sycamore Woodlands (Platanus racemosa Woodland Alliance)	Valley Foothill Riparian (VRI)	California Sycamore – (Coast Live Oak – Fremont Cottonwood), Gallery California Sycamore – White Alder (Mixed Willow), Gallery and California Sycamore Alluvial Fan Savanna, Gallery	N/A	N/A	N/A	Forest & Woodland	
Fremont Cottonwood Forest	Fremont Cottonwood Forest (Populus fremontii Forest Alliance)	Montane Riparian (MRI)	Fremont Cottonwood – Mixed Willow Forests Fremont Cottonwood – Mixed Willow Forests, Gallery	N/A	N/A	N/A	Forest & Woodland	Montane Riparian

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Montane Riparian	N/A	Montane Riparian (MRI)	Temporarily Flooded Cold Season Deciduous Forests Temporarily Flooded Cold Season Deciduous Shrublands	N/A	Southwestern North American Riparian Evergreen and Deciduous Forest Group	Montane Riparian	Forest & Woodland	Montane Riparian
Red Willow Thickets	Red Willow Thickets (Salix laevigata Woodland Alliance)	Montane Riparian (MRI)	Mixed Willow Forests	N/A	N/A	N/A		Montane Riparian
Redwood	N/A	Redwood (RDW)	N/A	N/A	N/A	Redwood	Forest & Woodland	Pacific Northwest Conifer Forests
Sandbar Willow Thickets	Sandbar Willow Thickets (Salix exigua Shrubland Alliance)	Montane Riparian (MRI)	Narrowleaf Willow (Mulefat) thickets	N/A	N/A	N/A	Forest & Woodland	Montane Riparian

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Valley Foothill Riparian	N/A	Valley Foothill Riparian (VRI)	N/A	Willow – Mixed Riparian Shrubs Mapping Unit	Southwestern North American Riparian/Wash Scrub Shrubland Group	Valley Foothill Riparian	Forest & Woodland	
White Alder Groves	White Alder Groves (Alnus rhombifolia Forest Alliance)	Montane Riparian (MRI)	White Alder (Mixed Willow)	N/A	N/A	N/A	Forest & Woodland	Montane Riparian
Wetland								
Baltic and Mexican Rush Marshes	Baltic and Mexican Rush Marshes (Juncus arcticus [var. balticus, mexicanus] Herbaceous Alliance)	Wet Meadow (WTM)	Sedge – Rush – Wet Grasses – (Salt Grass) Meadow Mapping Unit	Wet Meadow Vegetation – Sedges Rushes Wet Meadow Grasses	Western North American Wet Meadow Low Shrub Carr Herbaceous Vegetation	Wet Meadow	Aquatic Vegetation	Wet Mountain Meadow
California Bulrush Marsh	California Bulrush Marsh (Schoenoplectus californicus Herbaceous Alliance)	Freshwater Emergent Wetland (FEW)	Undifferentiated Marsh (Cattail, Bulrush)	N/A	N/A	N/A	Aquatic Vegetation	Freshwater Marsh

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Cattail Marshes	Cattail marshes (Typha [angustifolia, domingensis, latifolia) Herbaceous Alliance	Freshwater Emergent Wetland (FEW)	N/A	Marsh Vegetation – Cattail – Bulrush – Spike rush	N/A	N/A	Aquatic Vegetation	Freshwater Marsh
Common and Giant Reed Marshes	Common and Giant Reed Marshes (Arundo donax Semi-Natural Herbaceous Stands)	Valley Foothill Riparian (modified) (VRI)	Giant Cane	N/A	N/A	N/A	Introduced & Semi Natural Vegetation	
Estuarine	N/A	Estuarine (EST)	N/A	N/A	N/A	Estuarine	Aquatic Vegetation	Brackish (Estuarine) Submerged Aquatic Vegetation
Fresh Emergent Wetland	N/A	Fresh Emergent Wetland (FEW)	N/A	N/A	N/A	Fresh Emergent Wetland	Aquatic Vegetation	Freshwater Marsh
Lacustrine	N/A	Lacustrine (LAC)	Small Ephemeral Ponds	Small Farm Ponds		Lacustrine	Open Water	Freshwater Aquatic Vegetation

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Marsh	N/A	N/A	N/A	N/A	N/A	Marsh	Aquatic Vegetation	
Mulefat Thickets	Mulefat Thickets (Baccharis salicifolia Shrubland Alliance)	Montane Riparian (MRI)	Sparse Mulefat – Floodplain Small Shrubs (Atriplex spp. – Scalebroom Annual Grasses & Forbs) Mixed Shrub Willow – Mulefat Thickets Mulefat Alliance	N/A	N/A	N/A	Shrub & Herb Vegetation	Montane Riparian
Perennial Pepper Weed Patches	Perennial Pepper Weed Patches (Lepidium latifolium Semi-Natural Herbaceous Stands)	Freshwater Emergent Wetland (FEW)	Lepidium latifolium	N/A	N/A	N/A	Introduced & Semi Natural Vegetation	Freshwater Marsh

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Pickleweed Mats	Pickleweed Mats (Sarcocornia pacifica [Salicornia depressa] Herbaceous Alliance)	Saline Emergent Wetland (SEW)	Pickleweed – Saltgrass – Jaumea – Alkali heath Mapping Unit	N/A	N/A	N/A	Aquatic Vegetation	Salt Marsh Salt Marsh Meadows
Riverine	N/A	Riverine (RIV)	Active River Channel River Flats	N/A	N/A	Riverine	Forest & Woodland	Freshwater Aquatic Vegetation
Saline Emergent Wetland	N/A	Saline Emergent Wetland (SEW)	Tidally Influenced Portions of the Salinas River	N/A	N/A	Saline Emergent Wetland	Aquatic Vegetation	Salt Marsh Salt Marsh Meadows
Water	N/A	Water (WAT)	Reservoirs Water	N/A	Water	N/A	Open Water	N/A
Wet Meadow	N/A	Wet Meadow (WTM)		Wet Meadow Vegetation – Sedges Rushes Wet Meadow Grasses	Western North American Wet Meadow and Low Shrub Carr Herbaceous Vegetation	Wet Meadow	Aquatic Vegetation	Wet Mountain Meadow

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Agriculture – Herbaceous								
Cropland	N/A	Cropland (CRP)	Row & Field Crops (Irrigated and Non-Irrigated)	N/A	N/A	Cropland	Agricultural & Developed Vegetation	N/A
Dryland Grain Crops	N/A	Dryland Grain Crops (DGR)	N/A	N/A	N/A	Dryland Grain Crops	Agricultural & Developed Vegetation	N/A
Irrigated Grain Crops	N/A	Irrigated Grain Crops (IGR)	N/A	N/A	N/A	Irrigated Grain Crops	Agricultural & Developed Vegetation	N/A
Irrigated Hayfield	N/A	Irrigated Hayfield (IRH)	N/A	N/A	N/A	Irrigated Hayfield	Agricultural & Developed Vegetation	N/A
Irrigated Row and Field Crops	N/A	Irrigated Row and Field Crops (IRF)	N/A	N/A	N/A	Irrigated Row and Field Crops	Agricultural & Developed Vegetation	N/A
Pasture	N/A	Pasture (PAS)	N/A	N/A	N/A	Pasture	Introduced & Semi Natural Vegetation	N/A

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Rice	N/A	Rice (RIC)	N/A	N/A	N/A	Rice	Agricultural & Developed Vegetation	N/A
Agriculture – Trees/Shrubs								
Deciduous Orchard	N/A	Deciduous Orchard (DOR)	N/A	N/A	N/A	Deciduous Orchard	Agricultural & Developed Vegetation	N/A
Evergreen Orchard	N/A	Evergreen Orchard (EOR)	N/A	N/A	N/A	Evergreen Orchard	Agricultural & Developed Vegetation	N/A
Orchard and Vineyards	N/A	Orchard and Vineyards (OVN)	Orchard – Vineyards	N/A	N/A	N/A	Agricultural & Developed Vegetation	N/A
Vineyard	N/A	Vineyard (VIN)	N/A	N/A	N/A	Vineyard	Agricultural & Developed Vegetation	N/A

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Other								
Barren	N/A	Barren (BAR)	Cliffs – Rock Outcrops Quarry Sparsely Vegetated or Unvegetated Areas	Sparsely Vegetated Rock Outcrop	Cliffs, Rock Outcrops, and Steep Eroded Slopes	Barren	Open Rock Vegetation	California Foothill and Coastal Rock Outcrop Vegetation Northwest Coast Cliff and Outcrop
Urban	N/A	Urban (URB)	Built-up / Urban Disturbance Land Use/ Unvegetated	Urban or Built Up	Built-Up Planted Trees and Shrubs	Urban	Developed & Other Human Use	N/A

Appendix B. Focal Species Pressures and Stressors

Monterey County Regional Conservation Investment Strategy

Focal Species Stressors and Pressures

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Acronyms and Abbreviations

ACE	Area of Conservation Emphasis
CCVA	climate change vulnerability assessment
CDFW	California Department of Fish and Wildlife
CRLF	California red-legged frog
CTS	California tiger salamander
DPS	distinct population segment
IPCC	Intergovernmental Panel on Climate Change
km/yr	kilometers per year
NOAA	National Oceanic and Atmospheric Administration
OCE	other conservation element
OPC	(California) Ocean Protection Council
ppm	parts per million
RCIS	Regional Conservation Investment Strategy
RCIS area	Monterey County Regional Conservation Investment Strategy area
RCP	representative concentration pathway
SCLTS	Santa Cruz long-toed salamander
SWAP	State Wildlife Action Plan
USFWS	U.S. Fish and Wildlife Service
USNVC	U.S. National Vegetation Classification

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1. EXECUTIVE SUMMARY

Section 1852(c)(5) of California Fish and Game Code, and Regional Conservation Investment Strategy (RCIS) Guidelines (CDFW 2018a) require that an RCIS include a summary of historic, current, and projected future stressors and pressures in the RCIS area, including climate change vulnerability, from the best available data. A stressor is defined as a degraded ecological condition that results from the negative impacts of pressures, which are drivers that could result in changing ecological conditions.

This document includes a summary of historic, current, and projected stressors and pressures on focal species and non-focal species, and other conservation elements identified as part of the RCIS evaluation. These include: airborne pollutants, climate change, water management, fire, development of housing and urban areas, livestock and agriculture, habitat fragmentation, non-native species, recreation and tourism, and renewable energy. Climate change already is affecting wildlife, plants, and habitats throughout California (CDFW 2015) and is the primary stressor assessed in this document due to the severity of its projected future stressors. The effects of climate change are described in further detail in the following subsections.

This summary is a result of the review of available State datasets and literature from California Department of Fish and Wildlife's (CDFW) climate website and other supporting documents. Summary data are presented in text and table format to provide the reader with a synthesis of stressors and pressures in the RCIS area. No new analyses were conducted as part of this assessment.

Identifying projected non-climate and climate stressors and pressures in the RCIS area prioritizes conservation strategies. Stressors and pressures identified in this RCIS report can be incorporated in developing future conservation strategies. Climate vulnerability is defined as the amount of evidence that climate change is projected to negatively affect a species, asset, or system (Gardali et al. 2012). Climate vulnerability often is expressed in terms of exposure, sensitivity, and adaptive capacity:

- Exposure – the nature and degree to which a species is exposured to climate change stressors
- Sensitivity – the degree to which the physical condition and functionality of a species is affected by climate change

- Adaptive Capacity – the ability of a species to evolve in response to, or cope with the impacts of climate change

Although exposure can be the greatest indicator of a species' susceptibility to climate change stressors, evaluating sensitivity and adaptative capacity provide valuable information on the degree to which a species would be affected or impaired and inherent characteristics that allow the species to respond or be modified. Species are most vulnerable if they are exposed to climate change stressors, have high sensitivity, and low adaptive capacity. The following sections describe the climate vulnerability of focal species and natural communities in the RCIS area. In addition, a high-level habitat resilience assessment was conducted, using the CDFW's Areas of Conservation Emphasis dataset (CDFW 2018b) to identify and prioritize areas for conservation.

1.1 Focal Species and Natural Communities Climate Vulnerability

To assess climate change vulnerability, a literature review of regional and taxon-specific climate change vulnerability assessments, regional adaptation plans, and species-specific background research was conducted. A climate change vulnerability assessment aids in determining which fish, wildlife, and plant species may be most vulnerable to climate change, and why (CDFW 2019). To determine the climate vulnerability of focal species and natural communities in the RCIS area, several climate change vulnerability assessment reports for California species were reviewed from CDFW's Climate Science Program (CDFW 2019). A species' or natural community's projected climate vulnerability can aid in identification and prioritization of conservation targets and strategies.

In general, climate change vulnerability assessments indicate that climate vulnerability of focal species and natural communities ranges from low to high (CDFW 2019). The following focal and non-focal species ranked as having moderate and above vulnerability in species-specific climate change vulnerability assessments and/or occupy natural communities that have a high combined vulnerability rank. The species most vulnerable to climate change in the RCIS area are listed in Table 1-1.

Table 1-1. Summary of Most Climatically Vulnerable Focal/Non-Focal Species

Focal/Non-Focal Species	Climate Change Vulnerability Rank
California tiger salamander	Moderate High
Santa Cruz long-toed salamander	High
Santa Lucia slender salamander	High
least Bell's vireo	High
yellow-billed magpie	High
western snowy plover	High
steelhead (South-Central California Coast Steelhead DPS)	Moderate High
tidewater goby	Moderate High
San Joaquin kit fox	Moderate
southern sea otter	Moderate
California brackish water snail	High
eelgrass	High
Yadon's rein orchid	High

Notes: Compiled by AECOM in 2020
Sources: Anacker and Leidholm 2012; Gardali et al. 2012; Hutto et al. 2015; Moyle et al. 2012; Stewart et al. 2016; Thorne et al. 2016; Wright et al. 2013

The following focal species are discussed below and represent some of the most widespread and/or vulnerable natural communities in the RCIS area:

- Amphibians: California red-legged frog and California tiger salamander
- Mammals: southern sea otter, mountain lion, and pallid bat
- Fish: steelhead (south-central California coast steelhead Distinct Population Segment)
- Birds: western snowy plover
- Invertebrates: Smith's blue butterfly
- Plants: Monterey spineflower and Yadon's rein orchid

Conservation strategies focusing on these important flagship species have the potential to affect many other focal and non-focal species that are vulnerable to the impacts of climate change. Though some focal species, such as California red-legged frog, have neutral projections of climate vulnerability (Wright et al. 2013), continued implementation of already successful conservation measures could positively impact a variety of more climate-vulnerable focal species. Focal species that already have high present-day vulnerabilities due to non-climate stressors, such as steelhead and Western snowy plover, are projected to be extremely vulnerable to climate change. Steelhead require high-quality riparian habitat with stable hydrology and can be used as indicators of for healthy riparian ecosystems

(NMFS 2013)., Western snowy plover require stable Coastal dune and beach systems and their presence can be used as an indicator of climate change-induced coastline retreat. Conservation strategies focusing on these important flagship species have the potential to affect many other focal and non-focal species that are vulnerable to the impacts of climate change.

1.2 High Climate Resiliency Locations in the RCIS Area

A high-level habitat resilience assessment of locations in the RCIS area was conducted using the Area of Conservation Emphasis (ACE) dataset (CDFW 2018b). These are areas where conditions are projected to remain suitable for the animal and plant species that currently reside there and are expected to be relatively buffered from the impacts of climate change. Areas with projected high climate reliance include Fort Ord National Monument, Los Padres National Forest, Fort Hunter Liggett, Northern Camp Roberts, Santa Lucia Range, Diablo Range, Gabilan Range, Coast Range, and Salinas Valley. These areas are likely to retain suitable habitat for plant and wildlife species and could be prioritized for protection and/or implementation of conservation strategies.

2. STRESSORS AND PRESSURES

2.1 Regional Stressors and Pressures

A stressor is a degraded ecological condition that results from the negative impacts of pressures, which are drivers that could result in changing ecological conditions (CDFW 2018a). Eleven categories and eight subcategories of regional stressors and pressures are identified in the State Wildlife Action Plan (CDFW 2015) for the CDFW-designated Central California Coast, Central California Coast Ranges, and Central California Central Coastal HUC 1806 ecoregions (these ecoregions do include areas outside the RCIS area). The State Wildlife Action Plan identifies which habitats these regional pressures impact. Species-specific U.S. Fish and Wildlife Service (USFWS) recovery plans helped identify which pressures impact focal and non-focal species. Descriptions of the Central California Coast, Central California Coast Ranges, and Central California Central Coastal HUC 1806 CDFW-designated stressor and pressure categories and sub-categories are shown in Table 2-1.

Table 2-1. Stressors and Pressures in the RCIS Area

Pressure	Stressor
Airborne pollutants	• Discharges from power plants, sewage plants, and vehicle emissions include pollutants, particulates, and pathogens which can negatively impact the environment. • Carbon dioxide and methane contribute to climate change. • Airborne pollutants impact amphibians that have porous skin.
Climate change	• Winters are projected to become warmer and wetter, and summers to become drier and hotter. • Impacts may include more winter flooding, increased rates of coastal erosion, increased sedimentation in wetland habitats, higher water demands, and an increase in salinity of freshwater sources from sea level rise.
Dams and water management/use	• Higher water demands, because of an increasing human population in the RCIS area, may lead altered freshwater hydrological and thermal regimes which can negatively impact aquatic species. • Dams can increase the establishment of some non-native species. • Desalination plant construction and operations can negatively impact marine ecosystems.

Pressure	Stressor
Fire and fire suppression	• Fire is part of the natural disturbance regime in many natural communities within the RCIS area (e.g., chaparral, Closed-cone pine-cypress). • Human-caused fires result in unnaturally high fire frequency, which has altered the natural fire regime. • Fire suppression along the urban–wildland interface causes unnatural succession in fire-adapted natural communities and increases wildfire intensity. • Fuel modification practices may lead to an increase of linear features where the vegetation structure has been modified, as well as an increase of non-native species.
Housing and urban areas + Commercial and industrial areas + Garbage and solid waste + Roads and railroads + Utility and service lines + Household sewage and urban wastewater + Industrial and military effluents	• Increasing human population is causing a high demand for land and water, resulting in the conversion of natural land into urban areas and leading to habitat loss/degradation. • Development associated with urban areas, including linear structures such as roads and utility lines, also restricts wildlife movement.
Livestock, farming, and ranching + Annual and perennial non-timber crops + Agriculture and forestry effluents	• Heavy use of pesticides can negatively impact wildlife, plants, water quality, etc. • Heavy water consumption from crops and wineries affects aquatic and riparian habitats. • Habitat loss and fragmentation occurs.
Habitat fragmentation	• Habitat fragmentation impacts plant and wildlife movement dispersal, predator–prey relationships, competitive interactions, nutrient cycling, and gene flow.
Non-native species and disease	• Non-native species outcompete native plants and can alter the structure and species composition of biological communities in ways that degrade habitat for native animals. • Non-native species may alter and/or inhibit ecosystems functions. • Species already stressed by other pressures are more susceptible to diseases that are introduced or increasing in prevalence.

Pressure	Stressor
Recreation and tourism	• Increased demand for human infrastructure can cause disturbance to ecosystems and fragmentation. • Increased human–wildlife interactions generate negative impacts.
Renewable energy	• Land conversion for renewable energy facilities leads to habitat loss and fragmentation. • Bird and bat collisions with wind turbines occur. • Solar energy facilities can lead to an increased potential for heat damage to wildlife, birds, and insects and negative impacts from operational noise and habitat fragmentation.
Wood and pulp plantations	• Can change sediment erosion-deposition regimes, runoff, and river flow, and can contribute to habitat fragmentation.
Source: CDFW 2015	

2.2 Species-Specific Stressors and Pressures

This section presents a summary of the stressors and pressures identified by the State Wildlife Action Plan (CDFW 2015) for the CDFW-designated Central California Coast, Central California Coast Ranges, and Central California Central Coastal HUC 1806 ecoregions and species-specific USFWS recovery plans. The following categories and subcategories of stressors and pressures apply to all focal/non-focal species and other conservation elements in RCIS area (CDFW 2015):

- Climate change
- Fire and fire supression
- Loss of habitat connectivity (habitat fragmentation)
- Non-native species and disease
- Housing and urban areas:
  - Commercial and industrial areas
  - Garbage and solid waste
  - Roads and railroads
  - Utility and service lines
- Livestock and farming
  - Annual and perennial non-timber crops

Stressor and pressure categories not listed above were identified by the State Wildlife Action Plan (CDFW 2015) as only affecting certain species and other conservation elements in the RCIS area. Species-specific stressors and pressures for focal species and focal other conservation elements are shown in Table 2-2 and non-focal species and non-focal other conservation elements are provided in Table 2-3.

Table 2-2. Focal Species and Other Conservation Element-Specific Stressors and Pressures

Species	Airborne Pollutants	Dams and Water Management / Use	Housing and Urban Areas Household Sewage and Urban Waste	Housing and Urban Areas Industrial and Military Effluents	Livestock, Farming, and Ranching Agriculture and Forestry Effluents	Recreation and Tourism	Renewable Energy	Wood and Pulp Plantations
burrowing owl (Athene cunicularia)	No	Yes [1]	No	No	Yes [2]	No	Yes	No
California brackish water snail (Tryonia imitator)	No	Yes	Yes	Yes	Yes	Yes	No	Yes
California condor (Gymnogyps californianus)	No	Yes	Yes	No	Yes	Yes [3]	Yes	No
California newt (Taricha torosa)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
California red-legged frog (Rana draytonii)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
California tiger salamander (Ambystoma californiense)	Yes	Yes	Yes	No	Yes	No	Yes	No
coast horned lizard (Phrynosoma blainvillii)	Yes	No	No	No	Yes [2]	Yes	Yes	No

Species	Airborne Pollutants	Dams and Water Management / Use	Housing and Urban Areas Household Sewage and Urban Waste	Housing and Urban Areas Industrial and Military Effluents	Livestock, Farming, and Ranching Agriculture and Forestry Effluents	Recreation and Tourism	Renewable Energy	Wood and Pulp Plantations
foothill yellow-legged frog (southwest/south coast clade) (Rana boylii)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
monarch butterfly (Danaus plexippus pop.1)	Yes	No	No	No	No	Yes	No	No
mountain lion (southern California/central coast ESU) (Puma concolor)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
pallid bat (Antrozous pallidus)	Yes	No	No	No	Yes [2]	Yes	Yes	No
San Joaquin kit fox (Vulpes macrotis mutica)	No	Yes	No	No	Yes [2]	No	Yes	No
Santa Cruz long-toed salamander (Ambystoma macrodactylum croceum)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Smith's blue butterfly (Euphilotes enoptes smithi)	Yes	No	No	No	Yes [2]	Yes	No	No

Species	Airborne Pollutants	Dams and Water Management / Use	Housing and Urban Areas Household Sewage and Urban Waste	Housing and Urban Areas Industrial and Military Effluents	Livestock, Farming, and Ranching Agriculture and Forestry Effluents	Recreation and Tourism	Renewable Energy	Wood and Pulp Plantations
southern sea otter (Enhydra lutris nereis)	No	Yes	Yes	Yes [3]	Yes	Yes	No	Yes
steelhead (south-central California coast steelhead Distinct Population Segment) (Oncorhynchus mykiss irideus)	No	Yes	Yes	Yes	Yes	Yes	No	Yes
tidewater goby (Eucyclogobius newberryi)	No	Yes	Yes	Yes	Yes	Yes	No	Yes
tricolored blackbird (Agelaius tricolor)	No	Yes	Yes	Yes	Yes	No	Yes	No
vernal pool fairy shrimp (Branchinecta lynchi)	No	Yes	Yes	No	Yes	Yes	Yes	No
western snowy plover (Charadrius nivosus nivosus)	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Carmel Valley bush mallow (Malacothamnus palmeri var. involucratus)	Yes	No	No	No	Yes [2]	Yes	No	No

Species	Airborne Pollutants	Dams and Water Management / Use	Housing and Urban Areas Household Sewage and Urban Waste	Housing and Urban Areas Industrial and Military Effluents	Livestock, Farming, and Ranching Agriculture and Forestry Effluents	Recreation and Tourism	Renewable Energy	Wood and Pulp Plantations
Lemmon's jewelflower (Caulanthus lemmonii)	No	No	No	No	No	No	Yes	No
Hickman's onion (Allium hickmanii)	Yes	No	No	No	Yes [2]	Yes	No	No
Monterey gilia (Gilia tenuiflora ssp. arenaria)	Yes	Yes [1]	No	No	No	Yes	No	No
Monterey spineflower (Chorizanthe pungens var. pungens)	Yes	Yes[1]	No	No	No	Yes	No	No
Pajaro manzanita (Arctostaphylos pajaroensis)	No	No	No	No	Yes [2]	Yes	No	No
seaside bird's-beak (Cordylanthus rigidus ssp. littoralis)	Yes	No	No	No	Yes [2]	Yes	No	No
Yadon's rein orchid (Piperia yadonii)	Yes	No	No	No	No	Yes	No	No
California sycamore woodlands (Platanus racemosa Alliance)	No	Yes	Yes	Yes	Yes	Yes	No	No
Monterey pine forest (Pinus muricata-Pinus radiata Alliance)	Yes	No	No	No	No	Yes	No	No

Species	Airborne Pollutants	Dams and Water Management / Use	Housing and Urban Areas Household Sewage and Urban Waste	Housing and Urban Areas Industrial and Military Effluents	Livestock, Farming, and Ranching Agriculture and Forestry Effluents	Recreation and Tourism	Renewable Energy	Wood and Pulp Plantations
Valley oak woodland (Quercus lobata Woodland Alliance)	No	Yes	Yes	Yes	Yes	Yes	No	No
Working lands	No	Yes	No	No	No	No	No	No
Dune Formation	No	No	No	No	No	Yes	No	No
Habitat Connectivity	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Compiled by AECOM 2020

Additional stressors and pressures from focal species' recovery plans that are not identified by the State Wildlife Action Plan (CDFW 2015):

- The Big Sur Land Trust identifies desalination plants to be a population threat.
- The Big Sur Land Trust identifies agriculture and forestry effluents to be a population threat due to habitat removal, cattle impacts, and soil damage.
- The California Condor Recovery Plan (USFWS 1996) identifies lead poisoning from recreational hunting to be a major population threat.
- The Final Revised Recovery Plan for southern sea otter (Enhydra lutris nereis) (USFWS 2003) identifies offshore oil facilities and oil spills to be a major population threat to this species.

Source: CDFW 2015, USFWS 1996, 2003

Table 2-3 Non-Focal Species and Other Conservation Element-Specific Stressors and Pressures

Species	Airborne Pollutants	Dams and Water Management / Use	Housing and Urban Areas Household Sewage and Urban Waste	Housing and Urban Areas Industrial and Military Effluents	Livestock, Farming, and Ranching Agriculture and Forestry Effluents	Recreation and Tourism	Renewable Energy	Wood and Pulp Plantations
American badger (Taxidea taxideus)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
least Bell's vireo (Vireo bellii pusillus)	No	Yes	Yes	No	Yes	Yes[1]	No	No
little willow flycatcher (Empidonax trailii brewsteri)	No	Yes	Yes	No	Yes	No	No	No
northern California legless lizard (Anniella pulchra)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Santa Lucia slender salamander (Batrachoseps luciae)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Townsend's big-eared bat (Corynorhinus townsendii)	Yes	No	No	No	No	Yes	Yes	No
two-striped garter snake (Thamnophis hammondii)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Species	Airborne Pollutants	Dams and Water Management / Use	Housing and Urban Areas Household Sewage and Urban Waste	Housing and Urban Areas Industrial and Military Effluents	Livestock, Farming, and Ranching Agriculture and Forestry Effluents	Recreation and Tourism	Renewable Energy	Wood and Pulp Plantations
western mastiff bat (Eumops perotis californicus)	Yes	No	No	No	No	Yes	Yes	No
western spadefoot (Spea hammondii)	Yes	Yes	Yes	No	Yes	Yes	Yes	No
yellow-billed magpie (Pica nuttallii)	No	Yes	Yes	Yes	Yes	No	No	No
Carmel Valley cliff aster (Malacothrix saxatilis var. arachnoidea)	Yes	No	No	No	No	No	Yes	No
Clare's Pogogyne (Pogogyne clareana)	No	Yes	Yes	No	Yes	Yes	No	No
Contra Costa goldfields (Lasthenia conjugens)	No	Yes	Yes	No	Yes	Yes	Yes	No
eelgrass (Zostera marina)	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Jolon clarkia (Clarkia jolonensis)	Yes	Yes	Yes	No	Yes	No	Yes	No
Little sur manzanita (Arctostaphylos edmundsii)	Yes	No	No	No	No	Yes	No	No

Species	Airborne Pollutants	Dams and Water Management / Use	Housing and Urban Areas Household Sewage and Urban Waste	Housing and Urban Areas Industrial and Military Effluents	Livestock, Farming, and Ranching Agriculture and Forestry Effluents	Recreation and Tourism	Renewable Energy	Wood and Pulp Plantations
Menzies' wallflower (Erysimum menziesii)	Yes	No	No	No	No	Yes	No	No
Monterey clover (Trifolium trichocalyx)	Yes	No	No	No	No	Yes	No	No
Monterey larkspur (Delphinium hutchinsoniae)	Yes	No	No	No	No	Yes	No	No
sandmat manzanita (Arctostaphylos pumila)	Yes	No	No	No	No	Yes	No	No
Coast live oak woodland (Quercus agrifolia Alliance)	No	Yes	Yes	Yes	Yes	Yes	No	No
Woolly-leaf manzanita shrubland (Arctostaphylos tomentosa Alliance)	Yes	No	No	No	No	Yes	No	No

Notes:

Additional stressors and pressures on non-focal species not identified by the State Wildlife Action Plan (CDFW 2015):

1. The Draft Recovery Plan for the Least Bell's Vireo (1998) describes recreational developments as being a major contributor to habitat loss.

Compiled by AECOM 2020.

Sources: CDFW 2015, 2016, USFWS 1998

3. CLIMATE CHANGE

Climate change already is affecting wildlife, plants, and habitats throughout California, and its effects are projected to continue to increase in severity (CDFW 2015). The projections of climate change in the RCIS area and vulnerability assessments of focal/non-focal species and other conservation elements presented in this chapter will help prioritize future conservation targets and actions. Species' vulnerability assessment results are grouped by taxon or natural community.

3.1 Projections of Climate Change

This section reviews the best-available climate science for the RCIS area—including changes in temperature, precipitation, and sea level rise. It also discusses the physical impacts of these changes in the climate, including wildfires, flooding, coastal erosion, landslides, and drought.

3.1.1 Modeling Climate Change

To project future climate conditions, scientists rely on numerical models, known as general circulation models. These models incorporate the inter-related physical processes of the atmosphere, ocean, and land surface to simulate the response of climate systems to changing greenhouse gas and sulfate aerosol emissions. These models are based on well-established physical principles and have been demonstrated to reproduce observed changes of recent and past climates. Because the level of future emissions will be affected by population, economic development, environmental changes, technology, and policy decisions, the Intergovernmental Panel on Climate Change (IPCC) has developed a range of possible future emission scenarios, based on a combination of these driving factors.

For the most recent IPCC report, the Fifth Assessment Report (AR5), the IPCC updated its scenarios—now called representative concentration pathways (RCPs)—to reflect advances in modeling approaches and additional factors that could affect future climate conditions (IPCC 2013). For climate adaptation planning, RCP4.5 and RCP8.5 are the most commonly used scenarios. The higher of the two (RCP8.5) also is referred to as a business-as-usual scenario and represents rapid economic growth, with greenhouse gas concentrations exceeding 900 parts per million (ppm) by 2100. RCP4.5 represents a more moderate scenario, with greenhouse gas emissions rising until 2040 and reaching a concentration of 550ppm, followed by stabilization.

The different RCP scenarios are incorporated into the numeric general circulation models, creating combinations of selected future conditions that can be used as input for researchers to assess the influence of the variables on the projected climate. General circulation models provide estimates of climate change on a global level because the resolution typically is too coarse for detailed regional climate projections. Therefore, the models often are "downscaled" to allow more place-based projections on the local level. Using general circulation model results for input, downscaled models generate locally relevant data by connecting global-scale projections and regional dynamics.

3.1.2 State Climate Change Guidance and Resources

California has developed a series of guidance documents and studies, to enhance the understanding of climate change impacts on a regional scale and directly inform vulnerability assessments and adaptation strategies. Table 3-1 summarize State resources that are leveraged for assessment of climate stressors in the RCIS area. Table 3-2 summarizes projected changes in temperature, precipitation and sea level rise based on low and high emission conditions.

Table 3-1. State of California Climate Change Guidance and Resources

Study (Author/Date)	Summary
California's Fourth Climate Change Assessment–Central Coast Region Report (Langridge 2018)	• The assessment is composed academic and technical reports, discussing climate change projections for a suite of climate stressors, including temperature, sea levels, snowpack, annual precipitation, precipitation intensity, frequency of drought, frequency and intensity of Santa Ana winds, marine layer clouds, and wildfire. • Potential impacts also are described for a variety of sectors (e.g., land use and development, biodiversity and ecosystems, forest health, transportation, and public health). • The Central Coast Regional Report, which includes Monterey County, emphasizes potential effects on natural ecosystems, agriculture, and coastal and farm communities, and it lists potential adaptations for each sector.

Study (Author/Date)	Summary
Ocean Protection Council Sea Level Rise Guidance Update (California Ocean Protection Council 2018)	• Compiles, reviews, and summarizes the latest research on sea level rise • Presents the latest peer-reviewed projections of sea level rise, describes an extreme scenario for sea level rise caused by rapid ice sheet loss from the West Antarctica ice sheet, and presents scenario selections using risk-based (probabilistic) planning capabilities, and • Pays out preferred approaches to planning for vulnerable assets, natural habitats, and public access.
Cal-Adapt (Cal-Adapt 2017)	• To satisfy a key recommendation of the 2009 California Climate Adaptation Strategy, Cal-Adapt was developed to provide an interactive geospatial tool for localized climate projections in California. • The tool allows users to explore projected changes in temperature, extreme heat, precipitation, snowpack, wildfire, and sea level rise across the state, based on a variety of climate models and future emission scenarios. • The updated version of the tool, Cal-Adapt 2.0, also includes high-resolution, local climate projections, using downscaling methods and emission scenarios that align with the Intergovernmental Panel on Climate Change's Fifth Assessment Report.

3.1.3 Sea Level Rise Projections

Since installation of the Monterey tide station in 1973, sea levels have increased at a rate of 0.06 inch per year, which equates to 0.52 foot in 100 years (NOAA 2018). Numerous studies indicate a global acceleration of local sea level rise during the turn of the twenty-first century, with rates tripling earlier observations. Based on the latest climate science, Monterey County sea levels are likely to rise between 0.5 and 1.1 feet by mid-century, and between 0.9 and 3.3 feet by end of the century. The California Ocean Protection Council (OPC) recommends using the upper limit of the likely range for projects with a high tolerance to flooding (e.g., parks or natural areas) (California OPC 2018).

Because uncertainty exists regarding future greenhouse gas emissions, sea level rise projections with lower probabilities of occurring also have been considered. In the RCIS area, a 0.5 percent probability exists that sea level rise will reach or exceed 1.9 feet by mid-century and 6.9 feet by the end of the century (California OPC 2018). OPC recommends using these projections when planning for assets with lower tolerances to flooding, such as major transportation corridors (California OPC 2018). Table 3-2 summarizes projected sea level rise ranges, based on low and high emission conditions.

3.1.4 Temperature Projections

Temperatures are expected to increase significantly for the RCIS area over the next century. Based on the RCP8.5 scenario, annual average temperatures are expected to increase by 4.9°F by mid-century and 7.5°F by end-of-century relative to historical period observations (1976–2005) (Table 3-2). Changes in the number of extreme heat days, defined as days with temperatures above the 98th percentile of observed daily maximum temperatures, are projected to increase by 15 days by mid-century and 30 days by end-of-century (Langridge 2018).

3.1.5 Precipitation Projections

Projections of future precipitation are associated with considerable uncertainty. Precipitation is one of the least certain aspects of climate models at the regional level, because the models do not resolve many of the fine-scale and complex interactions that occur locally. In general, a projected increase of year-to-year variability exists along the Central Coast, with fewer days of precipitation but an increase in the amount of precipitation occurring during wet days. The largest changes are expected to occur in coastal areas, where the amount of precipitation recorded in a single day may increase by up to 30 percent in Monterey County by the end of the century. The average annual precipitation, based on the RCP8.5 scenario, shows an increase of 2.1 inches by mid-century and 5.1 inches by end-of-century, when compared to historical conditions (1976–2005) (Langridge 2018) (Table 3-2).

3.1.6 Projection Summary

In general, sea levels are projected to rise at an accelerated rate through the next century. Similarly, maximum temperatures are projected to continue to increase, with greater increases experienced in inland areas. Average precipitation also is expected to increase by a relatively small amount, but annual variability in total inches is expected to increase substantially by the end of the century, with less total precipitation overall but an increase in the amount of precipitation during storm events.

Table 3-2. Summary of Climate Stressors

	Historical (1961–1990)	Low Emissions Mid-Century (2040–2069)	Low Emissions End-of-Century (2070–2099)	High Emissions Mid-Century (2040–2069)	High Emissions End-of-Century (2070–2099)
Sea Level Rise	N/A	N/A	2.3–5.5 feet	1.1–1.9 feet	3.3–6.9 feet
Temperature (annual average)	70°F	73.7°F	74.9°F	74.9°F	77.5°F
Temperature (# of extreme heat days)	4.3	14	19	19	34
Precipitation (annual average)	19.3 inches	21.1inches	21.2 inches	21.4 inches	24.4 inches

Notes:

1. For low emissions, all climate stressors are based on RCP4.5, except sea level rise, which is based on RCP2.6.
2. For high emissions, all climate stressors are based on RCP8.5.
3. Only sea level rise projections, based on RCP8.5, are provided in the Guidance prior to 2060, because emissions currently are on the RCP8.5 trajectory.

Compiled by AECOM 2020

Sources: Langridge 2018, NOAA 2018

3.2 Analysis Methodology

To assess climate change vulnerability, a literature review was conducted of regional and species-specific climate change vulnerability assessments, species-specific research, and regional adaptation plans. A high-level habitat resilience assessment was conducted using the ACE dataset (CDFW 2018b).

3.2.1 Literature Review

Regional Climate Change Vulnerability Assessments and Adaptation Plans

Monterey County and several of its communities have completed a suite of studies, to evaluate vulnerability and potential adaptation strategies in preparation for climate change impacts (Table 3-3). The studies range from reports to understanding potential climate impacts on public health, and to city-specific climate change adaptation plans, to protect built and natural public infrastructure.

Table 3-3. Previous and Ongoing Climate Change Vulnerability Assessments and Adaptation Plans for Monterey County/Monterey Cities

Study/Lead Agency (Date)	Summary
City of Monterey Transportation Adaptation Plan Monterey–Salinas Transit, Transportation Agency for Monterey County, Association of Monterey Bay Area Governments (2018)	• Identifies transportation infrastructure vulnerable to climate change and develops adaptation strategies to preserve the transportation network by building on the findings of the City's Sea Level Rise and Vulnerability Analyses, Existing Conditions, and Issues Report. • Focuses on benefits to regional disadvantaged communities, local businesses, homes, and schools relying on the network.
City of Monterey Sea Level Rise and Vulnerability Analyses, Existing Conditions and Issues Report City of Monterey (2016)	• Examines existing conditions and climate stressor projections for sea level rise, temperature, precipitation, and wildfire in a series of planning horizons through 2100. • Evaluates coastal flood hazards based on wave flooding, barrier beach flooding, tidal inundation, and short and long-term erosion.
Monterey County Multi-Jurisdictional Hazard Mitigation Plan The Monterey County Hazard Mitigation Planning Team (2015)	• Serves as a guide for State and local efforts to reduce disaster losses of life, property, and infrastructure, including transportation assets. • Identifies trends and vulnerabilities associated with county-wide hazards, including sea level rise flooding, precipitation flooding, wildfires, landslides, and coastal erosion. • Offers county-wide and jurisdiction-specific recommendations to reduce future risks.
City of Pacific Grove Climate Change Vulnerability Assessment City of Pacific Grove (2015)	• Discusses potential climate change impacts, including temperatures, sea level rise, ocean acidification, extreme storms, and wildfires. • Evaluates the adaptive capacity of existing city assets. • Provides recommendations to assist the City in addressing identified climate change impacts.
Monterey Bay Sea Level Rise Vulnerability Assessment The Monterey Bay Sanctuary Foundation (2014)	• Presents the methods used to map erosion and coastal flood hazards, based future climate scenarios for the Monterey Bay coastline. • Presents the results at the planning horizons of 2030, 2060, and 2100. • Creates hazard zones for the 100-year tide, wave run-up, overtopping, and seasonally closed lagoons.

Species-Specific and Natural Community Climate Change Vulnerability Assessments Methodologies

Table 3-4 shows the climate change vulnerability assessments that were reviewed for each focal/non-focal species assessed in the RCIS area. Climate change assessments that have been developed or supported by State and federal agencies for all taxa except invertebrates, which do not have a species-specific climate change vulnerability assessment in California (CDFW 2019) and the State Wildlife Action Plan (CDFW 2015) were reviewed. Additional data reviewed included climate change assessments developed by non-governmental agencies, along with species-specific background information for focal/non-focal species and natural communities. Table 3-4 summarizes the climate change vulnerability assessments and methodologies that were reviewed for focal/non-focal species.

The specific variables for exposure and sensitivity used to model responses to climate stressors differ depending on the taxa, which makes directly comparing vulnerability between taxa challenging. Each assessment uses different, specific ranking systems but present a vulnerability ranking for each species or community to climate change. Some of the reviewed assessments use the following additional modeled variables:

- Species' distribution models: measures of habitat suitability or probability of occurrence for each taxon;
- Adaptive capacity: the ability of a species, asset, or system to evolve in response to, or cope with the impacts of climate change; and
- Representative concentration pathways (RCPs): a range of possible future emssion scenarios based of population, economic development, environmental changes, technology, and policy decisions.

Climate change vulnerability assessments require a large amount of species-specific information, and the vulnerability to climate change of many focal and non-focal species have not been assessed directly in the reviewed literature. In these cases, the vulnerability of the natural communities with which the focal/non-focal species are associated are used to assess the species current and future vulnerability to climate stressors.

Table 3-4. Climate Change Vulnerability Assessments for Focal/Non-Focal Species

Study (Author/Date)	Summary and/or Methodology
A Climate Change Vulnerability Assessment for Twenty California Mammal Taxa (Stewart et al. 2016)	• Considers the ratio of climatic exposure to climatic niche breath; • Includes adaptive capacity metrics; • Considers expert-assessed qualitative vulnerability categories for 2070–2099. • Used IPCC 5th Assessment Report Representative Concentration Pathways (RCPs) and two general circulation models: Warm and Wet, and Hot and Dry. • Species distribution models used occurrence locations and seven climatic and hydrological variables to project future climatic suitability at present-day occurrence locations. • Twenty-seven climate change vulnerability criteria were evaluated using information on the species' natural history, habitat requirements, physiology, and interactions with other species. • Overall Climate Change Vulnerability is the weighted mean of each taxon's modeled geographic response, exposure/niche breadth, and qualitative vulnerability scores.
A Climate Change Vulnerability Assessment of California's At-Risk Birds (Gardali et al. 2012)	• Develops a new framework for assessing climate change vulnerability of California's at-risk birds for 2070 and models some species' future distribution. • Used IPCC 4th Assessment Report Representative Concentration Pathways (RCPs). • Integrates the results into the existing California Bird Species of Concern list. • Sensitivity factors include habitat specialization, physiological tolerance, migratory status, dispersal ability. • Exposure factors include changes in habitat suitability, changes in food availability, changes in extreme weather.

Study (Author/Date)	Summary and/or Methodology
A Climate Change Vulnerability Assessment of California's Terrestrial Vegetation (Thorne et al. 2016)	• Determines climate change vulnerability of vegetation communities by mapping spatial patterns and examines how climate conditions are projected to change at those locations in 2070–2099. • Used IPCC 5th Assessment Report Representative Concentration Pathways (RCPs). • Identifies the biological traits of the dominant plant species and explains that different types have different levels of sensitivity and adaptive capacity to climate change. • Sensitivity traits include: sensitivity to temperature, precipitation, and fire, germination agents, mode(s) of dispersal, and reproductive lifespan. • Adaptive capacity traits include: adaptive capacity to fire, mode and level of recruitment, and seed longevity. • Climate Exposure: assessed how each the area each community occupies is expected to change under various climate projections. Variables included: annual mean minimum/maximum temperature, annual precipitation, actual/potential evapotranspiration, climatic water deficit, snowpack depth on April 1st, runoff, and recharge. • Spatial Disruption Rank: modeled expected shifts in area currently occupied by each community. Variables included: mean annual actual evapotranspiration, mean annual snowpack, mean annual runoff, mean annual minimum/maximum temperature, and mean annual precipitation. • Mean Combined Vulnerability Rank: measures of sensitivity, exposure, and spatial disruption were combined into an index of vulnerability for comparison of macrogroups.

Study (Author/Date)	Summary and/or Methodology
California Amphibian and Reptile Species of Future Concern: Conservation and Climate Change (Wright et al. 2013)	• Builds ecological niche models for all amphibian and reptile species in California and forecasts the distribution of suitable habitat under four future climate scenarios and eleven general circulation models for 2050. • Uses two measures of climate change vulnerability: Point Ranking captures future habitat loss by calculating how many currently occupied 1x1 km cells remain suitable (based on lowest presence threshold) in 2050, and Area Ranking models future (2050) change in range of population size using minimum convex polygons encompassing current localities.
Carpe Noctem: The Importance of Bats as Bioindicators (Jones et al. 2009)	• Identifies bats as having a big potential to act as bioindicators for climate change and habitat loss worldwide. • Discusses several climate factors, such as drought and increasing temperatures, and their effects on bats.
Climate Change Vulnerability Assessment for the North-Central California Coast and Ocean (Hutto et al. 2015)	• Identifies focal marine and coastal resources that were assessed by federal and State agencies, non-governmental organizations, and academic institutions. • Used IPCC 4th Assessment Report Representative Concentration Pathways (RCPs). • Exposure and Sensitivity variables used: climate and climate driven factors, future climate exposure, life history, dependencies (generalist/specialist), and non-climate stressors. • Adaptive Capacity variables used : extent, status, and dispersal ability, intraspecific/life history diversity, and management potential.
Climate Change Vulnerability Assessment for Pacific Salmon and Steelhead in the California Current Large Marine Ecosystem (Crozier et al. 2019)	• Includes four components to assess climate vulnerability: exposure, sensitivity, probability of directional shift, and net direction of climate effects. • Uses exposure and sensitivity attributes of each life history stage to calculate total vulnerability. • Range shift and net climate effect provides supplemental information. • Adaptive capacity is incorporated into the sensitivity component.

Study (Author/Date)	Summary and/or Methodology
Climate Change Vulnerability Assessment of Rare Plants in California (Anacker and Leidholm 2012)	• Uses the Nature Serve Climate Change Vulnerability Index to determine the most at-risk of California's rare plant species for 2050. • Presents predicted species' distribution maps.
Dispersal will Limit Ability of Mammals to Track Climate Change in the Western Hemisphere (Schloss et al. 2012)	• Models velocities at which species will need to move to keep pace with projected changes in suitable climates and compares them to dispersal velocities of mammal species.
Projected Effects of Climate Change in California: Ecoregional Summaries Emphasizing Consequences for Wildlife (PRBO Conservation Science 2011)	• Assembles available literature relative to the twelve ecoregions in California. • Fill data gaps with regional climate models to synthesize information about climate change as related to wildlife habitat.
Projected Effects of Future Climates on Freshwater Fishes of California (Moyle et al. 2012)	• Presents methodology that allows a systematic evaluation of climate change impacts on freshwater fishes in California and models species distribution. • Baseline Vulnerability: current population size (last 10 years), current/long-term population trends, current/long-term range trends, current/future vulnerability to non-climate stressors, life span and reproductive plasticity, vulnerability to stochastic events, current dependence on human intervention. • Climate Change Vulnerability: physiological/behavioral tolerances to temperature increase and precipitation changes, vulnerability to change in frequency of degree of extreme weather events, dispersive capability, habitat specialization, likely future habitat changes, ability to shift at same rate as habitat, availability of habitat within new range, dependence on exogenous factors, vulnerability to non-native species. • Combined Vulnerability Ranking: combination of baseline and climate change vulnerabilities, indicates overall likelihood of each species persistence in 2100. • Uses expert opinion and literature review to score both the status of each species and projected impact of climate change for 2100.

Study (Author/Date)	Summary and/or Methodology
Survival by Degrees: 389 Bird Species on the Brink (Wiley et al. 2019)	• Assesses climate change vulnerability of 604 avian species across Canada, the United States, and Mexico as a function of a species' climate change exposure, sensitivity, and adaptive capacity. • Produces climate change vulnerability scores for both breeding and winter ranging using a combination of species distribution models and trait-based information. • Uses15 general circulation models and two IPCC 5th Assessment Report Representative Concentration Pathways (RCP4.5 and RCP8.5) for two future time periods (2050s and 2080s)
State Wildlife Action Plan 2015 Province-Specific Conservation Strategies—Bay Delta and Central Coast (CDFW 2015)	• Identifies specific stressors and pressures, including climate change, in the Bay–Delta and Central Coast regions
Terrestrial Climate Change Resilience–Area of Conservation Emphasis (ACE) dataset (CDFW 2018b)	• Summarizes information on areas in California that are expected to be buffered from the impacts of climate change. • Uses modeled exposure of natural habitats (vegetation) to climate change.
The Impact and Implications of Climate Change for Bats (Sherwin et al. 2013)	• Identifies observed impacts of climate change on bats and identified risk factors allowing species-specific predictions.
Twenty-Five Years of Monitoring a Townsend's Big-Eared Bat (Corynorhinus townsendii) Maternity Roost (Fellers and Halstead 2015)	• Describes the results of a 25-year monitoring project of a Townsend's big-eared bat maternity roost in central California and documents how the species has reacted to different effects of climate change.

3.2.2 Ecological Climate Resilience Assessment

The RCIS guidelines require identification of areas that may be resilient to the impacts of climate change (CDFW 2018a) A high-level habitat resilience assessment for the RCIS area was conducted using the ACE dataset (CDFW 2018b). This dataset is a suite of conservation information and includes assessments of climate resilience, species biodiversity, significant terrestrial and aquatic habitats, and habitat connectivity (CDFW 2018b). It includes summaries of the following:

- Climate Resilience: This summary uses the climate change vulnerability assessment of terrestrial vegetation communities conducted by Thorne et al. (2016). A location's projected future climate exposure is used to assess the probability that the natural vegetation communities and ecological functions will remain intact and function as climate refugia at mid-century and end-of-century. Areas mapped as urban, agriculture, or open water were not included.
- Species Biodiversity: This summary is based on species' occurrence and distribution information for amphibians, aquatic macroinvertebrates, birds, fish, mammals, plants, and reptiles. It combines information from the Terrestrial Biodiversity Summary and the Aquatic Biodiversity Summary. These summaries combine three measures of biodiversity: native species richness, rare species richness, and a weighted measure of endemism (the ecological state of a species being unique to a defined geographic location).
- Significant Habitats: The terrestrial significant habitat and aquatic significant habitat summaries provide information to help determine significant habitat areas that are essential to the survival of specific species of conservation concern. Information on vegetation, land cover, and species-specific habitat information is used in these determinations.
- Habitat Connectivity: This summary uses mapped corridors or linkages, distance from large, contiguous, natural areas, and a relative intactness score for terrestrial habitats. An aquatic equivalent dataset has not been developed yet.

Scores for all datasets range from 1 (low) to 5 (high). RCIS area locations were assessed first for high climate resilience. Locations with lower resiliency rankings (1-2) are projected to experience higher future climate exposure and may not remain suitable habitat for present-day species, with ecological functions diminished or eliminated. Higher resiliency rankings (4-5) are given to areas projected to experience lower future climate exposure and may remain suitable habitat for present-day species, with ecological functions continuing as usual.

RCIS area locations were also assessed for a combination of high scores for climate resilience, species biodiversity, significant habitats, and habitat connectivity.

3.3 Results

3.3.1 Focal/Non-Focal Species and Natural Communities Results

The results of the climate change vulnerability assessments and species-specific background studies for focal and non-focal amphibians and reptiles, mammals, fish, vernal pool species, and plants are described next. Where the assessments include results from different emission scenarios, those from RCP4.5 and RCP8.5 are presented because these are the commonly used emission scenarios for climate adaptation planning. Tables are used to summarize the data where applicable. Table 3-5 through Table 3-6 summarizes the climate change vulnerability assessments for all focal/non-focal species and other conservation elements, and the vegetation communities they occur in in the RCIS area. Assessment results are not always directly comparable due to the differences in study design and variables measured, but generally measure Low, Moderate, and High climate change vulnerability.

Table 3-5. Natural Communities Climate Change Vulnerability Assessments Under a Low Emission (RCP4.5) Scenario

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Grassland							
Annual grassland	• burrowing owl • California red-legged frog • California tiger salamander • San Joaquin kit fox • tricolored blackbird • Lemmon's jewelflower	• None	California Grassland and Flower Fields	Mid-High	Moderate	Low	Mid-High
			Western Upland Grasslands	Mid-High	Mid-High	Moderate	Mid-High
Perennial grassland	• Smith's blue butterfly • Lemmon's jewelflower	• Monterey larkspur	North Coast Deciduous Scrub and Terrace Prairie	Moderate	Low	Low	Moderate
			California Grassland and Flower Fields	Mid-High	Moderate	Low	Mid-High
			Western Upland Grasslands	Mid-High	Mid-High	Moderate	Mid-High

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Shrub – Dominated							
Coastal dune[1]	• coast horned lizard • Smith's blue butterfly • western snowy plover • Monterey gilia • Monterey spineflower • seaside bird's-beak • dune formation	• nothern California legless lizard • Menzies' wallflower • Monterey larkspur	California Foothill and Coastal Rock Outcrop	Mid-High	Low	Moderate	Moderate to Mid-High
Coastal scrub[2]	• burrowing owl • California condor • California newt • coast horned lizard • Smith's blue butterfly • Western snowy plover • Carmel Valley bush mallow • Monterey gilia • Monterey spineflower	• American bader • Santa Lucia slender salamander • Jolon clarkia • Little Sur manzanita • Monterey larkspur • Sandmat manzanita	Coastal Sage Scrub	Mid-High	Low	Moderate	Moderate to Mid-High
			North Coast Deciduous Scrub and Terrace Prairie	Moderate	Low	Low	Moderate
			Chaparral	Moderate	Low	Low	Moderate

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Mixed chaparral[2]	• California tiger salamander • coast horned lizard • Smith's blue butterfly • Hickman's onion • Monterey gilia • Montery spineflower • Pajaro manzanita • Seaside bird's-beak • Yadon's rein orchid	• Northern California legless lizard • Jolon clarkia • Little Sur manzanita • Monterey larkspur • Sandmat manzanita • Woolly-leaf manzanita shrubland	North Coast Deciduous Scrub and Terrace Prairie	Moderate	Low	Low	Moderate
			Coastal Sage Scrub	Mid-High	Low	Moderate	Moderate to Mid-High
Tree – Deciduous							
Blue oak woodland[3]	• California newt • San Joaquin kit fox	• yellow-billed magpie	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Moderate	Moderate
Closed-cone pine-cypress	• California condor • monarch butterfly • Hickman's onion • Yadon's rein orchid • Monterey pine forest	• Monterey clover	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Moderate	Moderate

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Montane hardwood[3]	• California condor • coast horned lizard • monarch butterfly	• American badger • northern California legless lizard • Jolon clarkia • woolly-leaf manzanita shrubland	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Moderate	Moderate
			North Coastal Mixed Evergreen and Montane Conifer Forests	Mid-High	Low	Moderate	Moderate to Mid-High
Valley oak woodland	• burrowing owl • California red-legged frog • California tiger salamander • San Joaquin kit fox • valley oak woodland alliance • working lands	• yellow-billed magpie	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Moderate	Moderate
Evergreen							

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Coastal oak woodland	• California newt • California red-legged frog • Yadon's rein orchid • working lands	• Santa Lucia slender salamander • coastal oak woodland alliance	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Moderate	Moderate
Foothill Pine Woodland	• California sycamore woodlands	• None	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Moderate	Moderate
Wetland							
Freshwater emergent wetland	• California newt • California red-legged frog • California red-legged frog • Santa Cruz long-toed salamander • tricolored blackbird • California sycamore woodlands	• two-stiped garter snake • western spadefoot	Freshwater Marsh	Moderate	High	High	High

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Riparian	• foothill yellow-legged frog • steelhead • California sycamore woodlands	• least Bell's vireo • northern California legless lizard • western spadefoot • Clare's pogogyne • Jolon clarkia	American Southwest Riparian Forest and Woodland[12]	Moderate	Moderate	Moderate	Moderate
Saline emergent wetland	• California brackish water snail • tidewater goby	• eelgrass	Salt Marsh Meadows	Moderate	High	High	High
Wet meadow	• Hickman's onion	• None	Wet Mountain Meadow	High	Mid-High	Mid-High	Mid-High
Other							
Rocky outcroppings	• California condor	• Clare's pogogyne	California Foothill and Coastal Rock Outcrop Vegetation	Mid-High	Low	Moderate	Moderate to Mid-High

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank

Notes:

Compiled by AECOM 2020.

1. Analysis conducted by Hutto et al. (2015) addressed sensitivity, exposure, and adaptive capacity for "Beaches and Dune" habitats, resulting in a final ranked vulnerability (weighted score) of Moderate-High.
2. PRBO Conservation Science (2011) projected a decrease in area (19 to 43 percent) of the chaparral/Coastal scrub vegetation group by 2070–2099 in central western California.
3. PRBO Conservation Science (2011) projected a decrease in area (44 to 55 percent) of blue oak woodland/foothill pine woodland vegetation group by 2070–2099 in central western California.

Source: Thorne et al. 2016

Table 3-6. Natural Communities Climate Change Vulnerability Assessments Under a High Emission (RCP8.5) Scenario

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-Focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Grassland							
Annual grassland	• burrowing owl • California red-legged frog • California tiger salamander • San Joaquin kit fox • tricolored blackbird • Lemmon's jewelflower	• None	California Grassland and Flower Fields	Mid-High	Moderate	Mid-High	Mid-High
			Western Upland Grasslands	Mid-High	Mid-High	Mid-High	Mid-High
Perennial grassland	• Smith's blue butterfly • Lemmon's jewelflower	• Monterey larkspur	North Coast Deciduous Scrub and Terrace Prairie	Moderate	Moderate	Mid-High	Moderate (Warm and Wet) to Mid-High (Warm and Wet)
			California Grassland and Flower Fields	Mid-High	Moderate	Mid-High	Mid-High
			Western Upland Grasslands	Mid-High	Mid-High	Mid-High	Mid-High

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-Focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Shrub – Dominated							
Coastal dune[1]	• coast horned lizard • Smith's blue butterfly • western snowy plover • Monterey gilia • Monterey spineflower • seaside bird's-beak • dune formation	• nothern California legless lizard • Menzies' wallflower • Monterey larkspur	California Foothill and Coastal Rock Outcrop	Mid-High	Moderate	Mid-High	Mid-High
Coastal scrub[2]	• burrowing owl • California condor • California newt • coast horned lizard • Smith's blue butterfly • Western snowy plover • Carmel Valley bush mallow • Monterey gilia • Monterey spineflower	• American badger • Santa Lucia slender salamander • Jolon clarkia • Little Sur manzanita • Monterey larkspur • Sandmat manzanita	Coastal Sage Scrub	Mid-High	Moderate	Moderate	Mid-High
			North Coast Deciduous Scrub and Terrace Prairie	Moderate	Moderate	Mid-High	Moderate
			Chaparral	Moderate	Low	Moderate	Moderate

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-Focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Mixed chaparral[2]	• California tiger salamander • coast horned lizard • Smith's blue butterfly • Hickman's onion • Monterey gilia • Montery spineflower • Pajaro manzanita • Seaside bird's-beak • Yadon's rein orchid	• Nothern California legless lizard • Jolon clarkia • Little Sur manzanita • Monterey larkspur • Sandmat manzanita • Woolly-leaf manzanita shrubland	North Coast Deciduous Scrub and Terrace Prairie	Moderate	Moderate	Mid-High	Moderate
			Coastal Sage Scrub	Mid-High	Moderate	Moderate	Mid-High
Tree – Deciduous							
Blue Oak Woodland[3]	• California newt • San Joaquin kit fox	• yellow-billed magpie	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Mid-High	Moderate
Closed-cone pine-cypress	• California condor • monarch butterfly • Hickman's onion • Yadon's rein orchid • Monterey pine forest	• Monterey clover	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Mid-High	Moderate

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-Focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Montane hardwood[3]	• California condor • coast horned lizard • monarch butterfly	• American badger • northern California legless lizard • Jolon clarkia • woolly-leaf manzanita shrubland	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Mid-High	Moderate
			North Coastal Mixed Evergreen and Montane Conifer Forests	Mid-High	Low	Mid-High	Moderate (Warm and Wet) to Mid-High (Hot and Dry)
Valley oak woodland	• burrowing owl • California red-legged frog • California tiger salamander • San Joaquin kit fox • valley oak woodland alliance • working lands	• yellow-billed magpie	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Mid-High	Moderate

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-Focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Tree – Evergreen							
Coastal oak woodland	• California newt • California red-legged frog • Yadon's rein orchid • working lands	• Santa Lucia slender salamander • coastal oak woodland alliance	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Mid-High	Moderate
Foothill Pine Woodland	• California sycamore woodlands	• None	California Foothill and Valley Forests and Woodlands	Moderate	Moderate	Mid-High	Moderate
Wetland							
Freshwater emergent wetland	• California newt • California red-legged frog • California red-legged frog • Santa Cruz long-toed salamander • tricolored blackbird • California sycamore woodlands	• two-stiped garter snake • western spadefoot	Freshwater Marsh	Moderate	High	High	High

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-Focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank
Riparian	• foothill yellow-legged frog • steelhead • California sycamore woodlands	• least Bell's vireo • northern California legless lizard • western spadefoot • Clare's pogogyne • Jolon clarkia	American Southwest Riparian Forest and Woodland[12]	Moderate	Mid-High	Mid-High	Mid-High
Saline emergent wetland	• California brackish water snail • tidewater goby	• eelgrass	Salt Marsh Meadows	Moderate	High	High	High
Wet meadow	• Hickman's onion	• None	Wet Mountain Meadow	High	Mid-High	Mid-High	Mid-High
Other							
Rocky outcroppings	• California condor	• Clare's pogogyne	California Foothill and Coastal Rock Outcrop Vegetation	Mid-High	Moderate	Mid-High	Moderate to Mid-High(Hot and Dry)

Monterey County RCIS Natural Community	Focal Species and Other Conservation Elements	Non-Focal Species and Other Conservation Elements	United States National Vegetation Classification (common name)	Sensitivity and Adaptability Rank	Climate Exposure and Spatial Disruption Rank Warm and Wet	Climate Exposure and Spatial Disruption Rank Hot and Dry	Combined Vulnerability Rank

Notes:

Compiled by AECOM 2020.

1. Analysis conducted by Hutto et al. (2015) addressed sensitivity, exposure, and adaptive capacity for “Beaches and Dune” habitats, resulting in a final ranked vulnerability (weighted score) of Moderate-High.
2. PRBO Conservation Science (2011) projected a decrease in area (19 to 43 percent) of the chaparral/Coastal scrub vegetation group by 2070–2099 in central western California.
3. PRBO Conservation Science (2011) projected a decrease in area (44 to 55 percent) of blue oak woodland/foothill pine woodland vegetation group by 2070–2099 in central western California.

Source: Thorne et al. 2016

Focal and Non-Focal Amphibian and Reptile Species Climate Change Vulnerability Assessment

Wright et al. (2013) conducted a climate change vulnerability assessment for all Californian amphibian and reptile species for 2050, results of the assessment are summarized in Table 3-7. Species vulnerability was ranked by projection of currently occupied areas remaining statewide, and projected change of suitable habitat remaining statewide.

Results of the assessment show that all focal and non-focal amphibian and reptile species, with the exceptions of California tiger salamander and Santa Lucia slender salamander, had current statewide population distributions that are likely to remain the same as present-day, experience a less than 20 percent reduction in area, or experience an increase in area. Anomaly scores for California red-legged frog and western spadefoot indicate that although current distribution and habitat suitability are likely to persist, climatic conditions are projected to change enough to reduce habitat suitability on average to make these species high conservation priorities.

California Tiger Salamander

Under the RCP8.5 scenario the amount of suitable habitat for California tiger salamander is projected to decrease by 50 to 99 percent statewide, and currently occupied areas are projected to be reduced by 40 to 80 percent statewide. Under the RCP4.5 scenario the amount of suitable habitat is projected to decrease by 20 to 50 percent statewide, and currently occupied areas are projected to be reduced by 20 to 40 percent statewide.

Santa Lucia Slender Salamander and Santa Cruz Long-toed Salamander

Under the RCP8.5 scenario the amount of suitable habitat for Santa Lucia salamander is projected to decrease by 50 to 99 percent statewide, and currently occupied areas are projected to be reduced by more than 80 percent statewide. Under the RCP4.5 scenario the amount of suitable habitat is projected to decrease by 20 to 50 percent statewide, and currently occupied areas are projected to be reduced by 40 to 80 percent statewide. No specific analysis exists for Santa Cruz long-toed salamander; it has a smaller present-day range than Santa Lucia slender salamander and likely is similarly very vulnerable to climate change.

Table 3-7. Focal and Non-Focal Reptile and Amphibian Species Climate Change Vulnerability Assessment

Species[1]	Type of Analysis	Low Emissions (RCP4.5)	High Emissions (RCP8.5)	Climate Vulnerability
Focal				
California newt	Current Distribution	Slightly Reduced	Slightly Reduced	Neutral
	Habitat Suitability	Neutral	Neutral	
California red-legged frog	Current Distribution	Slightly Reduced	Slightly Reduced	Neutral[2]
	Habitat Suitability	Neutral	Neutral	
California tiger salamander	Current Distribution	Moderately Reduced	Greatly Reduced	Intermediate
	Habitat Suitability	Somewhat Increase Vulnerability	Increased Vulnerability	
coast horned lizard	Current Distribution	Slightly Reduced	Slightly Reduced	Neutral
	Habitat Suitability	Neutral	Neutral	
foothill yellow-legged frog	Current Distribution	Slightly Reduced	Slightly Reduced	Neutral
	Habitat Suitability	Neutral	Neutral	
Non-Focal				
northern California legless lizard	Current Distribution	Slightly Reduced	Slightly Reduced	Neutral
	Habitat Suitability	Neutral	Neutral	
Santa Lucia slender salamander[3]	Current Distribution	Greatly Reduced	Severely Reduced	High
	Habitat Suitability	Somewhat Increase Vulnerability	Increased Vulnerability	
two-striped garter snake	Current Distribution	Stable	Stable	Neutral
	Habitat Suitability	Neutral	Neutral	
western spadefoot	Current Distribution	Slightly Reduced	Slightly Reduced	Neutral[2]
	Habitat Suitability	Neutral	Neutral	

Species[1]	Type of Analysis	Low Emissions (RCP4.5)	High Emissions (RCP8.5)	Climate Vulnerability

Notes:

1. Projected future range maps were created for each species for every combination of future greenhouse gas trajectories (RCP).
2. Model anomaly scores indicates that although current distribution and habitat suitability is likely to persist, climatic conditions are projected to change enough to reduce habitat suitability on average to make these species a high conservation priority.
3. Santa Cruz long-toed salamander likely has similar climate change projections as the Santa Lucia slender salamander due to its similar ecological requirements and restricted present-day range.

Complied by AECOM 2020.

Sources: Wright et al. (2013)

Focal and Non-Focal Bird Species Climate Change Vulnerability Assessments

Gardali et al (2012) conducted climate change vulnerability assessments for 358 at-risk California bird species and identified those vulnerable to climate change (Table 3-8). Habitat specialization is the primary sensitivity factor contributing to a species' climate change vulnerability. Most focal and non-focal species have High vulnerability in this category, meaning that the species are dependent on specific habitat types or elements. The western snowy plover, least Bell's vireo, and yellow-billed magpie are included in the Climate Change Vulnerability Priority list, meaning that they were among the group of taxa with the highest rank (25 percent) of all scores. These taxa then were ranked into levels of climate change priority by identifying natural breaks in the distribution of vulnerability scores.

Table 3-8. Focal and Non-Focal Avian Species Climate Change Vulnerability Assessments

Species	Exposure Habitat Suitability	Exposure Food Availability	Exposure Extreme Weather	Sensitivity Habitat Specialization	Sensitivity Physiological Tolerances	Sensitivity Migratory Status	Sensitivity Dispersal Ability	Climate Vulnerability Priority List
Focal Species								
burrowing owl[1,2]	Low	Low	Low	High	Low	Moderate	Low	N/A
California condor	Low	Low	Moderate	High	Low	Low	Low	N/A
tricolored blackbird[1,3]	Moderate	Low	Moderate	Moderate	Low	Low	Low	N/A
western snowy plover	Moderate	Low	High	High	Low	Low	Low	Moderate
Non-Focal Species								
least Bell's vireo	Low	Low	High	High	Low	High	Low	Moderate
little willow flycatcher	Low	Low	Low	High	Low	High	Low	N/A
yellow-billed magpie[1,4]	High	Low	Moderate	Low	Low	Low	Moderate	Low

Notes:

1. Gardali et al. (2012) created projected future species range maps for two different climate models.
2. Audubon Climate Report assessed summer and winter range as stable to climate change (Wilsey et al. 2019).
3. Audubon Climate Report assessed summer range as moderately vulnerable and winter range as highly vulnerable to climate change (Wilsey et al. 2019).
4. Audubon Climate Report assessed summer and winter range as highly vulnerable to climate change (Wilsey et al. 2019).

Compiled by AECOM 2020.

Source: Gardali et al. (2012), Wilsey et al. (2019)

Western Snowy Plover

Hutto et al. (2015) also conducted a climate change vulnerability assessment on western snowy plover on exposure and sensitivity factors:

Sensitivity to Climate and Climate Driven Change (Exposure)

- Sea-Level Rise– High
- Coastal Erosion– High
- Wave Action– High
- pH- Low
- Precipitation– Low

Sensitivity of Change in Disturbance Regimes (Exposure)

- Wind–High
- Storms-High
- Flooding-High

Sensitivity and Current Exposure to Non-Climate Stressors

- Land Use Change-High
- Pollution and Poison– High
- Recreation– High
- Invasive Species– Moderate-high

Overall Vulnerability

- Overall Vulnerability– Moderate-high
- Sensitivity– Moderate-high
- Exposure– Moderate-high
- Adaptive Capacity– Moderate

Focal Fish Species Climate Change Vulnerability Assessments

Moyle et al. (2012) conducted a climate change vulnerability assessment for all 121 native Californian fish species and 43 non-native species. Results for focal fish species are shown in Table 3-9.

Table 3-9. Focal Fish Species Climate Change Vulnerability Assessment

Species	Baseline Vulnerability	Climate Change Vulnerability	Combined Vulnerability Score
steelhead (south-central California coast distinct population segment (DPS))	Approaching Extinction	Highly Vulnerable	On Path to Extinction
tidewater goby	Approaching Extinction	Highly Vulnerable	On Path to Extinction
Notes: Compiled by AECOM 2020. Source: Moyle et al. (2012)			

Steelhead (South-Central California Coast DPS)

Crozier et al. (2019) conducted a climate change vulnerability assessment on steelhead south-central California coast DPS), including assessments of exposure and sensitivity factors.

Exposure Factors

- Ocean Acidification Exposure– High
- Flooding– Moderate-high
- Sea-Level Rise– Moderate-high
- Sea Surface Temperature–Moderate-high
- Upwelling– Moderate
- Ocean Currents– Moderate
- Stream Temperature– Moderate
- Summer Water Deficit–Moderate
- Hydrologic Regime–Low

Sensitivity Factors

- Other Stressors-Moderate-high
- Juvenile Freshwater Stage– Moderate
- Estuary Stage– Moderate
- Cumulative Life-Cycle Effects– Moderate
- Population Viability– Moderate
- Ocean Acidification Sensitivity– Moderate
- Early Life History-Low

- Marine Stage-Low
- Adult Freshwater Stage– Low
- Hatchery Influence– Low

Overall Vulnerability

- Overall Sensitivity–Moderate
- Overall Exposure-Moderate-high
- Adaptive Capacity-Moderate
- Overall Vulnerability– Moderate

Tidewater Goby

Hutto et al. (2015) also conducted a climate change vulnerability assessment on tidewater goby. The climate factors to which this species is most sensitive were determined to be precipitation and displacement from extreme storm events (Hutto et al. 2015):

Sensitivity to Climate and Climate Driven Change (Exposure)

- Precipitation–Mid High
- pH-Low
- Sea-Level Rise–Low
- Coastal Erosion–Low

Sensitivity of Change in Disturbance Regimes (Exposure)

- Flooding– Mid High

Sensitivity and Current Exposure to Non-Climate Stressors

- Land Use Change–Moderate
- Invasive Species– Low

Overall Vulnerability

- Overall Vulnerability– Moderate
- Sensitivity– Moderate
- Exposure– Moderate
- Adaptive Capacity– Low

Focal and Non-Focal Mammal Species Climate Change Vulnerability Assessments

San Joaquin Kit Fox

San Joaquin kit fox climate change vulnerability assessment results are summarized in Table 3-10. Although many areas San Joaquin kit fox currently occupies are projected to become unsuitable, newly climatically suitable areas are projected to be created in Monterey County under all climate scenarios.

Table 3-10. San Joaquin Kit Fox Climate Change Vulnerability Assessment

Climate Change Scenario	Species Distribution Model Results Occurrence Locations Remaining Suitable	Species Distribution Model Results Area Remaining Suitable	Climate Change Vulnerability Score Exposure	Climate Change Vulnerability Score Sensitivity and Adaptive Capacity	Climate Change Vulnerability Score Overall Climate Change Vulnerability Score
Low Emission (RCP4.5) Warm and Wet	99.13%	118.04%	Moderately Vulnerable	Less Vulnerable	Less Vulnerable
Low Emission (RCP4.5) Hot and Dry	92.15%	132.61%	Moderately Vulnerable	Less Vulnerable	Less Vulnerable
High Emission (RCP8.5) Warm and Wet	75.73%	131.80%	Highly Vulnerable	Less Vulnerable	Moderately Vulnerable
High Emission (RCP8.5) Hot and Dry	26.01%	114.53%	Highly Vulnerable	Less Vulnerable	Moderately Vulnerable
Source: Stewart et al. 2016					

Southern Sea Otter

Southern sea otter (SSO) and its estuarine and marine habitat are sensitive to climate-related threats, including precipitation changes, decreased pH, and wave action (Hutto et al. 2015). Decreased pH (ocean acidification) is of concern, as it poses a serious threat to the marine organisms that make up otter's prey base (USFWS 2015). Increased sea surface temperature and dynamic ocean conditions can influence abundance of giant kelp, which is important sea otter habitat. Resulting declines in food availability may result in an increased susceptibility to disease (USFWS 2015). Climate-related modifications of freshwater hydrological processes could influence the transport of pathogens and contaminants from land to the nearshore marine environment, and algal and cyanobacterial blooms may increase in frequency (USFWS 2015).

Bats

Although no specific climate change vulnerability assessments exist for the focal and non-focal bat species, studies have been made projecting bat species responses to various climate stressors. Overall, increased in climate exposure is likely to have detrimental impacts to bat species population health. An increase in the number of severe storms (Fellers and Halstead 2015) and increased periods of drought (Jones et al. 2009) may have detrimental effects on insect populations, leading to lower prey availability. An increase in overall winter temperatures could lead to negative effects during hibernation, by increasing energy needs, depleting fat reserves, and making bats more susceptible to fungal infections (Jones et al. 2009). Increasing temperatures (Jones et al. 2009) may cause some species to move farther north and increasing incidences of heat waves may threaten bats with direct and mass mortality (Sherwin et al. 2013).

Mountain Lion and American Badger

No specific climate change vulnerability assessments exist for mountain lion and American badger. Mountain lion occurs in all terrestrial habitat types and all regions in the RCIS area. Because of its use of a large variety of habitat types, it is less susceptible to changes to any one habitat type. Analysis conducted by Schloss et al. (2012) predicted the response of mammals to climate change based on their dispersal ranges (kilometers per year [km/yr]). Species with larger dispersal ranges were predicted to be less vulnerable to climate change effects (Schloss et al. 2012). Mountain lion had one of the highest dispersal ranges (48.92 km/yr) and likely can keep pace with large-scale climate changes (Schloss et al. 2012). American badger also had a relatively high dispersal range (12.03 km/yr) and also is likely to be able to keep pace with large-scale climate changes (Schloss et al. 2012). Despite its being highly mobile, mountain lions and American badgers are still likely susceptible to stochastic, catastrophic weather events such as severe, wind-driven fires (Yap and Rose 2019).

Focal and Non-Focal Vernal Pool Species Climate Change Vulnerability Assessment

Limited climate change vulnerability assessments have been done for vernal pool species, and many have been region-specific. The USFWS 2007 5-Year Review for vernal pool fairy shrimp (USFWS 2007a) and the USFWS 2013 5-Year Review for Contra Costa goldfields (USFWS 2013) projects potential climate change impacts vernal pool communities in California and many of these impacts are closely connected to the availability of water. More rainfall through in intense precipitation events could result in an increase in suitable vernal pool habitat that would benefit Contra costa goldfields and vernal pool fairy shrimp. Or, if a more hot and dry global circulation model occurs, the resulting droughts could negatively affect the amount of vernal pool habitat and increase the frequency of vernal pools drying before vernal pool fairy shrimp have completed their life cycle, or cause pool temperatures to exceed suitable temperatures for breeding.

Focal Invertebrate Species Climate Change Vulnerability Assessments

Monarch Butterfly

While no species-specific climate change vulnerability assessment has been conducted for focal invertebrate species, the Center for Biological Diversity and Center for Food Safety's Petition to Protect the Monarch Butterfly under the Endangered Species Act (2014) discusses projected climate change impacts to Monarch butterflies. Increased summer temperatures and decreased winter temperatures may make present-day habitat unsuitable. Increased storm events and droughts, reduced water availability, increased disease susceptibility, and a reduction in population of milkweed larval host plants, nectar sources, and forests used for overwintering may lead to increased mortality and population reductions. Overwintering habitat, especially in Mexico, has been projected to become unsuitable by end-of-century. Monarch butterflies will have to adjust their seasonal movement patterns in order to persist as a species.

Focal and Non-Focal Plant Species Climate Change Vulnerability Assessments

Few species-specific climate change vulnerability assessments have been conducted for plant species and vegetation alliances. In general, focal and non-focal plant species and other conservation elements are projected to experience shifts in distribution to higher elevations and northward, depending on the species' ability to do so (Loarie et al. 2008). In particular, coastal populations are projected to be vulnerable to habitat loss and degradation due to sea level rise and storm surges (Loarie et al. 2008).

Yadon's Rein Orchid

Analysis by Anacker and Leidholm (2012) on a subset of rare California plants included Yadon's rein orchid. Using distributional and natural history information to obtain vulnerability scores, this species was given a score of Extremely Vulnerable. This means that the abundance and/or range extent within the assessed geographical area would be extremely likely to substantially decrease or disappear by 2050. Anacker and Leidholm also created modelled range maps, which project a near total range loss for Yadon's rein orchid. (Anacker and Leidholm 2012).

Eelgrass

No specific climate change vulnerability assessment exists for eelgrass. Because eelgrass is a keystone species in estuarine habitats, climate change vulnerability assessments of this habitat type can be used as a likely indicator of how climate change may affect eelgrass. Hutto et al. (2015) conducted a climate change vulnerability assessment on estuarine habitats of exposure and sensitivity factors:

Sensitivity to Climate and Climate Driven Change (Exposure)

- Sea-Level Rise– High
- Precipitation-Moderate-high
- Sea Surface Temperature- Monderate-high
- Wave Action- Moderate-high
- Coastal Erosion–Moderate
- pH- Moderate
- Dissolved Oxygen Levels-Moderate
- Air Temperature-Moderate

- Dynamic Ocean Conditions-Low
- Salinity-Low
- Turbidity-Low

Sensitivity of Change in Disturbance Regimes (Exposure)

- Disease– Moderate-high
- Storms- Moderate-high
- Flooding- Moderate-high

Sensitivity and Current Exposure to Non-Climate Stressors

- Land Use Change-High
- Invasive Species– Moderate-high
- Coastal Roads/Amoring- Moderate-high
- Overwater/Underwater Structures – Moderate-high

Overall Vulnerability

- Overall Vulnerability– Moderate-high
- Exposure– High
- Sensitivity– Moderate-high
- Adaptive Capacity– Moderate

Key factors for eelgrass health included water clarity and quality, which are greatly affected by human activities and land use pressures (Hutto et al. 2015). Sea level rise, increased sea temperatures, and storm events have been projected as climate change stressors to West Coast eelgrass populations (Sherman and DeBruyckere 2018). Several studies modeling eelgrass response to sea level rise on the West Coast have projected a major decline or extinction in several populations (Clinton et al. 2014, Shaughnessy et al. 2012, Sherman and DeBruyckere 2018).

Other Focal/Non-Focal Plants

No specific climate change vulnerability assessments exist for the other focal/non-focal plant species. The climate change vulnerability assessment of natural terrestrial communities (Thorne et al. 2016; Table 3-5 and Table 3-6) can be used for indicators of how these species may fare with climate change.

Focal Invertebrate Species Climate Change Vulnerability Assessments

Monarch Butterfly

While no species-specific climate change vulnerability assessment has been conducted for focal invertebrate species, the Center for Biological Diversity and Center for Food Safety's Petition to Protect the Monarch Butterfly under the Endangered Species Act (2014) discusses projected climate change impacts to Monarch butterflies. Increased summer temperatures and decreased winter temperatures may make present-day habitat unsuitable. Increased storm events and droughts, reduced water availability, increased disease susceptibility, and a reduction in population of milkweed larval host plants, nectar sources, and forests used for overwintering may lead to increased mortality and population reductions. Overwintering habitat, especially in Mexico, has been projected to become unsuitable by end-of-century. Monarch butterflies will have to adjust their seasonal movement patterns in order to persist as a species.

Natural Communities Climate Change Vulnerability Assessment

For species and other conservation elements where there is no specific climate change vulnerability assessment, the climate change vulnerability assessment for the natural communities in which they occur can be used as a possible indicator, or proxy, of the species' or other conservation element's vulnerability to climate change. Thorne et al. (2016) conducted climate change vulnerability assessments for 31 terrestrial vegetation macrogroups (as defined by the U.S. Natural Vegetation Classification UCNVC system) in California. Some natural communities occurring in the RCIS area included multiple USNVC macrogroups. Montane chaparral and vernal pool natural communities were not included due to lack of adequate spatial data, and marine communities were not included the study scope. Some natural communities in the RCIS encompass multiple UCNVC macrogroups.

The climate change vulnerability results from vegetation communities occurring in the RCIS area are provided in Table 3-5 and Table 3-6. No natural community had a Combined Vulnerability Rank of Low, those with Mid-High or High ranking in at least one emission scenario and/or general circulation model are show in Table 3-11.

Table 3-11. Summary of Natural Communities with Mid-High or High Combined Vulnerability Ranking

Monterey County RCIS Natural Community	Mean Combined Vulnerability Rank
Grassland	
Annual grassland	Mid-High (RCP4.5 and RCP8.5)
Perennial grassland	Mid-High (RCP4.5 and RCP8.5)
Shrub – Dominated	
Coastal dune	Mid-High (RCP4.5 Hot and Dry, RCP8.5)
Coastal scrub	Mid-High (RCP4.5 Hot and Dry, RCP8.5)
Mixed chaparral	Mid-High (RCP4.5 Hot and Dry, RCP8.5)
Tree – Deciduous	
Montane hardwood	Mid-High (RCP4.5 Hot and Dry and RCP8.5 Hot and Dry)
Wetland	
Freshwater emergent wetland	High (RCP4.5 and RCP8.5)
Riparian	Mid-High (RCP8.5)
Saline emergent wetland	High (RCP4.5 and RCP8.5)
Wet meadow	Mid-High (RCP4.5 and RCP8.5)
Other	
Rocky outcroppings	Mid-High (RCP4.5 Hot and Dry and RCP8.5 Hot and Dry)
Notes: Complied by AECOM 2020. Source: Thorne et al. (2016)	

3.3.2 Ecological Climate Resilience

As shown in Figure 3-1, most of the RCIS area has an ACE Climate Resilience Score of either 4 or 5, indicating high potential climate resiliency, and includes: Fort Ord National Monument, Fort Hunter Liggett, Northern Camp Roberts, Santa Lucia Range, Diablo Range, Gabilan Range, Coast Range, Salinas Valley, and portions of Los Padres National Forest. Coastal areas, such as Elkhorn Slough, Monterey Bay, San Jose Creek south to the Santa Lucia Range, as well as inland patches within Los Padres National Forest, Northern Camp Roberts, Carmel Valley and Cholame Valley, are projected to experience higher climate exposure (e.g., sea level rise, increased storm frequency, etc.) and show low-medium to medium projected climate resiliency (scores 2 and 3). It is unclear from the dataset what natural community conditions trigger these lower climate resilience scores. No locations in the RCIS area have the lowest resiliency potential.

Additionally, the Species Biodiversity, Significant Habitats, and Terrestrial Connectivity datasets were summarized for the RCIS area. Areas with the highest scores, 4 or 5, for all four ACE assessment categories, include Fort Ord National Monument, Fort Hunter Liggett, and portions of the Diablo Range and Santa Lucia Range (CDFW 2018b).

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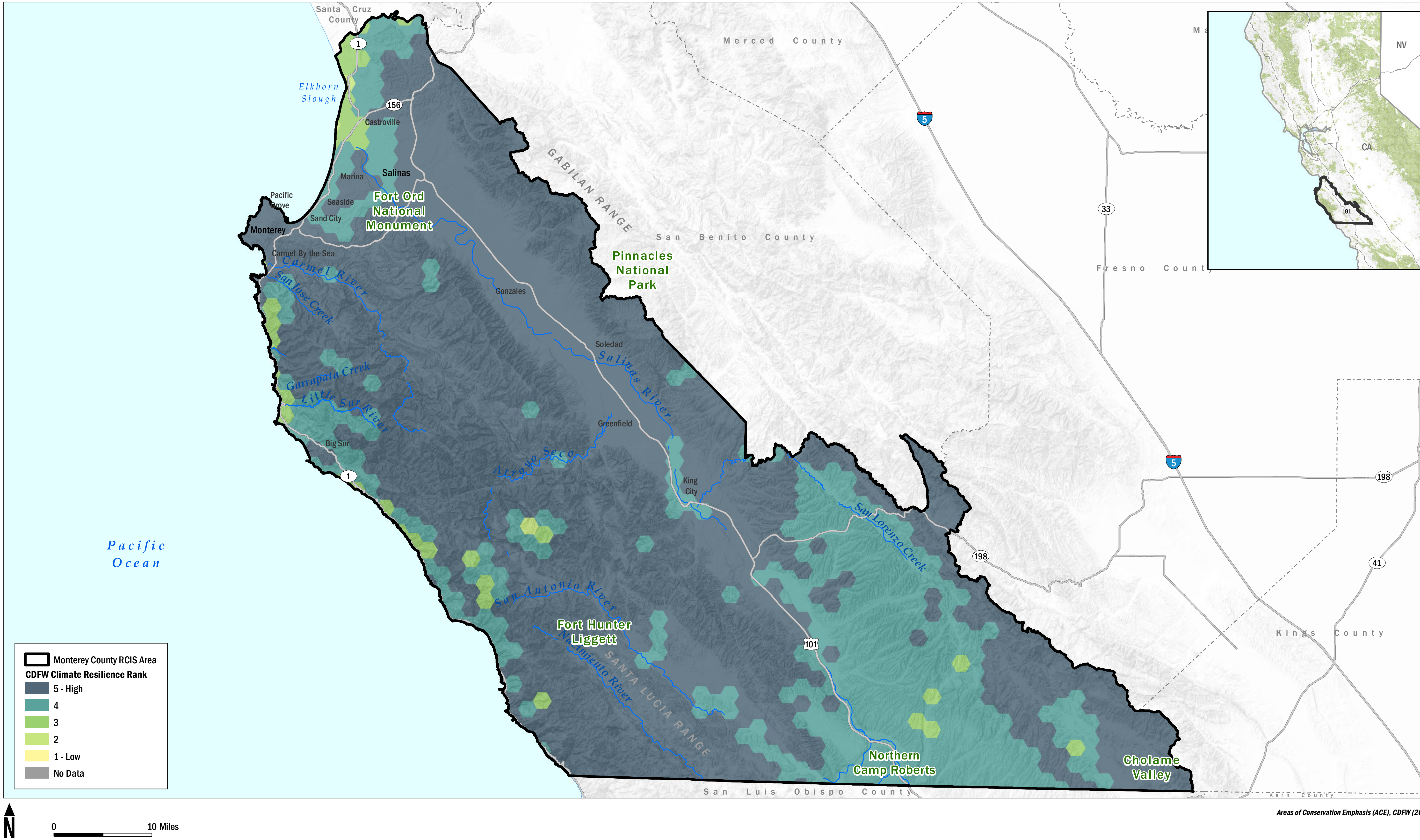

Areas of Conservation Emphasis (ACE), CDFW (2018)

AECOM
Transportation Agency for Monterey County
Monterey County Regional Conservation Investment Strategy

FIGURE 3-1
Climate Resilience

4. DISCUSSION

4.1 Species, Natural Communities, and Other Conservation Elements

Stressors and pressures that are often identified by species-specific recovery plans and background research as major or novel threats to a large number of focal/non-focal species and other conservation elements are discussed below in more detail. These stressors inform many of the conservation strategies that have been developed for focal species and other conservation elements. Flagship focal species have been identified for conservation emphasis as they represent widespread or vulnerable natural communities, multiple other focal/non-focal species, and/or are endemic to the RCIS area.

4.1.1 Stressors and Pressures

Habitat Loss

One of the primary causes of habitat loss and degradation in the RCIS area is the conversion of natural lands into urban and agricultural uses. Increasing human populations are putting increased demands on already limited supplies of land, water, and other natural resources (CDFW 2015). Focal and non-focal species and other conservation elements that already have a restricted range and/or are endemic to the RCIS area—monarch butterfly, Smith's blue butterfly, Santa Cruz long-toed salamander, Santa Lucia slender salamander, Clare's Pogogyne, Hickman's onion, Jolon clarkia, Little Sur manzanita, Monterey clover, Monterey gilia, Monterey larkspur, Monterey spineflower, Pajaro manzanita, sandmat manzanita, Yadon's rein orchid, and Monterey pine forest—will be most acutely negatively affected by habitat loss and degradation. These species also are associated with communities that are among the most vulnerable natural communities to climate change. Beyond direct land conversion, increased human use of the landscape will bring additional stressors, such as invasive species, fire suppression, and pest and pathogen outbreaks, further degrading natural community health (CDFW 2015).

Habitat Connectivity and Wildlife Corridors

The loss of habitat connectivity and increased habitat fragmentation will have a major impact on wildlife and natural communities in the RCIS area. Development of agricultural and urban areas, especially installation of new linear features (e.g., roads and utility lines) or development in critical choke points (areas of constrained movement) can affect plant and wildlife dispersal and predator–prey relationships, leading to increased mortality and genetic isolation. Movement by focal species such as mountain lion can be used as an indicator of healthy connectivity between different terrestrial habitat types, because of its occurrence in all the natural communities in the RCIS area and its large home range. However, habitat fragmentation and degradation can more acutely impact smaller species.

Aquatic species are limited in their abilities to bypass connectivity barriers in streams. Improving fish passage throughout riparian corridors can increase habitat connectivity for steelhead and other water-bound species. Furthermore, maintaining healthy connectivity between freshwater and saltwater habitats is important for maintaining hydrological regimes, water quality, and sediment balances.

In addition to providing habitat for aquatic species, riparian areas provide shade, water, and upland habitat for many terrestrial species. Riparian habitats disproportionately contribute to regional species richness (Krosby et al. 2018). These areas have the potential to act as dispersal corridors for both terrestrial and aquatic species because they often span multiple climatic gradients (Krosby et al. 2018). Riparian corridors in forested areas can reduce the effects of climate exposure by providing refugia from increasing air and water temperatures (Klausmeyer et al. 2011). Conservation strategies focusing on maintaining connectivity between various riparian habitats in the RCIS area have the potential to create future climate refugia for vulnerable species and maintain current species richness.

Non-Native Species

Non-native species can have devastating impacts on species that already are experiencing negative pressures from other non-climate and climate stressors. Invasive plants can be found in a variety of natural communities, such as grasslands, riparian, oak woodlands, and Coastal dunes, and they tend to dominate in brackish aquatic habitats (CDFW 2015). By outcompeting and displacing native plant communities, these invasive species often degrade habitat for native wildlife (CDFW 2015). Invasive wildlife species occur in both terrestrial and aquatic natural communities and often have negative impacts on native species. For example, Monterey County is the epicenter of hybridization between California tiger salamander and the invasive barred tiger salamander (USFWS 2017).

Fire and Fire Suppression

Fire is part of the natural disturbance regime in many natural communities within the RCIS area (e.g., chaparral, Closed-cone pine-cypress). Fire suppression without active forest management has caused unnatural succession in fire-adapted communities and increased wildlife intensity (CDFW 2015). Fire suppression activities (e.g., command posts, fire lines, fire retardant) also have negative impacts such as increased erosion and sedimentation, air and water pollution, introduction of non-native species, etc. (Backer et al. 2004). Altered natural fire regimes have led to increased forest densities, and drought-stressed forests become more vulnerable to fire because of tree deaths from pests and drought (CDFW 2015). Drought-stressed conditions are projected to become further stressed by increased climate change exposure (CDFW 2015), making more frequent, intense wildfires likely to occur.

Recreation and Tourism

As nature-based recreation and tourism has boomed in popularity, recognizing and addressing the negative impacts on species and natural communities is important. Hiking, walking, and mountain biking can lead to a reduction in vegetation cover, changes in species composition, and the introduction and spread of non-native species (Sumanapala and Wolf 2019). Long-term impacts, such as decline in plant growth, flowering, and seed production, also have been documented (Sumanapala and Wolf 2019). Increased encounters with wildlife from motorized and non-motorized recreational activities in both aquatic and terrestrial communities have been documented to have significant negative effects on all taxonomic groups (Larson et al. 2016). The presence of domestic dogs, both on-leash and off, in parks and beaches can negatively impact sensitive wildlife species.

Renewable Energy

Increased use of renewable energy sources has led to an increase in construction of solar and wind energy facilities. Construction of these facilities can cause mortality to subterranean species such as hibernating amphibians and reptiles, and operational impacts include increased noise pollution and habitat fragmentation (Lovich and Ennen 2011). Mortality impacts to birds, bats, and insects from both concentrated power tower and photovoltaic type facilities (Huso et al. 2016, USFWS 2018a), and wind energy facilities (USFWS 2018b) have been well documented. Hydropower dams can impact the composition of fish communities, ecosystem productivity, block fish passage, cause changes to hydrology and water quality, and increase habitat fragmentation (USFWS 2018c).

4.1.1 Climate Change Vulnerability

The following focal and non-focal species ranked as Moderate and above in species-specific climate change vulnerability assessments and/or occupy natural communities that have a High Combined Vulnerability rank. These species are the most vulnerable to climate change in the RCIS area:

Table 4-1. Summary of Most Climatically Vulnerable Focal/Non-Focal Species

Focal/Non-Focal Species	Climate Change Vulnerability Rank
California tiger salamander	Moderate High
Santa Cruz long-toed salamander	High
Santa Lucia slender salamander	High
least Bell's vireo	High
yellow-billed magpie	High
western snowy plover	High
steelhead (South-Central California Coast Steelhead DPS)	Moderate High
tidewater goby	Moderate High
San Joaquin kit fox	Moderate
southern sea otter	Moderate
California brackish water snail	High
eelgrass	High
Yadon's rein orchid	High

Notes: Compiled by AECOM in 2020
Sources: Anacker and Leidholm 2012; Gardali et al. 2012; Hutto et al. 2015; Moyle et al. 2012; Stewart et al. 2016; Thorne et al. 2016; Wright et al. 2013

Conservation strategies focusing on important flagship species have the potential to affect many other focal and non-focal species as well as natural communities that are vulnerable to the impacts of climate change. The following flagship species are discussed below and represent some of the most widespread and/or vulnerable natural communities in the RCIS area:

- Amphibians: California red-legged frog and California tiger salamander
- Mammals: southern sea otter, mountain lion, and pallid bat
- Fish: steelhead (south-central California coast steelhead Distinct Population Segment)

- Birds: western snowy plover
- Invertebrates: Smith's blue butterfly
- Plants: Monterey spineflower and Yadon's rein orchid

Amphibians

California red-legged frog habitats are projected to experience neutral impacts from climate change. The California amphibian and reptile climate change vulnerability assessment projects that 80 to 100 percent of the California red-legged frog currently occupied area in California will remain, and the amount of suitable habitat is expected to increase/decrease no more than 20 percent by 2050 (Wright et al. 2013). Though not included in the highest-risk species, the analysis showed that California red-legged frog may experience larger reductions in habitat suitability than modelled (Wright et al. 2013). Anomaly scores indicate that although current distribution and habitat suitability are likely to persist, climatic conditions are projected to change enough to reduce habitat suitability on average to make California red-legged frog high conservation priorities. The magnitude of these projections in the RCIS area will likely vary based on local conditions. This species occupies a wide range of upland habitats, and successful conservation measures are in place throughout the RCIS area.

California red-legged frog can serve as a flagship species for other, more highly vulnerable amphibians in the RCIS area. Many California red-legged frog conservation strategies have already been successfully implemented and have the potential to positively affect other focal species, such as California tiger salamander, foothill yellow-legged frog, Santa Cruz long-toed salamander, steelhead, tidewater goby, and tricolored blackbird, as well as affect several non-focal species (USFWS 2002). Continued implementation of California red-legged conservation strategies can offer important protection for the highly climate vulnerable California tiger salamander and Santa Cruz long-toed salamander.

The California amphibian and reptile climate change vulnerability assessment projects future California tiger salamander range decreases of 50 to 99 percent across California by 2050, under high emission scenarios (Wright et al. 2013). Santa Cruz long-toed salamander, the sub-species was not included in the climate change vulnerability assessment by Wright et al. (2013), is likely to have similar reductions in range because of its highly restrictive current range. The USFWS Recovery Plan (USFWS 2017) for California tiger salamander identifies climate stressors, such as increased periods of drought and higher temperatures, that can reduce the availability of breeding ponds and favor the life history of non-native species. Santa Cruz long-toed salamander and other salamanders in the RCIS area are likely to be affected by similar climate stressors.

These species also are susceptible to most of the non-climate stressors that have been identified in the RCIS area, such as linear features, non-native species, and disease. The California red-legged frog and California tiger salamander Recovery Strategies already addresses many of these non-climate stressors (USFWS 2002, 2017). Increased implementation of these strategies across the RCIS area, focusing on habitats with vulnerable salamanders, can have an increasingly positive impact as range contractions for these species occur.

Mammals

The southern sea otter is an attractive keystone species in the RCIS area. It is the only marine focal species, and many of its conservation strategies could have positive impacts on other focal and non-focal species that use marine and estuarine habitats. Conservation strategies targeting southern sea otter population health, such as reducing anthropogenic causes of algal and cyanobacterial blooms and supporting prey population (USFWS 2015), can have large impacts on the condition of both marine and freshwater aquatic systems. Protection and improvement additional marine and estuarine habitats can provide substantial benefits for human communities, such as improving water quality, increased public access, and increased resilience to future sea level rise.

Mountain lions are an umbrella species for terrestrial habitat corridors in the RCIS area. Though mountain lions are less susceptible the climate change due to their large home ranges (Schloss et al. 2012), future climate stressors will increase the importance of linkages between habitats. The installation of wildlife crossing structures over linear features can connect future climate refugia locations that are more resilient to projected climate change exposure.

Pallid bats can be used as surrogates for other bat species in the RCIS area. Bats provide many ecosystem services such as biological pest control, plant pollinations, and seed dispersal (Kasso and Balakrishnan 2013). Declines in bat populations may increase future climate exposure impacts to agriculture and urban areas.

Steelhead (South-central California Coast Steelhead Distinct Population Segment)

Steelhead are an important indicator for the health of riparian and freshwater aquatic habitats because they are negatively affected by pressures such as urban wastewater, agriculture and forestry effluents, and dams and water management/use. Conservation strategies targeting steelhead population health, such as restoring flows and instream habitat conditions (NMFS 2013), can have large impacts on the condition of riparian and freshwater aquatic systems. Restoration of riparian and steelhead habitats can provide substantial benefits for human communities, such as improving water quality and reducing flood damage (NMFS 2013).

Conservation strategies focusing on riparian communities, such as California sycamore woodlands, are important because they are some of the most vulnerable habitats to climate change. Although representative plant species used in the climate change vulnerability assessment from riparian habitats are moderately sensitive (e.g., to temperature and fire), they have life history traits that enable them to adapt to increased frequency of climate stressors (Thorne et al. 2016). These communities have a Combined Vulnerability Ranking of Mid-High to climate change impacts. The projected effects of climate exposure and modelled spatial disruption are significant enough that it will be difficult for these communities to adapt to changing climate conditions.

Coastal Natural Communities

Western snowy plover, Smith's blue butterfly, and Monterey spineflower can be used as indicators of coastline natural communities. Smith's blue butterfly and Monterey spineflower are nearly endemic to the Coastal dune and Coastal scrub habitats in Monterey County. Western snowy plover has a Moderate ranking on the climate change priority list (Gardali et al. 2012) and a high dispersal ability (USFWS 2007b), and critical nesting habitat occurs along the Monterey County coastal strand. Coastal natural communities in the RCIS area are some of the most at-risk to the effects of climate change and are projected to have some of the greatest losses in current spatial distribution, due to greater and more frequent wave action, resulting in erosion and shoreline retreat (USFWS 2009). In addition, the representative plant species used in the climate change vulnerability assessments for these communities had low adaptive capacity scores (Thorne et al. 2016), meaning they do not physiologically respond well to changing conditions. When combined with projected impacts of sea level rise and changes in temperature and precipitation, coastal natural communities are very vulnerable to climate change. Conservation strategies targeting non-climate stressors, such as recreation, land use changes, pollution, and invasive species, as well as allowing space for inland migration of coastal ecosystems, can help create new areas of suitable habitat that will help reduce the pressures of climate change on Western snowy plover, Smith's blue butterfly, and Monterey spineflower, along with other focal and non-focal species.

Yadon's Rein Orchid

Yadon's rein orchid occurs in some of the only native Monterey pine forest remaining in California and its range is extremely likely to substantially decrease or disappear by 2050 due to climate change exposure (Anacker and Leidholm 2012). This species can be used as an indicator of the health of an important, endemic ecosystem in Monterey County. Conservation strategies targeting non-climate stressors, such as maintaining hydrologic regimes, drainage patterns, and natural fire regimes, will help reduce the pressures of climate change on Yadon's rein orchid and Monterey pine forest as well as other focal and non-focal species.

4.2 Ecological Resilience

Areas identified as having high ecological climate resilience, and high species biodiversity, significant habitats, and terrestrial connectivity, include Fort Ord National Monument, Fort Hunter Liggett, and portions of the Diablo Range, Santa Lucia Range., Los Padres National Forest. According to the ACE dataset (CDFW 2018b), the natural vegetation communities and ecological functions at these locations are projected to remain ecologically intact and continue to support high biodiversity, significant habitats, and habitat connectivity in a changing climate. These areas projected to retain suitable habitat for plant and wildlife species that presently occur there and could be prioritized for protection and/or implementation of conservation strategies.

Areas that have lower scores for species biodiversity, significant habitats, and terrestrial connectivity but have high ACE Climate Resilience Scores, Northern Camp Roberts, Gabilan Range, Coast Range, and the Salinas Valley, are still important areas for protection and implementation of conservation strategies. While presently they may not have the highest species diversity, significant habitats, or terrestrial connectivity, these areas may become important future climate refugia for plant and animal species that currently occupy other parts of the RCIS area.

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Appendix C. Non-focal Species Ecological Requirements and Associated Focal Species Actions

Non-focal species were selected based on their shared habitat, range, or ecosystem function of focal species and other conservation elements. For example, the American badger is a wide ranging meso carnivore that has similar ecosystem function and uses similar habitat as mountain lion and San Joaquin kit fox. Conservation actions addressing connectivity and habitat enhancement for these species have the potential to also positively benefit American badger. Table C-1 describes non-focal species ecological requirements, includes conservation actions that benefit focal-species and address threats.

Table C-1. Non-focal Species Ecological Requirements and Associated Focal Species Actions

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
Wildlife Species				
American badger Taxidea taxus • Status: State Species of Special Concern • RCIS Regions: All terrestrial regions	• Annual grassland • Coastal scrub • Montane chaparral	• Most abundant in dry, open stages of most shrub and herbaceous habitats (CDFW 1988c, 2020) • Prefer loose-textured sandy soils in open areas for burrowing and to support a suitable prey population (CDFW 1988c, 2020)	• burrowing owl • mountain lion • San Joaquin kit fox • Lemmon's jewelflower • working lands	• All RC goals, objectives, and actions • BUOW 1.2.1, 1.2.2, 1.2.4, 1.3.1 • ML 1.2.1, 1.2.2, 1.2.3, 1.3.1, 1.3.3, 2.1.1 • SJKF 1.2.1, 1.2.4, 1.2.5 • WL 1.1.1, 1.1.2, 1.1.4, 1.1.5, 1.1.6 • HC Objective 1.2

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
Least Bell's vireo Vireo bellii pusillus • Status: Federally Endangered, State Endangered, State Species of Special Concern • RCIS Regions: Big Sur Coastline, Carmel Valley, Outer Coast Range, San Antonio Valley, Mid Inner Coast Range, Nacimiento River, San Antonio River, Gabilan Range and Pinnacles National Park	• Riparian	• Summer resident (CDFW 1988d) • Breeding habitat: obligate riparian breeder in thickets of willow and other low, dense riparian habitat and lower portions of canyons. Prefers early successional habitat (CDFW 1988d. USFWS 1998c)	• foothill yellow-legged frog • California newt • steelhead • California sycamore woodland	• All RC goals, objectives, and actions • Water 1.1.1, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1,1,8, 1.2.1, 1.2.2, 1.2.4 • SCCCS 1.2.1, 1.2.5, 1.3.5 • CSW 1.2.1, 1.2.2 • HC 2.1.1, 2.1.3

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
little willow flycatcher Empidonax traillii brewsteri • Status: State Endangered • RCIS Regions: All terrestrial regions	• Riparian	• Summer resident (CDFW 2005b) • Breeding habitat: low, dense willow thickets near slow streams, standing water, or seeps (CDFW 2005b)	• California newt • foothill yellow-legged frog • steelhead • California sycamore woodland	• All RC goals, objectives, and actions • Water 1.1.1, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, Water Objective 1.2 • SCCCS 1.2.5, 1.3.5 • CSW 1.2.1, 1.2.2 • HC 2.1.1, 2.1.3

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
northern California legless lizard Anniella pulchra • Status: State Species of Special Concern • RCIS Regions: All terrestrial regions	• Coastal dune • Mixed chaparral • Montane chaparral • Riparian	• Found in sandy or loose loamy soils or where there is plenty of leaf litter (CDFW 2000c) • Prefer slightly moist soils (CDFW 2000c)	• Lemmon's jewelflower • Monterey spineflower • Pajaro manzanita • seaside bird's beak	• All RC goals, objectives, and actions • All Dune goals, objectives, and actions

Santa Lucia slender salamander Batrachoseps luciae • Status: None (endemic to Monterey Co.) • RCIS Regions: Big Sur Coastline, Monterey Peninsula to Pt. Lobos	• Coastal oak woodland • Coastal scrub	• Occurs mostly on west slopes of Santa Lucia Mountains on north-facing slopes (CDFW 2006) • Moist habitats in redwood and mixed conifer forests, woodlands, and open or disturbed habitats (CDFW 2006) • Subterranean refuges: Found under rotting logs, rocks, and surface litter (CDFW 2006) • Breeds in communal underground sites (CDFW 2006)	• Hickman's onion • Yadon's rein orchid • Monterey pine woodland	• All RC goals, objectives, and actions • Water 1.1.1, 1.1.3, 1.1.5, 1.1.7, Water Objective 1.2 • All amphibian goals, objectives and actions

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
Townsend's big-eared bat Corynorhinus townsendii • Status: State Species of Special Concern • RCIS Regions: All terrestrial regions	• All terrestrial communities	• Roosts in caves, mines, tunnels, buildings, or other human-made structures with access to open, mesic sites for foraging (CDFW 2000d) • May use separate sites for night, day, hibernation, or maternity roosts (CDFW 2000d)	• pallid bat • working lands	• All RC goals, objectives, and actions • All PB goals, objectives, and actions

two-striped garter snake Thamnophis hammondii • Status: State Species of Special Concern • RCIS Regions: All terrestrial regions	• Freshwater emergent wetland	• Associated with permanent or intermittent waterbodies with adjacent dense vegetation in a variety of habitats (CDFW 2000e) • Foraging habitat: primarily in and along streams (CDFW 2000e) • At night, retreat to mammal burrows, crevices, and under surface objects (CDFW 2000e)	• California red-legged frog • tricolored blackbird • working lands	• All RC goals, objectives, and actions • Water 1.1.1, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, Water Objective 1.2 • All Amphibian goals, objectives, and actions • CRLF 1.1.1, 1.2.1, 1.2.3, 1.2.4, 1.2.5, 1.2.6 • WL 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.2.1

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
				• HC Objective 1.2
western mastiff bat Eumops perotis californicus • Status: State Species of Special Concern • RCIS Regions: All terrestrial regions	• All terrestrial communities	• Roosts in cliff faces, high buildings, trees, and tunnels near extensive open areas for foraging (CDFW 1988f)	• pallid bat • working lands	• All RC goals, objectives, and actions • All PB goals, objectives, and actions

western spadefoot Spea hammondii • Status: State Species of Special Concern • RCIS Regions: Mid Inner Coast Range, Outer Coast Range, San Antonio Valley, San Antonio River, Nacimiento River, Gabilan Range and Pinnacles National Park	• Vernal pool • Annual grassland • Freshwater emergent wetland • Riparian	• Most of the year spent in upland underground burrows (CDFW 2000f) • Breeding habitat: shallow, temporary pools with submerged vegetation or rocks (CDFW 2000f)	• California red-legged frog • California tiger salamander • vernal pool fairy shrimp • valley oak woodland • working lands	• All RC goals, objectives, and actions • All Amphibian goals, objectives, and actions • CRLF 1.1.1, 1.2.1, 1.2.3, 1.2.5, 1.2.6, 2.1.1, 2.2.2 • CTS Objective 1.2, 2.1.1, and 2.2.2 • VPFS, 1.2.1, 1.2.2, 1.2.3, 1.2.6, 1.2.7 • WL 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.2.1

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
				• HC Objective 1.2
yellow-billed magpie Pica nuttallii • Status: State Species of Special Concern • RCIS Regions: Mid Inner Coast Range, Outer Coast Range, Big Sur Coastline, San Antonio River, San Antonio Valley, Nacimiento River, Gabilan Range and Pinnacles National Park	• Riparian • Valley oak woodland • Blue oak woodland	• Yearlong resident in open oak and riparian woodland, and farm and ranchland with tall trees in the vicinity of grassland, pasture and cropland (CDFW 1988e)	• valley oak woodland • working lands	• All RC goals, objectives, and actions • Water 1.1.3, 1.1.7, 1.1.8 • VOW 1.2.1, 1.2.2, 1.2.3 • WL 1.1.2, 1.1.4, 1.1.7, 1.2.1 • HC 2.1.1, 2.1.3

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
Plant Species				
Carmel Valley cliff aster Malacothrix saxatilis var. arachnoidea • Status: California Native Plant Rank 1B.2 • RCIS Regions: Carmel Valley	• Rocky outcroppings	• Found on rocky outcrops or steep rocky roadcuts in chaparral and coastal scrub habitats (CDFW 2020)	• Carmel Valley bush mallow	• All RC Goal 1 and Plant goals, objectives and actions • CVBM 1.2.1

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
Clare's pogogyne Pogogyne clareana • Status: State Endangered, California Native Plant Rank 1B.2 • RCIS Regions: Big Sur Coastline	• Riparian	• Found in intermittent streams in moist, sandy soils in chaparral, cismontane woodland, and riparian woodland habitats (CDFW 2020).	• California newt • steelhead	• All RC Goal 1 and Plant goals, objectives and actions • Water 1.1.1, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, Water Objective 1.2 • SCCCS 1.2.5

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
Contra Costa goldfields Lasthenia conjugens • Status: Federally Endangered, California Native Plant Rank 1B.1 • RCIS Regions: Mid Inner Coast Range	• Vernal pool	• Occurs in vernal pools, swales, low depressions, and open grassy areas in valley and foothill grassland, alkaline playa, and cismontane woodland habitats (CDFW 2020).	• burrowing owl • California tiger salamander • vernal pool fairy shrimp • working lands	• RC Goal 1 • Water 1.1.1, 1.1.5, 1.1.7, 1.1.8 • BUOW 1.2.4 • CTS 1.1.1, 1.1.2, 1.2.3, 1.1.4 • VPFS 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.2.5, 1.2.6 • All Plant goals, objectives and actions • WL 1.1.1, 1.1.2, 1.1.4, 1.1.7, 1.2.1

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
eelgrass Zostera marina • Status: None • RCIS Regions: Monterey Bay Coastline	• Saline emergent wetland • Marine • Estuarine	• Soft-bottomed habitats in intertidal, subtidal, and nearshore areas (Sherman and DeBruckyere 2018).	• southern sea otter • steelhead • tidewater goby	• RC 1.1.3, 1.1.5, 1.2.1, 1.2.2, 1.2.3, 1.2.5, 1.2.6, 1.2.8, 1.2.9, 1.2.10 • Water 1.1.1, 1.1.3, 1.1.5, 1.1.6, 1.1.7, Water Objective 1.3 • SSO 1.2.1 • SCCCS 1.2.2, 1.3.7, 2.1.1, 2.1.2 • TG 1.2.3, 1.3.1, 1.3.3 • Plant Objective 1.1

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
Jolon clarkia Clarkia jolonensis • Status: California Native Plant Rank 1B.2 • RCIS Regions: All terrestrial regions	• Mixed chaparral • Montane hardwood • Coastal scrub • Riparian	• Edges and recently burned stands of chaparral, coastal scrub, or oak woodland habitats in the Santa Lucia Mountains (Coastal Training Program 2020d).	• burrowing owl • California red-legged frog • California tiger salamander • mountain lion • working lands	• All RC Goal 1 • CRLF 1.2.2, 1.2.5 • All Plant goals, objectives and actions • WL 1.1.1, 1.1.2, 1.1.4, 1.1.7, 1,1,8
Little Sur manzanita Arctostaphylos edmundsii • Status: California Native Plant Rank 1B.2 • RCIS Regions: Big Sur Coastline	• Mixed chaparral • Coastal scrub	• Sandy terraces on ocean bluffs (CDFW 2020).	• Smith's blue butterfly	• RC Goal 1 • BLUE 1.2.1, 1.2.5, 1.3.1 • All Plant goals, objectives and actions

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
Menzies' wallflower Erysimum menziesii • Status: Federally Endangered, State Endangered, California Native Plant Rank 1B.1 • RCIS Regions: Monterey Bay Coastline, Monterey Peninsula to Pt. Lobos	• Coastal dune	• Localized on dunes and coastal strand (CDFW 2020).	• Monterey spineflower	• RC Goal 1 • All Plant and Dune goals, objectives and actions • MS.2.1.1, 2.1.2
Monterey clover Trifolium trichocalyx • Status: Federally Endangered, State Endangered, California Native Plant Rank 1B.1 • RCIS Regions: Monterey Peninsula to Pt. Lobos	• Closed-cone pine-cypress	• Openings, burned areas, and roadsides in areas with sandy soils (CDFW 2020). • Fire-dependent (USFWS 2004b)	• Hickman's onion • Monterey pine forest	• RC Goal 1 • All Plant goals, objectives and actions • MPF 1.2.2, 1.2.3

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
Monterey larkspur Delphinium hutchinsoniae • Status: California Native Plant Rank 1B.2 • RCIS Regions: Monterey Bay Coastline, Big Sur Coastline	• Mixed chaparral • Perennial grassland • Coastal dune • Coastal scrub	• Found on semi-shaded, slightly moist slopes. Slopes are usually west facing (CDFW 2020).	• California condor • coast horned lizard • Smith's blue butterfly • Monterey spineflower	• RC Goal 1 • BLUE 1.2.1, 1.2.2, 1.3.1 • All Plant and Dune goals, objectives and actions
sandmat manzanita Arctostaphylos pumila • Status: California Native Plant Rank 1B.2 • RCIS Regions: Monterey Bay Coastline, Monterey Peninsula to Pt. Lobos, Big Sur Coastline	• Mixed chaparral • Coastal scrub	• Occurs on sandy soils with other chaparral associates (CDFW 2020)	• Monterey spineflower • seaside bird's beak	• RC Goal 1 • All Plant goals, objectives and actions

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
Other Conservation Elements				
coast live oak woodland Quercus agrifolia Alliance • Status: None • RCIS Regions: All terrestrial regions	• Coastal oak woodland	• Quercus agrifolia is dominant or co-dominant in the tree canopy (CNPS 2020) • Occurs on alluvial terraces, canyon bottoms, stream banks, slopes or flats with deep sandy or loamy soils with high organic matter (CNPS 2020)	• California newt • California red-legged frog • Yadon's rein orchid • working lands	• RC Goal 1 • CRLF 1.1.1, 1.2.1, 1.2.2, 1.2.5 • All Plant goals, objectives and actions • YRO 1.2.1 • WL 1.1.2, 1.1.4, 1.1.7, 1.2.1

Non-Focal Species Information	RCIS Natural Communities	Ecological Requirements	Focal Species Association Common Name	Associated Focal Species Actions
woolly-leaf manzanita shrubland Arctostaphylos tomentosa Alliance • Status: S3 • RCIS Regions: Monterey Bay Coastline, Outer Coast Range Mid Inner Coast Range	• Mixed chaparral • Montane chaparral	• Arctostaphylos tomentosa is dominant, co-dominant, or characteristically present in the shrub canopy (CNPS 2020). • Occurs near the coast or within maritime climatic influence including bluffs, dunes, mesas, outcrops, slopes, and terraces (CNPS 2020).	• Carmel Valley bush mallow • Monterey gilia • Monterey spineflower • seaside bird's beak • Yadon's rein orchid	• RC Goal 1 • All Plant goals, objectives and actions • CVBM 1.2.1 • MS 1.2.1 • YRO 1.2.1, 1.2.2